Child's Nervous System (2018) 34:1997–2122
https://doi.org/10.1007/s00381-018-3912-9

ABSTRACTS

46th Annual Meeting of International Society for Pediatric Neurosurgery, Tel Aviv, ISRAEL, 7-11 October, 2018

Shlomi Constantini, ISPN 2018 Annual Meetings' Chair
Anthony Figaji, ISPN 2018 Scientific Committee Chair
Francesco Sala, ISPN 2018 Scientific Committee Co-Chair

PLATFORM PRESENTATIONS

Monday, 8 October 2018
08:10 – 10:35

Platform Presentations: Neuro-Oncology

PF-001

Special Topic: Neuro-Oncology

Genomic Analyses Revealed Secondary Glioblastoma after Radiotherapy in a Subset of Recurrent Medulloblastomas

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OBJECTIVE: Despite great advances in understanding of molecular pathogenesis and achievement of a high cure rate in medulloblastoma, recurrent medulloblastomas are still dismal. Additionally, misidentification of secondary malignancies due to histological ambiguity leads to misdiagnosis and eventually to inappropriate treatment. Nevertheless, the genomic characteristics of recurrent medulloblastomas are poorly understood, largely due to a lack of matched primary and recurrent tumor tissues.
MATERIAL-METHODS:We performed a genomic analysis of recurrent tumors from 17 pediatric medulloblastoma patients.
RESULTS:Whole-transcriptome sequencing revealed that a subset of recurrent tumors initially diagnosed as locally recurrent medulloblastomas are secondary glioblastomas after radiotherapy showing high similarity to the non-G-CIMP proneural subtype of glioblastoma. Further analysis, including whole-exome sequencing, revealed missense mutations or complex gene fusion events in PDGFRA with augmented expression in the secondary glioblastomas after radiotherapy, implicating PDGFRA as a putative driver in the development of secondary glioblastomas after treatment exposure. This result provides insight into the possible application of PDGFRA-targeted therapy in these second malignancies. Furthermore, genomic alterations of TP53 including 17p loss or germline/somatic mutations were also found in most of the

secondary glioblastomas after radiotherapy, indicating a crucial role of TP53 alteration in the process. On the other hand, analysis of recurrent medulloblastomas revealed that the most prevalent alterations are the loss of 17p region including TP53 and gain of 7q region containing EZH2 which already exist in primary tumors. The 7q gain events are frequently accompanied by high expression levels of EZH2 in both primary and recurrent medulloblastomas, which provides a clue to a new therapeutic target to prevent recurrence.
CONCLUSION:Considering the fact that it is often challenging to differentiate between recurrent medulloblastomas and secondary glioblastomas after radiotherapy, our findings have major clinical implications both for correct diagnosis and for potential therapeutic interventions in these devastating diseases.

PF-002

Special Topic: Neuro-Oncology

Results of the combined treatment of childhood craniopharyngioma. A review of 210 cases

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OBJECTIVE:The goal of study was to compare the effectiveness and safety of surgical and combined treatment of craniopharyngiomas.
MATERIAL-METHODS:We have analyzed 135 children primary operated in Burdenko Neurosurgery Institute in 2005-2012 and 75 irradiated patients. Median follow-up was 89,9 months (16,9-134,1). 49% patients had endosuprasellar, 22% - stalk, and 29% - intraventricular craniopharyngiomas.

Surgery included tumor removal (total-35%, subtotal-25%, partial-25%), transnasal cyst evacuation-11%, Ommaya implantation-4%. Stereotactic fractionated RT was performed in 30, hypofractionated – in 30, radiosurgery – in 15 patients.
RESULTS:5-PFS after total resection was 79%, it was significantly ($p<0.01$) higher then after non-total resection – 18%. PFS wasn't significant differe between subtotal and partial resection, transnasal cyst evacuation and Ommaya implantation. 5-PFS after combined treatment was 86%; after adjuvant irradiation (n=50) – 100%, while after salvage RT/RS (n=25) – 79%. Difference wasn't significant (p=0.5).

80% children after tumor removal had panhypopituitarism and DI. Irradiation-induced new hormone deficit was only in 1/15 cases.

11,4% patients had transient cyst enlargement after RT/RS.

Vision increased after surgery in 22%, decreased in 14%, remained unchanged in 64% patients. Visual impairment more frequently occurred in patients with severe vision impairment before operation (p=0.01). After RT/RS visual functions remained unchanged in 78%, improved in 16%, worsened in 6%. Vision didn't deteriorate after irradiation in any child with severe vision impairment.

Diencephalic disturbancies appeared after total removal of stalk and intraventricular CP (in 11/25 patients). Obesity didn't appeare in any patient after combined treatment (p=0.02).

QoL was significantly higher after combined treatment of stalk and intraventricular CP then after total removal (p=0.01).
CONCLUSION:Endosuprasellar craniopharyngiomas should be removed totally. Combined treatment provides the same PFS as total removal. It is more safe then radical surgery of intraventricular craniopharyngiomas. Combined treatment of stalk and intraventricular craniopharyngiomas is preferred, as it provides high PFS and don't impairs QoL.

PF-003

Special Topic: Neuro-Oncology

Neurofibromin deficiency alters brain-wide intrinsic functional organization of the developing brain

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OBJECTIVE:Children with NF1 display multiple structural and functional changes in the central nervous system, such as white matter alterations, and a unique profile of neuropsychological cognitive abnormalities. Assessment of resting state networks (RSNs) can reveal differences in the functional architecture of the developing brain in response to neurofibromin deficiency resulting from NF1 mutation. Here, we focused on resting-state functional connectivity between the subcortical striatum and cortical networks differentiated as primary (e.g., visual, somatomotor) versus association (e.g., ventral attention, default).
MATERIAL-METHODS:Eighteen children with NF1 who had resting-state fMRI scans were group-matched (age,

gender and head movement) with 18 typically developing children (TDC) from the ABIDE repository. Coherent slow fluctuations in the fMRI signal across the entire brain were used to interrogate the pattern of functional connectivity of cortical-subcortical structures. Assessment of RSNs was done using a previously established automated clustering algorithm.
RESULTS:NF1 children demonstrated abnormal organization of association networks, particularly, deficient long-distance functional connectivity.

Examining the contribution of the striatum revealed that corticostriatal functional connectivity was altered, with NF1 children demonstrating diminished functional connectivity between striatum and the ventral attention network, as well as the posterior cingulate area, which is associated with the default network. By contrast, somatomotor functional connectivity with the striatum was increased. Functional connectivity of the visual network with the striatum did not differ in the NF1 group.
CONCLUSION:These findings suggest that, much like in animal studies, the striatum plays a major role in NF1 cognitive pathogenesis. In addition, the "immature" pattern of deficient long distance functional connectivity suggests that NF1-associated myelin abnormalities may also play a significant role in the disrupted formation of RSNs.

PF-004

Special Topic: Neuro-Oncology

MicroRNA–mRNA expression profiles can differentiate medulloblastoma subgroup 3 and 4

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OBJECTIVE:Medulloblastoma (MB), the most common malignant brain tumor in children, is divided into four subgroups: wingless-type (WNT), sonic hedgehog (SHH), Group 3, and Group 4. Each subgroup has a distinct demographic and genetic profile and outcome. Subgroup based treatment protocols are currently evolving with escalation of therapy for high risk group 3 patients and de-escalation for some low risk WNT and group 4 patients. While WNT and SHH subgroups have well-defined biomarkers, distinguishing Group 3 from Group 4 is not so straightforward. MicroRNAs (miRNAs), which regulate posttranscriptional gene expression, are involved in MB tumorigenesis. However, the miRNA–messenger RNA (mRNA) regulatory network in MB is far from being fully understood. Our aims were to investigate miRNA expression regulation in MB subgroups, to assess miRNA target relationships, and to identify miRNAs that can distinguish Group 3 from Group 4.
MATERIAL-METHODS:With these aims, integrated transcriptome mRNA and miRNA expression analysis was performed on primary tumor samples collected from 18 children with MB, using miRNA sequencing (miRNA-seq), RNA sequencing (RNA-seq), and quantitative PCR.
RESULTS:Of all the expressed miRNAs, 19 appeared to be significantly differentially expressed (DE) between Group 4 and non-Group 4 subgroups (false discovery rate [FDR] <0.05), including 10 miRNAs, which, for the first time, are reported to be in conjunction with MB. RNA-seq analysis identified 165 genes that were DE between Group 4 and the other subgroups (FDR <0.05), among which seven are predicted targets of five DE miRNAs and exhibit inverse expression pattern.
CONCLUSION:This study identified miRNA molecules that may be involved in Group 4 etiology, in general, and can distinguish between Group 3 and Group 4, in particular.

In addition, understanding the involvement of miRNAs and their targets in MB may improve diagnosis and advance the development of targeted treatment for MB.

PF-005

Special Topic: Neuro-Oncology

Safety of ultrasound-induced blood-brain barrier opening in pediatric patients with refractory sus-tentorial malignant brain tumors before chemotherapy administration – The SONOKID clinical trial

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OBJECTIVE:To determine the safety of repeated disruption of the blood-brain barrier (BBB) by low intensity pulsed ultrasound (LIPU) with the Sonocloud® device in children with recurrent malignant supra-tentorial brain tumors prior to intravenous carboplatin chemotherapy. The safety of this procedure is currently being validated in adult patients with recurrent glioblastoma (Carpentier et al. 2016).
MATERIAL-METHODS:This single-center phase I/IIa clinical trial will include 12 to 24 patients aged 5 to 18 years, with recurrent malignant supra-tentorial brain tumors. The Sonocloud® device will be implanted into the skull under general anesthesia, during a standard procedure (biopsy or resection). Thanks to a transdermic connexion, sonications will be performed monthly in combination with injection of an ultrasound contrast agent (Sonovue®). US parameters will be based on the adult patients study. BBB disruption will be evaluated using multimodal magnetic resonance imaging (MRI) realized before and after each sonication. Carboplatin will be injected intravenously during the hour following the sonication. Patients will receive a maximum of 6 monthly sonications and will be followed at least for 6 months after the last sonication.
RESULTS:The principal criteria will be the absence of grade ≥ 3 neurological toxicity (NCI-CTCAE 4.0 Version, clinical and radiological assessment) linked to the US-induced opening of the BBB after first treatment. Secondary evaluation criterias will include tolerance of repeated sonications, 6 months overall survival and progression-free survival, and feasibility of the technique.
CONCLUSION:SONOKID is the first clinical trial assessing the feasibility and tolerance of US-induced opening of the BBB in children treated for a malignant brain tumor.
SPONSOR Canceropole Ile de France

Carpentier A et al. Clinical trial of blood-brain barrier disruption by pulsed ultrasound. Sci Transl Med. 2016 Jun 15;8(343):343re2.

PF-006

Special Topic: Neuro-Oncology

Phase 1 Study using the IDO-inhibitor indoximod in combination with radiation and chemotherapy for children with progressive brain tumors (NCT02502708)

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OBJECTIVE:The indoleamine 2,3-dioxygenase (IDO) pathway is a natural immune-checkpoint mechanism often exploited by tumors to escape anti-tumor immunity. Small-molecule IDO pathway inhibitor drugs, such as indoximod, are in multiple trials for adults. Combining indoximod immunotherapy with radiation and chemotherapy is a highly innovative approach for treating children with progressive brain cancer.
MATERIAL-METHODS:The goal of this first-in-children trial is to assess the feasibility, safety, and preliminary evidence of efficacy of combining indoximod either with temozolomide, or with radiation followed by maintenance therapy with indoximod/temozolomide, for children age 3 to 21 with progressive malignant brain tumors. The study includes two dose-escalation cohorts using a standard 3+3 design to determine a recommended phase-2 dose (RP2D) for indoximod in combination with either temozolomide (planned n=12) or radiation (planned n=12). Indoximod dose-levels are 80%, 100%, and 120% of the adult RP2D.
RESULTS:We present up-to-date toxicity/side-effect data and follow-up results for all patients enrolled in dose-escalation arms. Twenty nine children have enrolled, and 16 of these have been treated with indoximod plus radiation, including children with ependymoma (n=14), medulloblastoma and malignant gliomas (n=9). Some children received more than one radiation plan over time. All patients were heavily pre-treated, and many patients required target volume and dose adaptation to reduce toxicity risks. Among patients treated to date, median total radiation dose was 30 Gy (range 14-54 Gy), median number of radiation fraction was 20 (range 1-30), and median follow-up duration was 8 months (range 2-15 months). To date, all patients have been able to complete their planned

radiation and start maintenance therapy with indoximod/temozolomide and adverse events have been manageable. CONCLUSION:The combination of indoximod and radiation/chemotherapy has been well tolerated in this patient population with good overall quality-of-life.

Platform Presentations: Neuro-Oncology

PF-085

Special Topic: Neuro-Oncology

Suprasellar Germ Cell Tumors in Childhood

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OBJECTIVE:Suprasellar germ cell tumors (S-GCT) are a rare form of intracranial tumor. S-GCTs occur in the hypothalamus and pituitary axis either in an isolated fashion or concurrently with pineal (P) or basal ganglia (BG) GCT. S-GCT have not been well described in the literature. Therefore, we reviewed our own cases of germ cell tumors affecting the suprasellar location to identify their nature, behavior and response to treatment.
MATERIAL-METHODS:A retrospective review of a series of 42 S-GCT showed 24 isolated S-GCTs, 14 multifocal with P-GCTs and 4 multifocal with BG-GCTs. MR imaging characteristics were reviewed. Surgical tissue biopsy was done in 30 patients (13 craniotomy, 10 ventriculoscopy, 5 transsphenoidal and 2 stereotaxic). The other 12, diagnosis was based on serum and CSF tumor markers, CSF cytology and imaging characteristics. All 42 patients were treated with chemotherapy and subsequent radiation therapy (RT). Four patients received a second look surgery. Clinical outcome information was reviewed.
RESULTS:There were 24 boys and 18 girls. Isolated S-GCT showed female predominance (17 vs. 7). The most common symptom was diabetes incipidus occurring in all but 4, followed by headaches, weight loss and visual symptoms. Lateral ventricle dissemination was noted in 4 isolated S-GCTs and in 3 P-GCTs and 3 BG-GCTs. Cavernous sinus involvement was noted in 4 patients. Histology included germinoma or presumably germinoma in 37, and non-germinomatous GCT (NGGCT) in 5. During the follow up period of up to 20 years, 5 patients died of disease and 2 other patients had recurrences. Nearly all patients required multiple hormonal replacement therapy for DI and hypopituitarism.
CONCLUSION:Germinomas with high HCG and NGGCT pose high recurrence rates. However, S-GCT show good prognosis with chemotherapy and RT even among those with multifocal presentation.

Monday, 8 October 2018
11:00 – 12:50

PF-007

Special Topic: Neuro-Oncology

Pineal tumors in children: the French Register and the Lyon experience

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OBJECTIVE:We report the experience of the Lyon and of the French Register of the pineal tumors focusing only on pediatric cases.
MATERIAL-METHODS:From 830 patients of the French Register of the pineal tumors, 294 represent pediatric patients. In the national register pineal parenchymal tumors (PPT) represent 25,2% of cases, germinal tumors 43,9%, glial tumors 10,5%, papillary tumors 3,7%, pineal cysts 9,9% and other 6,8%. In the Lyons series, PPT represent 18,9%, germinal tumors 44,1%, glial tumors 10,2%, PTPR 1,6%, pineal cyst 20,5% and other 4,7%. 188 patients were treated for hydrocephalus: 118 by ventriculoperitoneal or atrial shunt and 52 patients by endoscopic ventriculostomy and no data for 18 patients. 122 patients had a biopsy: 35 by endoscopy, 52 in stereotactic conditions, 17 by direct approach and in 18 the biopsy technique is unknown. 188 patients underwent surgical resection with or without initial biopsy or after adjuvant chemotherapy.
RESULTS:Analysis of the results shows a relationship with histology with better survival for benign lesions. In patients with pinealoblastoma, survival does not exceed 25% with a particularly poor outcome for children younger than 4 years. For mixed secreting germ line tumors, the overall survival is of only 15% despite additional treatment.
CONCLUSION:Pineal tumors in children represent a difficult challenge still to-day. The decisional tree depends on the radiological and markers studies and need a multidisciplinary discussion. Benign lesion can be treated with a low rate

of sequels while malignant lesions as pinealoblastomas have still a bad prognosis.

PF-008

Special Topic: Neuro-Oncology

Neuroendoscopic management for pineal tumors in pediatric patients

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OBJECTIVE:To analyze and compare our experience of 20 years with Neuroendoscopic approach to Pineal tumors in pediatric patients at the Neirosurgical Pediatric Department at the Asenjo's neurosurgical Institute in Santiago-Chile.
MATERIAL-METHODS:At the Asenjo' s Institute in Santiago-Chile -Neuroendoscopy started on 1996 and so far we have performed 1626 cases with a 40 % of pediatrics cases.Brain tumors cases were one third of the total and pediatric pineal tumors represented only 1.6 %

A full revision of clinical charts,operative videos,pre and post op images and clinical follow up of the 26 pediatric patients was carried on

to build our serie of 20 years to be compared with the main asiatic countries eries
RESULTS:We analyzed 26 patients operated using Neuroendoscpic techniques in which a biopsy sample was obtained and were treated accordingly to the histological report.In 90 % of them the sample was enough for the histological study and only 10 % were not conclusive.Main complicactions were the ventricular infection (11.5 %).Hydrocephalus was solved by endoscopic thirdventriculostomy in 80 % of the serie.Main tumors were Germinoma (46.5 %) followed by Pineocitoma (15 %) Mature teratoma (11,5%) and High Grade Astrocytoma (11,5 %)
CONCLUSION:Neuroendoscopic management of pineal tumors at our institutions has proven to be of great value becoming our gold standard for this pathology guiding the oncological therapy as well of solving the secondary hydrocepahlus avoiding a shunt in only one surgical gesture.

The high rate of ventriculitis must be lowered optimizing our technique and prophylactic measures once in the endoscopic procedure within the operation thatre.

PF-009

Special Topic: Neuro-Oncology

Optic pathway gliomas and their volumetric response to chemotherapy: threshold for improvement vs. treatment failure

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OBJECTIVE:Optic pathway gliomas (OPGs) are low-grade glial neoplasms centered within the optic apparatus: the optic nerve, optic chiasm, optic tracts, and optic radiations. Current dogma dictates that diagnosis is often based on imaging alone, followed by chemotherapy, with surgery rarely being utilized. Through volumetric analysis, we assessed the chemotherapeutic response of a large cohort of OPGs, stratified by pre-treatment size.
MATERIAL-METHODS:We retrospectively reviewed pre- and post-chemotherapy MRI scans for all OPGs at a single institution. OPG location, size, appearance of cystic components, and variation in chemotherapeutic regimens were evaluated. Volumetric analysis was then performed to assess treatment effect and lesional progression.
RESULTS:95 patients were reviewed, with a total of 26 receiving chemotherapy. Chemotherapy regimens typically included carboplatin and vincristine, although vinblastine and temozolomide were used as well. Of those receiving chemotherapy, 16 lesions were less than 12 cc3 and 10 were greater than 12. Following chemotherapy, lesions less than 12 cc3 showed a decrease in volume of 40.99% compared to lesions greater than 12 cc3 showing a 104.95% increase in tumor volume ($P<0.05$).
CONCLUSION:OPGs require management from experienced multidisciplinary teams for optimal longitudinal care. Lesion volume of 12 cc3 prior to chemotherapeutic treatment appears to show a threshold, in which tumor volumes greater than this threshold have a limited response to chemotherapeutic regimens. The implications of these findings may portend an overall improvement to chemotherapeutic response if upfront surgical debulking is undertaken to decrease the tumor burden when size is greater than 12 cc3.

PF-010

Special Topic: Neuro-Oncology

Predicting optic pathway glioma progression using magnetic resonance image analysis and machine learning

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OBJECTIVE:Optic pathway gliomas (OPGs) are low-grade tumors of the visual system with a variable clinical course. The initial decision to treat or observe is difficult due to the inability to prospectively identify which patients will develop tumor enlargement or vision decline. We applied advanced image analysis and machine learning techniques to generate a MRI-based predictive model of OPG tumor progression.
MATERIAL-METHODS:We performed a retrospective case-control study of OPG patients managed between 2009 and 2015 at an academic children's hospital. All OPG patients with tumor progression were selected and matched to an equal number of controls. Progression was defined as radiographic tumor growth or vision decline. The following MRI sequences were registered for each patient: T1, T1-contrast-enhanced (CE), T2, FLAIR, and diffusion-tensor imaging. Optic nerves were manually defined using T1-CE images, and optic radiations were defined using diffusion tractography tools. Intensity distributions, as well as mean, minimum, and maximum values, were extracted from within the defined optic pathways across all imaging modalities. A machine learning algorithm was used to analyze multiple imaging features to find the combination most predictive of progression. Leave-two-out cross validation was performed.
RESULTS:Thirty six patients (mean age 6.5+/-3.5 years, 17 female) were included. Mean surveillance period was 289+/-215 days for cases and 357+/-257 days for controls. Extracted features totaled 254. The model correctly classified patients as having tumor progression with 83% accuracy, 81% sensitivity, and 85% specificity (Figure 1). The most highly predictive features were mean fractional anisotropy and mean T2 signal of the optic radiations.
CONCLUSION:Machine learning can be used to accurately predict OPG tumor progression, and, as OPGs grow along white matter tracts, radiographic alterations of diffusion are predictive of progression. The image-based model provides prognostic information and may guide the frequency of surveillance imaging to facilitate early detection and treatment of tumor progression.

PF-012

Special Topic: Neuro-Oncology

Feasibility and Safety of Awake Brain Surgery in Children

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OBJECTIVE:Awake brain surgery has fewer indications in children due to the young age and neuropsychological aspects interfering with its feasibility compared to adults. Despite these limitations awake procedures can be performed in children with specific precautions. This study reports our results of feasibility, and overall outcome of awake brain surgery in children.
MATERIAL-METHODS:Retrospective review and prospective outcome analysis of all children who underwent awake brain surgery in Lyon between 2005 and 2018 are reported
RESULTS:Among 19 children considered for awake brain surgery 17 were accounted eligible after neuropsychological evaluation and underwent asleep-awake-asleep brain surgery. The cohort included 5 males and 12 females. The median age at surgery was 14.8 years, (range: 9.4 to 17.6 years). The indications were related to CNS lesions in eloquent areas, mostly glial tumors. Intraoperative testing included cortical electromagnetic stimulation during speech or motor activity. A complete tumor removal was achieved in 10 patients (59%). Transient neurological deficits were postoperatively observed in 4 patients (24%), whereas permanent deficits were noted in any of the patients. One patient developed an infectious complication requiring long-term antibiotic treatment. Severe psychological troubles occurred in 1 child aged 10 years old. The mean duration of follow up was 26,1 months (range: 1,2 to 86,4 months). Two patients died during follow-up due to tumor progression.
CONCLUSION:Awake brain surgery was shown to be feasible and beneficial in children in terms of psychological outcome and efficient preservation of neurological functions on long-term outcome. Psychological evaluation after surgery was altered importantly in 1 patient and temporarily in 3 patients, which is comparable to results in adults. Preemptive psychological preparation and sustain is essential to admit children to awake procedures in order to optimize the surgical resection extent and neurological outcome ratio, especially in younger children under the age of 10.

PF-013

Special Topic: Neuro-Oncology

The benefit of Surveillance Imaging for Paediatric Cerebellar Low Grade Glioma

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OBJECTIVE:Paediatric cerebellar low-grade gliomas (LGG) are amongst the most common of childhood brain tumours. These WHO Grade 1 tumours are generally amenable to resection and surgery alone is curative in the majority of cases. There is, however, a lack of evidence regarding the frequency and duration of post treatment MRI surveillance in these tumours.

This is important as follow-up imaging is a significant use of resources and often associated with patient and family anxiety.

The aim of this service evaluation was to assess the utility of MRI surveillance in the detection of cerebellar LGG recurrence at our regional paediatric neurosurgical centre.

MATERIAL-METHODS:The tumour register was interrogated at Alder Hey Children's Hospital to identify all patients diagnosed between 2007-2017, with a confirmed diagnosis of cerebellar Pilocytic astrocytoma. Patient demographics, surgical outcome, number of MRI scans and length of follow up were recorded for each patient.

RESULTS:42 patients met the inclusion criteria. The mean age at diagnosis was 7.8 years (range 8 months to 17 years). Complete surgical resection (CR), confirmed by post-operative MRI, was achieved in a total of 38 patients (90%). From 2010 onwards, (introduction of iOMRI) CR was seen in 100% of 26 cases.

In the CR cases there was only 1 (non-progressive)relapse diagnosed at 2.2 years post-surgery.

The 4 patients with partial resection (2007-2009), all required re-resection for progressive disease, with the time to progression being <12 months for all.

CONCLUSION:This series confirms the very low likelihood of recurrence for CR in cerebellar LGG, and in such cases the duration and frequency of surveillance imaging can be limited to maximum 3 years follow up imaging. This work also points to improved complete resection rates over time, probably associated with technical advances including the routine in-house use of intra-operative MRI in 2010.

PF-014

Special Topic: Neuro-Oncology

Management of NF2-associated vestibular schwannomas in children and young adults: influence of surgery on tumor volume and growth rate

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OBJECTIVE:To evaluate in NF2 patients under the age of 25 years tumor volume and growth rate of vestibular schwannomas before and after hearing preserving surgery, consisting of decompression of internal auditory canal (IAC) with various degrees of tumor reduction according to BEAP (brainstem evoked auditory potentials) stability.

MATERIAL-METHODS:In 36 NF2 patients (72 tumors) tumor volumetry using contrast T1-weighted MR images with thin slices (< 3 mm) was performed using the BrainLab Software. Growth rate was calculated using the gradient between a minimum of two MRI points and significance was tested with two independent sample t-test and paired sample t-test by SPSS software. Results were compared over time pre- and post surgery.

RESULTS:Data from 28 patients and 47 tumors before and after surgery were included. Two patients were operated twice on one side. 8 patients were excluded from the analysis because of no treatment, chemotherapy only or presence of collision tumors. The mean follow-up was 37.64 months (range 12-167 months) per patient. A mean growth rate of 0.693 (+/-1.296) ml/year before and 0.227 (+/-0.416) ml/year after surgery with statistical significance (p = 0.013) was found with a total reduction by 32.756 % of the output value.

Similarly, tumor volume before (mean: 3.338cm3+/-4.972cm3) and after surgery (1.658 cm3+/-3.817cm3) was significantly lower (p = 4.928-05), with a total reduction of volume of 50.33 % by surgery.

CONCLUSION:Hearing preserving surgery by decompression of the IAC and partial tumor resection guided by BEAP has no stimulatory influence on tumor growth rate, but slows tumor growth. Thus, timing of surgery is important and should precede medical treatment with growth inhibitors like bevacizumab. The exact effect of surgery on the extent of hearing preservation and the duration of hearing stability post surgery is currently evaluated.

Monday, 8 October 2018
14:00 – 15:30

Platform Parallel Presentations: Dysraphism /General

PF-015

Special Topic: Dysraphism

Surgery for spinal lipomas based on a new classification system

Nobuhito Morota, Satoshi Ihara, Kyoji Tsuda
Division of Neurosurgery, Tokyo Metropolitan Children's Medical Center, Tokyo, Japan

OBJECTIVE:The authors proposed a new classification of spinal lipoma based on the embryonic stage (Morota et al: J Neurosurg Pediatr 19: 428-439, 2017). Surgical tactics differ each type of spinal lipoma.
MATERIAL-METHODS:The study included 172 conus spinal lipoma (Type 1-3) operated from August 2002 to January 2018. Type 4 spinal lipoma (filum lipoma) was excluded because of its simple surgical procedure. Difference of surgical procedures and intraoperative findings were compared. All surgeries were performed under intraoperative neurophysiological procedures.
RESULTS:There were 61 type 1, 35 type 2 and 76 type 3 lipomas. In type 1 lipomas, the filum could be observed after removal of lipoma. Radical resection of the lipoma had been performed 14 among 41 type 1 lipomas since 2009. In type 2 lipomas, partial resection of lipoma was the standard procedure. The cauda equine often attached the ventral to the lipoma at its caudal end. Anatomical structure of the conus was lost. Deliberate manipulation under the neurophysiological monitoring (the bulbocavernosus reflex) played critical role to preserve urinary function. Primary goal of the type 3 lipoma surgery was untethering. Caudal end of the intradural lipoma could be removed as much. Its technical difficulty depended on the size of lipoma. During the last 3 and half years, only one (type 2) among 30 children with conus spinal lipomas experienced prolonged placement of urinary catheter postoperatively. Non needed CIC soon after surgery.
CONCLUSION:The new classification system of the spinal lipoma is useful to perform surgery safely. It enables surgeons to prepare surgical difficulty beforehand. From the surgical view point, surgeons can decide appropriate surgical approach, tactics and the way how to avoid complications.

PF-016

Special Topic: Dysraphism

Prospective survey of folate supplementation in pediatric spina bifida clinic supports the need for universal fortification

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OBJECTIVE:The Neural Tube Defects (NTDs) are a complex group of dysraphic conditions that require multi-disciplinary, life-long care. Multiple studies have demonstrated that up to 90% of NTD cases can be prevented with folic acid supplementation. However, the disordered embryopathy occurs early in the first trimester before most women realize they are pregnant. Furthermore, in the US at least 49% of pregnancies are unintended. Consequently, women cannot wait until they are pregnant to optimize folate intake for NTD prevention. The purpose of our study is to determine the rate of voluntary/preventive folic acid supplementation by women of childbearing age in our Spina Bifida Clinic.
MATERIAL-METHODS:After IRB approval was obtained, biological mothers of children with spina bifida were prospectively surveyed in the spina bifida multidisciplinary clinic from 2012-2017 at Children's of Alabama. Questions included prenatal and folic acid vitamins consumption before and during pregnancy. Descriptive analysis was conducted using SPSS (V25).
RESULTS:The final cohort consisted of 361 mothers of children with spina bifida. Just over 46% were 26-34 years at delivery, 5% were on fertility treatments, 81% were taking prenatal vitamins, 4% were taking additional folic acid supplements during pregnancy. Even with modern public health and the understanding of the importance of prevention, over 70% of women did not take any folic acid supplements before conception.
CONCLUSIONS: In a cohort of affected families the vast majority of mothers did not take folate supplements. This observational cohort study supports the potential benefit for universal food fortification with folic acid.

PF-017

Special Topic: Dysraphism

Posterior Vertebral Column Subtraction Osteotomy for the Treatment of Tethered Cord Syndrome: A prospective Outcome Study

Mari L Groves[1], Rajiv R Iyer[1], Samuel Kalb[2], Kumar Kakarla[2], Nicholas Theodore[1]
[1]Johns Hopkins Hospital
[2]Barrow Neurological Institute

OBJECTIVE:Tethered cord syndrome (TCS) is a constellation of neurological signs and symptoms related to pathological stretching of the spinal cord between two fixed points. Conventional intradural detethering procedures carry high retethering rates. The posterior vertebral column subtraction osteotomy (PVCSO) procedure for TCS may be a more

definitive treatment. PVCSO shortens the spinal column extradurally by 20-25mm in order to reduce tension on the neural elements without direct manipulation, while avoiding the typical complications of intradural surgery.

The authors present preliminary results from the first prospective study of clinical outcomes after PVCSO for TCS.
MATERIAL-METHODS:From January 2012 to present, twenty-one patients (ages 23-69) with progressive TCS underwent a thoracolumbar PVCSO at two institutions and were followed for changes in pain, neurological and functional (Oswestry Disability Index scores, ODI) status after surgery. Postoperative radiological outcomes were also assessed.
RESULTS:All patients presented with progressive low back pain, neurological symptoms, and tethering on MRI. Patients averaged 2 prior failed dithering procedures. PVCSO was performed at T12 or L1. Average spinal column reduction was 24mm. No surgical complications occurred. Average follow-up was 12.5 weeks. 2 recent patients have not yet had follow-up. All patients reported improvement in leg and/or back pain; 60% of patients had improvement in leg strength. ODI scores increased on average by 10 points. Spinal column alignment and hardware position were uniformly excellent on postoperative imaging.
CONCLUSION:In short-term follow-up, PVCSO appears to be a safe and effective alternative to intradural detethering surgery for TCS.

PF-018

Special Topic: Dysraphism

Neurosphere formation potential resides not in the caudal cell mass, but in the secondary neural tube

Ji Yeoun Lee[1], Eun Sun Lee[3], Saet Pyoul Kim[3], Myung Sook Lee[1], Ji Hoon Phi[2], Seung Ki Kim[2], Young Il Hwang[3], Kyu Chang Wang[1]
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[3]Neural Development and Anomaly Laboratory, Department of Anatomy and Cell Biology, Seoul National University College of Medicine, Seoul Korea

OBJECTIVE:The caudal cell mass (CCM) is known as the main player in secondary neurulation, forming the secondary neural tube (2NT). This suggests that the CCM may have the character of neural progenitor cells. The neural potential of the CCM and the 2NT (CCM + 2NT) was assessed by confirming the in vitro culture of neurospheres throughout the Hamburger and Hamilton stages (HH) of secondary neurulation (HH16, HH20, HH24, HH28, HH32).
MATERIAL-METHODS:The neurosphere assay was performed separately for CCM and the 2NT at HH20 and HH28. We further evaluated whether there was spatiotemporal diversity in the neural potential of the developing central nervous system (CNS) by quantification of the in vitro neurosphere culture results from the brain, upper spinal cord, lower spinal cord, and CCM + 2NT from various developmental HH stages.
RESULTS:The CCM + 2NT was capable of the in vitro formation of neurospheres, which were able to self-renew and differentiate into neurons, astrocytes, and oligodendrocytes. Quantitative evaluation of the neurosphere formation from the CCM + 2NT at various HH stages showed the greatest number of cultured neurospheres at HH28. Because the 2NT is most prominent at HH28, we hypothesized that it was rather the 2NT than the CCM, which had the main potential to produce neurospheres.

Indeed, when the neurospheres were cultured separately from the CCM and the 2NT, the latter made significantly more neurospheres.

When comparing the different parts of the developing CNS, at HH16 the greatest number of neurospheres was formed from the brain. At HH32, it was the CCM + 2NT. The region with the greatest number of neurospheres progressed in a cephalo-caudal direction as development proceeded.
CONCLUSION:This study showed that neurospheres can be cultured from CCM and its derivatives and the main player in the neurosphere formation was the 2NT, proving its neuroprogenitor protential.

PF-021

Special Topic: Dysraphism

Experience and Novel techniques in Management of 25 cases of Neuroenteric Cysts

Sandip Chatterjee, Lalgudi Harischandra
Park Clinic, Kolkata, India

OBJECTIVE:To analyse retrospectively 25 cases of neuroenteric cysts operated by us with a view to assessing problems in and solutions to their management.
MATERIAL-METHODS:25cases of neuroenteric cysts were operated on by the Senior author in the last decade. Of these 14 were in the cervical region, 3 in the dorsal region, and 8 in the dorsolumbar and lumbar area. The mean age of our pediatric patients was 7.2 years, with a male preponderance of 4:1.

The commonest manifestation was with neurological deficit(18/25) and with pain (14/25). 8 of the 25cases had other dysraphic states. Most had non-contrast- enhancing lesions on MRScans which were isointense on T1 weighted images and hyperintense on T2 weighted images. 23were intradural(intra and extramedullary) and only 2 were extradural in location. All the cervical ones were ventral to the cord, and 70% of the others were ventral as well.
RESULTS:Total surgical removal was aimed at in all cases and achievable in 14/25cases. 9 of the incompletely resected ones cases recurred, and these presented a particular problem in management. In two which recurred twice, a novel anterior approach was designed in the cervical spine, and in another 2 that recurred twice a cystosubarachnoid tube was placed. Neuromonitoring was used in all our patients. 3 of our 25cases had worsening of their preoperative neurological status.
CONCLUSION:Neuroenteric cysts are rare but present a challenge in management as they are located ventral to the cord and often not completely removable. The recurrent ones can be truly challenging.

PF-022

Special Topic: Dysraphism

Transition from subtotal to near total/radical resection of spinal cord lipoma - Is it safe?

Fozia Saeed, Ryan Koshy Mathew, Atul Tyagi
Leeds Teaching Hospitals Trust

OBJECTIVE:To compare outcomes and complication rates in the surgical management of spinal cord lipomas, following a change of practice in our department (based on Dr Pang's case series1) from subtotal resection (STR) to near-total/radical resection (NTR) in 2012.
MATERIAL-METHODS:Retrospective analysis of all patients undergoing NTR (n=17) and STR (n=11) of spinal cord lipomas (excluding filar lipomas) between 2009-2018. Only symptomatic patients underwent surgery. STR patients underwent primary dural closure alone, whilst NTR patients underwent augmented closure with an artificial dural substitute (Dura-Guard). Neurology at presentation, pre-and post-operative modified Necker-Enfants Malades (NEM) scores, lipoma classification (Pang), surgical procedure, complications, and outcome of bladder/bowel and lower limb function data were gathered through departmental records.
RESULTS:The NTR group had 10 transitional, 6 terminal and 1 chaotic spinal cord lipomas. Mean follow up was 19.6 months (range 1-56 months). Intra-operative neurophysiological monitoring was performed in all cases. In the STR group, 4 patients underwent re-operation (3 CSF leaks, 1 deep wound infection). None of the NTR group underwent re-operation (2 superficial wound infections, treated with oral antibiotics alone). Pre-operatively, there was evidence of sphincter dysfunction (NTR=5, STR=2), limb deficits (NTR=3, STR=1) or both (NTR=9, STR=8). Post-operatively, a higher proportion of NTR patients (13/17, 77%) demonstrated improvement or stabilisation in NEM scores compared to STR patients (7/11, 63%).
CONCLUSION:NTR conferred better outcomes in a higher proportion of patients. Correcting for the differences in dural closure, we did not see an increase in complication rates following NTR of spinal cord lipomas compared to STR, despite the implied risks of more aggressive surgery. Our data supports the view that NTR should be considered as the technique of choice for spinal cord lipomas.

Monday, 8 October 2018
17:15 – 18:20

Platform Presentations: Technology and Innovation

PF-023

Special Topic: Other

The evolution of intraoperative MRI, from low field to high field: It's not your grandmother's MRI anymore

Robert Keating, Deki Tsering, Kelsey Cobourn, John Myseros, Suresh Magge, Chima Oluigbo
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OBJECTIVE:Utilization of iMRI has been in practice > 20 years. State of the art has evolved from low-field magnets (0.15T) to 3T machines for enhanced resolution and adjunct radiographic modalities. While iMRI initially contributed to increasing extent of tumor resection, its current applications are revolutionizing new approaches to functional and minimally invasive/noninvasive neurosurgical therapeutic paradigms. Review of experience at CNMC over the past 13 years (both low-/high-field) demonstrates the radically different approaches that iMRI now provides neurosurgeons, along with safety considerations
MATERIAL-METHODS:Consecutive iMRI cases at CNMC were evaluated over the past 13 years, analyzing indications/applications for surgery, scanning time commitment, efficacy of scan, complications and safety considerations. During 2005-09, 60 cases used low-field (0.15T) iMRI whereas 117 cases from 2012-18 involved 1.5T.

RESULTS:Initially (2005-09), use of the 0.15T (Polestar) magnet was predominantly employed for tumor resection (57/60: 29 supratentorial, 22 infratentorial, 6 spinal), demonstrating 55% efficacy with no safety issues and 3/60 complications. Later (2012-18), the 1.5T magnet was used 40% (47/117) for tumor resections, 43% (50/117) for epilepsy and 17% (19/117) for stereotactic procedures (biopsies/thermal laser ablation). Surgical efficacy was 35%, complications 10% (12/116, p=0.22) and there were 2/117 non-serious safety issues. Additional time to scan was 84 min for low-field and 36.4 min for high-field. Each system had inherent strengths and weaknesses and it was necessary to tailor the surgical approach to these factors.
CONCLUSION:The use of iMRI has come a long way since its inception 20 years ago. Used initially for stereotactic localization and corroborative tumor resection, today's iMRI is being increasingly used for functional purposes and potentially offers the possibility of non-invasive approaches to brain tumors with HIFU ablation. While use of the high-field magnet permits greater flexibility in the OR it carries the potential cost of decreased efficiency and increased safety risk.

PF-024

Special Topic: Other

Comparing Robot guided surgery versus classic frame-based Stereotaxy for biopsy of intracranial lesions

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OBJECTIVE:With the introduction of the ROSA robot in our department in 2015, we have acquired an alternative to classic stereotactic surgery. In this study, we compare ROSA and stereotactic biopsies regarding time efficiency, complications and histopathological results
MATERIAL-METHODS:We included all patients who underwent robot guided or classic stereotactic biopsy from 2015 to 03/2018. 125 patients had ROSA guided surgery, 230 patients were operated using the classic stereotactic procedure. Patient files were analyzed regarding procedure time, complications related to the procedure and therapy guiding histopathological findings.
RESULTS:We performed 126 robot-guided biopsies in 125 patients, 71 male, 54 female. The mean age was 57, ranging from 1 to 85 years old. In 2 cases the histopathological finding was inconclusive, all other biopsies resulted in a diagnosis (98%). We identified 7 postoperative hemorrhages, 4 of them clinically silent. In 3 patients, neurological deficits due to postoperative hemorrhages were diagnosed (2%). In the same period of time, stereotactic biopsies were performed in 230 patients, 183 male, 159 female, with a mean age of 55. The youngest patient was 2, the oldest 87 years of age. In 91% a diagnosis could be established. We identified 17 postoperative hemorrhages, 8 of them relevant (3%). The average procedure time amounted to 146 min in robot guided biopsies and 113 min in stereotaxy.
CONCLUSION:With both methods, a diagnosis can be found most cases, complication rates are comparable. The robot guided procedure required more time, a learning curve was expected. Whereas in classic frame-based stereotaxy, a thin-layer CCT scan is required, most of the robot guided procedures were performed without a CT scan, saving radiation for the patient. As the robot-guided procedure does not require a frame, very young children and babies can get a biopsy and therefore, a diagnosis.

PF-025

Special Topic: Functional

Passive brain mapping of eloquent cortex using electrocorticographic signals

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[2]Department of Neurology, Albany Medical College, Albany, New York
[3]National Center for Adaptive Neurotechnologies, Wadsworth Center, New York State Department of Health, Albany, New York

OBJECTIVE:The common goal of brain surgery is to resect as much pathological tissue possible while preserving brain function. The current 'gold standard' for delineating functional cortical Areas, such as those related to language comprehension and production, is electrical cortical stimulation (ECS).
MATERIAL-METHODS:We present an alternative rapid and practical mapping that uses passive recordings of electrocorticographic (ECoG) signals.

Passive ECoG-based mapping is detecting task-related changes in broadband gamma activity, i.e., ECoG activity at frequencies higher than 70 Hz. Several studies have shown that passive ECoG mapping can be used to map motor and language cortex.
RESULTS:Receptive language cortex is activated by listening of a list of words, quickly followed by transient response in expressive language cortex, through activation of the fasciculus arcuatus. Responses to words were significantly larger than response to nonsense words in both awake and asleep

conditions. Our results strongly support the successful identification of cortical areas responsible for receptive language also under general anesthesia.
CONCLUSION:Passive ECoG-based mapping is a functional mapping tool based on direct and real time measurement of neural activity that is time-effective, safe, and well tolerated especially without inducing seizures. Furthermore, it is well applicable in children and handicapped patients without requiring active participation. Passive brain mapping holds promise as an independent technique as well as a complimentary technique to current functional mapping procedures.

PF-026

Special Topic: Functional

Passive Functional Mapping of Receptive Language Areas Using Electrocorticographic Signals

James R Swift[1], William G Coon[3], Christoph Guger[1], Peter Brunner[2], Marjorie Bunch[2], Timothy Lynch[2], Bridget Frawley[2], Anthony L Ritaccio[2], Gerwin Schalk[3]
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[3]National Center for Adaptive Neurotechnologies, Wadsworth Center, NY State Department of Health, Albany, NY, USA

OBJECTIVE:Functional mapping based on electro corticographic (ECoG) signals has recently been proposed as an alternative to traditional stimulation-based mapping. ECoG-based mapping depends on passive and real-time interpretation of signals, and hence has particular advantages with pediatric patients. The objective of our study was to validate the use of passive ECoG-based functional mapping for identifying receptive language cortex.
MATERIAL-METHODS:We mapped language function in 23 patients using ECoG signals in the broadband gamma (70-170 Hz) range, and using electrical cortical stimulation (ECS) in a subset of 15 subjects.
RESULTS:The qualitative comparison between cortical sites identified by ECoG and ECS show a high concordance. A quantitative comparison indicates a high level of sensitivity (95%) and a lower level of specificity (59%). Detailed analysis reveals that 82% of all cortical sites identified by ECoG were within one contact of a site identified by ECS.
CONCLUSION:These results show that passive functional mapping reliably localizes receptive language areas, and that there is a substantial concordance between the ECoG- and ECS-based methods. They also point to a more refined understanding of the differences between ECoG- and ECS-based mappings. This refined understanding helps to clarify the instances in which the two methods disagree and can explain why neurosurgical practice has established the concept of a "safety margin." Passive functional mapping using ECoG signals provides a fast, robust, and reliable method for identifying receptive language areas without many of the risks and limitations associated with ECS.

PF-027

Special Topic: Other

Novel non-invasive techniques for assessing ICP: optic nerve sheath diameter and deformability index

Llewellyn Padayachy[1], Reidar Brekken[2], Graham Fieggen[1], Tormod Selbekk[2]
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OBJECTIVE:The need for a reliable non-invasive technique for assessing ICP has been an ongoing quest for neurosurgeons, with description of a wide range of approaches and methods. This study aimed to further evaluate the combined interpretation of the optic nerve sheath diameter (ONSD) with the deformability index (DI) as a novel method for improving diagnostic accuracy in non-invasive ICP assessment.
MATERIAL-METHODS:This prospective study included children undergoing invasive ICP measurement as part of their clinical management. Dynamic ultrasound images of the ONS were acquired prior to measuring ICP. The images were processed to measure the ONSD and to obtain the pulsatile movement of the sheath, described as the DI. Patients were dichotomized into high (≥ 20 mmHg) or normal ICP groups and compared using the Mann-Whitney U-test. Diagnostic accuracy was described using area under the ROC curve (AUC), sensitivity and specificity, correlation between DI, ONSD and ICP was investigated using linear regression.
RESULTS:28 patients were included (19 with ICP≥ 20 mmHg). The ONSD in the high ICP group was 6.0mm (IQR: 5.8 to 6.4) versus 5.5mm (IQR: 4.8 to 5.77) for the normal ICP group ($p = 0.002$). The DI was lower in the high ICP group (0.105 versus 0.28, $p=0.001$), and a cut-off value of DI ≤ 0.185 demonstrated sensitivity of 89.5% and specificity of 88.9%, AUC was 0.87. Diagnostic accuracy improved when combining ONSD with the DI (AUC 0.98, sensitivity 94.7%, specificity 88.9%) and correlation with ICP improved when combined analysis of DI and ONSD was performed (Pearson correlation coefficient: 0.82 versus 0.42, respectively, $p=0.012$).

CONCLUSION:Combining ONSD interpretation with pulsatile dynamic features of the ONS as marker of the sheath stiffness, defined as the DI, improves the diagnostic accuracy of this non-invasive approach to assessing ICP, and may further simplify the acquisition process.

PF-028

Special Topic: Epilepsy

Responsive Neurostimulation In Children: Technique and Outcomes

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[2]Department of Neurology, Icahn School of Medicine at Mt Sinai, New York, NY USA

OBJECTIVE:To present our experience with responsive neurostimulation (RNS) in children and demonstrate its safety and efficacy, as both a salvage therapy after failed resection/disconnection/ablation, as well as a primary therapeutic choice in certain patients.
MATERIAL-METHODS:The records of all patients undergoing implantation of a responsive neurostimulator in our institution were reviewed. Pre-operative semiology, seizure frequency, medication burden, non-invasive diagnostic workup, neuropsychological evaluation, and invasive diagnostic evaluations were reviewed. Seizure outcomes were assessed via seizure diaries and the RNS Patient Data Management System (PDMS). Surgical outcomes and adverse events were documented.
RESULTS:Among 52 patients in whom the Neuropace RNS Device (Mt View, CA) was implanted at our institution over 30 month period, 16 were children (ages 8-17). Of these patients, all underwent invasive monitoring with either subdural electrodes (N=7) or stereo-EEG electrodes (SEEG) (N=9). Seven patients had failed prior resective surgery, and in the other 9, RNS was chosen as a primary therapeutic endeavor after SEEG. All patients have derived some therepeutic benefit at mean follow up of 19 months (range 2-30), with 12 patients having greater than a 50% decrease in the burden of their epilepsy. A particular subset of patients (N=7) with non-lesional, multifocal epilepsy appeared to fare better than similarly matched historical controls from the presenting authors' series, who had undergone prior resective/disconnective surgery.There was one adverse outcome involving a superficial infection that required removal and subsequent replacement of leads. Quality of life measurements assessed through a parental questionnaire indicate ongoing benefit from the device.
CONCLUSION:RNS is a safe and effective therapeutic alternative for pediatric patients. It is well tolerated and presents an attractive option for patients and caregivers in cases of medically intractable epilepsy where resective surgery has failed, as well as in non-lesional multifocal cases where resection has a low likelihood of success.

PF-029

Special Topic: Vascular

The utility of a novel surgical microscope laser light source and its application with integrated dual-image video angiography(DIVA)for pediatric cerebrovascular surgery

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OBJECTIVE:Indocyanine green videoangiography (ICG-VA) is a valuable tool to evaluate vessel's patency in cerebrovascular surgery. Vessels are shown as white over a black background. However, anatomic relationship with other cerebral structures is often difficult to recognize. We had developed at a high-resolution intraoperative imaging system (dual-image videoangiography, DIVA) to visualize light and near-infrared fluorescence images of ICG-VA simultaneously.
MATERIAL-METHODS:Also, we developed a new laser light source for the surgical microscope as an alternative to the conventional xenon light source. The new system does not consist of a broad range wavelengths spectrum as other light sources have. The wavelengths of the laser illumination include only four bands; all are combined to produce a white color: 464 nm (blue), 532 nm (green), 640 nm (red), and 785 nm (near-infrared/NIR).
RESULTS:This spectrum was narrowed as much as possible to avoid the harmful high-energy ultraviolet spectrum. The NIR 785 nm wavelength is mainly for ICG excitation. A chromaticity analysis demonstrated that the laser light has a wider range of color coordinates and that it has a wider range of brightness. With the DIVA system developed by our department, the laser light provided an excellent view for ICG-VA.
CONCLUSION:We've been using the DIVA and laser light source in cerebrovascular surgery for two years. We will present the usefulness of this novel system for pediatric cerebrovascular surgery.

Monday, 8 October 2018
14:00 – 15:30

Platform Parallel Presentations: Hydrocephalus

PF-030

Special Topic: Hydrocephalus

Treatment of Post-hemorrhagic Hydrocephalus (TROPHY) Registry Study – The Study Concept

Ulrich W. Thomale[1], Christoph Bock[2], Abhaya Kulkarni[3], Schaumann Andreas[1], Roth Jonathan[5], Sgouros Spyros[4], Shlomi Constantini[5], Guiseppe Cinalli[6]
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[5]Pediatric Neurosurgery, Dana Dwek Children´s Hospital, Tel-Aviv, Israel
[6]Pediatric Neurosurgery, Santobono Paulisipon, Naples, Italy

OBJECTIVE:Intraventricular hemorrhage in premature babies and newborns is associated with long-term developmental morbidity, with blood degradation, hydrocephalus, and treatment-associated complications as risk factors. The neurosurgical treatment strategy in the early phase of post-hemorrhagic hydrocephalus lacks consensus and remains a challenge.
MATERIAL-METHODS:Under the auspices of the International Federation of Neuroendoscopy (IFNE) the prospective Treatment of Post-hemorrhagic Hydrocephalus (TROPHY) study registry was designed in order to evaluate different treatment options for post-hemorrhagic hydrocephalus in neonates with respect to complications, shunt dependency, and long term developmental outcome.
RESULTS:An online database was designed to acquire prospective data collection on an international basis, to include several treatment options, including external ventricular drainage (EVD), ventricular access device (VAD), ventricular subgaleal shunt (VSGS), and neuroendoscopic lavage (NEL). A standardized set of data fields, including neurodevelopmental outcome, at pre-determined follow-up intervals will be collected to age 5 years. Two initial analyses will be planned from this database: 1) comparison of shunt rate and related surgical complications during the initial 12 and 24 months and 2) comparison of neurodevelopmental outcome with Bayley testing after 24, 36, and 60 months.
CONCLUSION:The TROPHY registry has the potential to provide important data on the current neurosurgical treatment strategies for post-hemorrhagic hydrocephalus in neonates, using an international, prospective, online registry design.

PF-031

Special Topic: Hydrocephalus

Magnetic Resonance Elastography in Chronically Shunted Hydrocephalus

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[2]Gruss Magnetic Resonance Research Center, Albert Einstein College of Medicine, Bronx, NY

OBJECTIVE:Magnetic resonance elastography (MRE) is an emerging technology which allows mechanical properties such as elastance (stiffness) to be derived from external perturbations that create shear waves in the tissue. Little is known about the effects of chronic shunting on the brain and shunt failure is considered a form of trauma which may negatively impact the brain's structural integrity and development. This study investigated the effect of chronic shunting on brain elastance, and measured elastance as a correlate of hydrocephalus outcome questionnaire (HOQ) measures.
MATERIAL-METHODS:Patients were identified from clinical records of two senior authors (RA, JG), and age-matched controls from study advertisements. Each patient underwent standard T1 anatomical sequences, as well as MRE sequences with actuators placed over the temples to induce concurrent millimeter-sized head vibrations. Elastance was extracted from this data to create brain stiffness maps.
RESULTS:Twenty eight patients (9-39 years) and 20 controls (6-46 years) were enrolled. Data was consistent between patient visits (variance <4.5%). White and grey matter stiffness was significantly reduced in chronically-shunted patients versus controls, indicating a loss of structural integrity ($p<0.001$). No significant association between tissue stiffness and ventricular size was noted. Elastance was significantly reduced in patients with multiple shunt revisions compared to patients with ≤1 revision ($p<0.001$). Shunted patients with higher elastance (nearer to controls) demonstrated improved QoL on HOQ ($p=0.044$).
CONCLUSION:Chronically-shunted patients demonstrate decreased brain elastance compared to matched control, and the greater number of shunt revisions, the greater the elastance loss. HOQ demonstrated improved QoL with increasing brain

stiffness, possibly indicating greater resistance to compressive forces and/or less repeated trauma. Future aims will investigate patients in acute shunt failure to determine elastance differences before and after revision

PF-032

Special Topic: Hydrocephalus

A New Bioinspired Device for Non-Invasive Restitution of Flow in Obstructed CSF Shunts: Concept, Design, and FDA Approval

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OBJECTIVE:Occlusion of ventriculoperitoneal shunts poses risk of morbidity in patients treated with shunts. We sought to develop a non-invasive method for managing acute shunt occlusion, and describe here the development of the device leading to approval by the US Food and Drug Administration (FDA).
MATERIAL-METHODS:The new device is comprised of a subcutaneous “flusher” implanted proximal to a conventional shunt valve, and a special ventricular catheter with an new "relief membrane" covering one or more backup holeswhich can be opened by the retrograde flushing action. The buildup and release of pressure in the flusher is biomimetic of the cough response in clearing the trachea.
The flusher-catheter system was tested in 9 acute and 11 chronic ovine implantations (cistern-peritoneal shunts), with survival times ranging up to 8 weeks. With complete obstruction, reliability of producing a patent fluid pathway with a digital compression was assessed, as well as any pathological changes associated with the flushing action. Flushing of the devices against malfunctioning shunt catheters in human patients (n=4) was performed with pressure measurements as performed in the animal studies.
RESULTS:In the ovine studies, the membranes opened and CSF flow was observed as had been seen with ex vivo testing. No pathological injury attributed to the flushing/catheter opening was seen, even with catheters intentionally placed in brain parenchyma. In the clinical cases with pressure monitoring, transient pressure spikes to 12 psi were recorded which would have been sufficient to open the membranes on the catheters if such had been in place. 510(k) approval for the device was obtained in November, 2017, and initial human implantations are expected starting in Spring, 2018.
CONCLUSION:A pathway for design and regulatory approval for a new, biomimetic, device is described. The new device is intended to increase treatment options. Initial clinical results will be discussed.

PF-033

Special Topic: Hydrocephalus

Infant external hydrocephalus: A cerebro-venous related disease

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OBJECTIVE:External hydrocephalus (eHC) is defined as macrocephaly, enlarged subarachnoid spaces and no or moderate ventricular enlargement. Observed in infants below 1 year, eHC normally subsides spontaneously in the following years. Newer studies point to an impaired reabsorption of CSF due to venous hypertension as the underlying cause. This study evaluates the correlation between venous abnormalities and the subarachnoidal volume in eHC.
MATERIAL-METHODS:Newly diagnosed infants received a MR phlebography with 3D sinus reconstruction. Clinical presentation and radiological findings were recorded. Radiological venous abnormalities were graded according to the number of affected segments and type. Ventricular width was assessed with Evans index and frontooccipital horn ratio (FOHR). Extraaxial CSF volume was determined using BrainLab 2.0 software.
RESULTS:13 patients with a mean age of 9 months were studied. Mean Evans index and mean FOHR were 0.27 and 0.35, respectively. Subarachnoidal CSF volume had an average of 167.25 cm3.. 13/13 patients presented with stenosis in phlebography. The most frequent affected segment was the sigmoid sinus (in 61.5%). The number of affected venous segments showed a significant positive correlation to the subarachnoidal volume (ANOVA p=0.0295), sugesting that a more severe venous outflow impairment leads to a larger extraaxial CSF volume. No correlation between ventricular width and extraaxial volume was found.
CONCLUSION:Venous outflow impairment seems to play a major role in the development of eHC, not pointing to a CSF born problem rather a venous system disease. Further studies and larger cohorts have to confirm that eHC has the same pathophysiology just at an earlier time point than pseudotumor cerebri.

PF-034

Special Topic: Hydrocephalus

Inadvertent Cerebral Spinal Fluid Shunt Valve Reprogramming: Prevalence and Correlation with Signs, Symptoms, Radiographic Changes, and Exposure to Magnetic Fields

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OBJECTIVE:Inadvertent reprogramming (IR) of adjustable cerebrospinal fluid (CSF) shunt valves has been reported to lead to serious symptoms that may require urgent reprogramming and/or surgery. The purpose of this study was to define the prevalence of inadvertent shunt reprogramming, to correlate IR with the presence or absence of symptoms and radiographic changes, and to evaluate the risk of inadvertent shunt reprogramming based on exposure to common environmental variables.
MATERIAL-METHODS:Pediatric patients with Strata valve CSF shunts, evaluated as part of their standard of care, were enrolled in this IRB-approved study over a 15-month period at a children's hospital. First, study participants or their caregivers completed a questionnaire that assessed multiple variables that have been previously associated with IR, including proximity to magnets, iPads, and cell phones. Study personnel checked Strata valve settings before and after MRI and then collected data regarding history, clinical, and imaging findings.
RESULTS:A total of 113 assessments were performed on 95 participants over a 15-month period. IR occurred in 15/113 (13.3%) encounters. 4/15 (26.7%) of IR encounters were associated with signs or symptoms of shunt malfunction, 4/15 (26.7%) resulted in a change in ventricular size that correlated with IR, and 1/15 (6.7%) resulted in surgery or a shuntogram. Univariate analysis showed that signs and symptoms of shunt malfunction were more likely to occur with IR (OR=4.09, 95%CI=1.13-14.84, p=0.032). However, no factor was found to be an independent risk factor for IR in the multivariate analysis, including exposure to any environmental factor.
CONCLUSION:CSF valve inadvertent reprogramming occurs frequently, can lead to signs and symptoms of shunt malfunction as a result of under- or over-drainage, and results in additional health care costs associated with hospital and office visits, imaging and occasionally invasive studies and surgery.

PF-035

Special Topic: Hydrocephalus

Wound dehiscence after CSF shunt surgery: Options for surgical management

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OBJECTIVE:In cases of bacterial CSF shunt infection, explantation of the complete hardware, temporary external CSF derivation and re-insertion of a new shunt after recovery from infection is the standard management. However, in cases of wound dehiscence over the shunt without signs of CSF or systemical infection, local skin revision without shunt explantation system may be sufficient.
MATERIAL-METHODS:Between 2002 and 2017 in Mainz, 33 patients (24 male, 9 female) underwent 35 operations for local skin revision after shunt surgery, without explantation of the system. Age at shunt surgery was 1 day - 16 years (median 192 days). Time intervall between shunt surgery and wound revision was 5 - 8796 (median 23) days. Skin dehiscence was directly over or adjacent to the shunt material in all cases (frontal, retroaurikular, occipital, clavicular, abdominal, thoracic or temporoparietal). Follow-up was 3.5 - 181 (median 47) months.
RESULTS:After 28 revision surgeries, there was no subsequent shunt infection. In 2 of the remaining 7 cases, infection occurred more than 6 months later; in a third case, shunt infection happened after a primarily abdominal infection (at the beginning without meningitis). That is, the relationship between wound dehiscence/revision and subsequent shunt infection was probable in 4 out of 35 operations (11.4%) and questionable in 1 case. Median age at revision surgery of patients with infection was 154 days, without infection 209 days. Age at surgery, site of wound dehiscence or liquorrhoea did not correlate with infection risk.
CONCLUSION:In cases of a wound dehiscenece after shunt surgery without signs of local or systemic infection, it is a feasible option to perform as a first step a local skin revision without shunt explantation, with the chance of avoiding additional surgeries or longer hospital stays. When local or systemic infection is present, the explantation of the shunt system is inevitable.

Tuesday, 9 October 2018
08:00 – 08:40

Platform Presentations: Women in Neurosurgery

PF-036

Special Topic: Global Children's Surgery

Career satisfaction and advancement in Pediatric Neurosurgery: an ongoing female disparity?

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OBJECTIVE:The purpose of this study was to explore career satisfaction and advancement for women in pediatric neurosurgery.
MATERIAL-METHODS:A web-based survey was emailed to women pediatric neurosurgeons across the world exploring cultural limitants, career advancement, family planning, mentorship, discrimination, and career satisfaction.
RESULTS:The survey responses will be rated and presented.
CONCLUSION:The ongoing challenges for women in pediatric neurosurgery are important to determine cultural limitations and to support advancement and equiality in rights, status, participation, opportunities of women in the field.

Tuesday, 9 October 2018
08:55 – 10:10

Platform Presentations: Chiari

PF-037

Special Topic: Chiari malformation

Hydrocephalus following foramen magnum decompression for Chiari I malformation: multinational experience of a rare phenomenon

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[8]University of Tennessee Health Science Center, Department of Pediatrics, Le Bonheur Children's Hospital, Neuroscience Institute, Memphis, TN, USA

OBJECTIVE:New onset hydrocephalus following foramen magnum decompression (FMD) for Chiari I malformation (CMI) is rare, and its natural history and pathophysiology is poorly understood.

We describe a series of patients who presented with hydrocephalus following FMD for CMI, provide possible explanations of this condition, and outline treatment options.
MATERIAL-METHODS:Of patients undergoing FMD for CMI from 6 different tertiary centres in North America, Europe and Middle East, we evaluated patients presenting with new onset hydrocephalus following the FMD. Retrospectively collected data included demographics, clinical and radiological findings of both the CMI and hydrocephalus, time from FMD and hydrocephalus onset, and treatment as well as surgical techniques.
RESULTS:None of the patients had obvious symptoms related to idiopathic intracranial hypertension nor hydrocephalus prior to FMD. Of 367 patients who underwent FMD for CMI, 28 (7.6%) subsequently developed symptoms related to hydrocephalus (18 females -64.2%, and 10 males – 35.8%), (7 Le Bonheur Children's Hospital, 6 Tel Aviv Medical Center and Dana Children's Hospital, 6 Cincinnati Children's Hospital Medical Center, 5 Children's National Medical Center, 3 NYU Langone Medical Center, 1 Charité Universitätsmedizin) with a mean age of 11.7 ± 11.9 years old (range 6 months to 52 years old). Hydrocephalus occurred on average 2.2 ± 2.6 months after FMD (ranging from 1 week to 8 months). Presenting symptoms of hydrocephalus were headaches (41%), vomiting (24.4%), CSF leak/pseudomeningocele (17%), decreased level of consciousness (7.3%), cranial nerves signs (7.3%) and papilledema (2.4%).

23 patients (82.1%) underwent CSF shunting, 1 patient had an endoscopic third ventriculostomy (3.5%), 3 patients (10.7%) temporary CSF diversion only, and 1 patient (3.5%) acetazolamide.

CONCLUSION:Hydrocephalus following FMD for CMI is uncommon. Based on our series and literature review, its incidence is ~7% and most likely will require further surgery. Considering different treatment options, shunting appears to be the favoured option.

PF-038

Special Topic: Chiari malformation

Atlantoaxial subluxations with Chiari malformations-a dangerous association: experience of 15 pediatric cases

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OBJECTIVE:Chiari malformations often present with neck pain and cervical syrinx, but in the pediatric age group may be associated with atlantoaxial pathology. Failure to recognize the subluxation can be disastrous and this paper highlights the need to be aware of this.
MATERIAL-METHODS:Out of a personal series of 78 pediatric patients with atlantoaxial subluxations, the senior author has encountered 15 cases with associated Chiari malformations. In 3 of these cases primary surgery for Chiari done elsewhere resulted in deterioration in neurological status before the associated subluxation was identified. The age of presentation ranged from 3 years to 13.5 years, and the commonest presentation where the diagnosis was made prior to surgery was with marked neurological deficit(10/12).
RESULTS:In 2 cases transarticular screws were used as the subluxations were reducible with traction, and posterior fossa bony decompression was performed at the same time. In 2 cases joint fusion technique with transarticular screw at atlas and transpedicular screw at axis were used. In the remaining 11 cases, 3 had already had wide decompression for Chiari done elsewhere,and were irreducible, and in these redo surgery with fixation was a technical challenge. In 2 of these 3 cases the neurodeficit was still reversible after fixation. In the remaining 8 cases, modified technique of occipitocervical fusion was used. In all these cases the decompression was extradural only. In 10/12 of the primary cases, the preoperative neurodeficit or pain resolved completely after surgery.
CONCLUSION:It is mandatory to assess the atlantoaxial joint prior to planning surgery for a Chiari malformation in a child, and when diagnosed the decompression is best extradural leaving space for occipital implants.

PF-039

Special Topic: Chiari malformation

Chiari I Malformation in children. When we decided to not operate and surgical strategy in a pediatric series

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Chiari Malformation type I is a disorder of the para-axial mesoderm that results in underdevelopment of the posterior cranial fossa and overcrowding of the hindbrain. Its incidence on MRI is 0,24-3,6%, its prevalence in children is 4% and the symptomatic prevalence is 0,007%.
Objective: in the last decade the occasional diagnosis of this condition has significantly increased. For this reason, not only the follow-up of asymptomatic patients, but also the right surgical treatment have gained more importance. The aim of this study is to correlate posterior fossa morphometry and patients' follow-up.
Materials and methods: from 1/1995 to 12/2017 we followed up 437 patients, 231 male, 206 female. The average age at diagnosis was 86 months. Our clinical criteria are represented by worsening headache/neck pain and/or neurological deficit. We considered syringomielia as a neuroradiological criteria. Follow-up was 72 months. 200 pts were operated (23,5% occasional diagnosis), 237 not operated (48,9% occasional diagnosis). We retrospectively studied the morphometry of 46 patients.
Results: from 1995-2001 occasional diagnosis was made in 3,4 pts/yrs, from 2002-2017 in 81, pts/yrs. Occasional diagnosis was made in 163 pts (37,3%), the average age was 94 months. 28,8% (47) were operated. In this group of patients an MRI was performed for psycomotor delay, epilepsy, genetic syndromes, craniofacial anomalies, trauma or headache, vertigo gait disturbances. The morphometrical analysis allowed us to divide the patients in 4 groups with a different risk of developing different clinical disturbances.
Conclusions: we found a good correlation between morphometrical analysis and follow-up. The limits of this study are: little and only pediatric population, the measurements are operator dependant. Finally, it would be important to extend the study to an adult population and to automatize the calculation.

PF-040

Special Topic: Chiari malformation

Syrinx resolution after posterior fossa decompression with tonsillectomy in Chiari malformation Type I: Outcome comparative study

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OBJECTIVE:Chiari malformation Type I is associated with a syrinx in 25~85% of patients. Posterior fossa decompression can be done with C1 laminectomy, duroplasty and tonsillectomy. But posterior fossa decompression without dural opening is also an accepted option for symptomatic chiari malformation. The purpose of this study is to compare the result in reducing of syrinx according to the difference of posterior fossa decompression method.
MATERIAL-METHODS:144 Patients with chiari malformation Type I who underwent posterior fossa decompression divided into 3 groups (Without dural opening group, dural opening without tonsillectomy group and tonsillectomy group). Volume of syrinx was measured in T2 weighted MR by using Mevislab.
RESULTS:All of 3 groups showed similar effect for reducing volume of syrinx after decompression. But the reduction rate of syrinx volume were different.
CONCLUSION:Posterior fossa decompression with tonsillectomy shows prompt effect for syrinx resolution. Decompression without dural opening can also reduce a syrinx, even if it takes more time for resolution.

PF-041

Special Topic: Chiari malformation

Symptomatic Improvement of Dysautonomia and Pain in Patients with Craniovertebral Instability via Occipital Cervical Fusion

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OBJECTIVE:Joint hypermobility in patients with inherited conditions of connective tissue has recently been shown to cause excess mobility of the movement of the odontoid process in relationship to the skull base. A subset of these patients will develop distortion of the relationship of the odontoid to the brainstem leading to tonsillar herniation, severe headaches and mechanical neck pain. These patients are also known to have associated abnormalities of the function of the autonomic nervous system. The purpose of this study is to assess the effect of reduction of the distortion of the brainstem and fusion of the occiput to the upper cervical spine could have an effect on the debilitating effect of the dysautonomia.
MATERIAL-METHODS:A prospective outcome study of patients undergoing intraoperative reduction of abnormal occipitocervical relationships with distortion of the brainstem who presented with severe unremitting headaches and mechanical neck pain were selected for study. All patients had documented type 3 Ehlers Danlos Syndrome (hypermobility). They all had abnormal movement of the occipitocervical junction, excess movement on flexion-extension MRI studies and improvement with use of a rigid cervical collar. A subset of 27 of these patients also suffered from severe dysautonomia and chronic fatigue syndrome. Questionnaires using available outcome measures were completed preoperatively at least 12 months postoperatively.
RESULTS:Karnofsky scores improved significantly post operatively ($P<0.05$). Pain was relieved or substantially improved in 63% of patients, palpitations were improved in 55%, Orthostatic intolerance improved in 52% and disabling chronic fatigue was improved in 48%. In total, 23/27 would definitely have gone through surgery in retrospect. All patients had normalizations of the cranial-axial angle via intraoperative reduction.
CONCLUSION:In this small series, pain, dysautonomia, and chronic fatigue syndrome responded to occipitocervical reduction and occipitocervical fusion.

PF-042

Special Topic: Chiari malformation

Does less tonsillar manipulation lead to fewer Chiari failures: Review of changing practice paradigms

Kelsey Cobourn, Deki Tsering, John Myseros, Suresh Magge, Chima Oluigbo, Robert Keating
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OBJECTIVE:To determine if re-operation rates differ between Chiari decompressions with and without tonsillar manipulation
MATERIAL-METHODS:A single-institution retrospective review of all patients undergoing Chiari decompression between 1986-2007 and from 2008-2017 was conducted to identify patients requiring re-operation. The decision was made to analyze patients in two different groups due to an institutional shift that led decreased use of tonsillar coagulation in recent years. Patients were excluded if operative reports or follow-up information was unavailable.

Demographic, surgical and outcome data were analyzed for both cohorts and compared
RESULTS:135 patients underwent Chiari decompression between 2008 and 2017. 6/135 patients failed(4.5%) and required repeat Chiari decompression, with one requiring a third operation. 5/7 failed operations were bone-only decompressions(10% overall failure rate) and 2/7 failures involved duraplasty and tonsilar ablation. The tonsils were ablated in 34/81 (42%) of patients in whom the dura was opened. Failure rates were not significantly different between cases with and without judicious coagulation of the tonsils.

For 150 patients treated between 1986-2007,repeat decompressive surgery was needed in 20/150 (13.3%) This was significantly higher than in the later cohort(p=.0125). The tonsils were coagulated in 42/57 (74%) of patients undergoing duraplasty (p=.0002). Bone-only decompressions failed in 9.26% of cases. The failure rate of tonsillar ablation in this group was 23.81% versus 9.09% in operations that avoided manipulation of the tonsils (p=.02).
CONCLUSION:Controversy persists regarding the optimal approach to Chiari decompression. Our institution saw a significant drop in failure rates following a shift towards more judicious use of tonsillar coagulation. In the earlier cohort, the re-operation rate was significantly higher in cases involving manipulation of the tonsils. No significant difference was noted in the more recent group. It is our feeling that further investigation of this question is required, ideally in larger cohorts and with consideration for the etiology of the Chiari malformation.

Tuesday, 9 October 2018
11:05 – 11:50

Platform Presentations: Global Neurosurgery

PF-043

Special Topic: Global Children's Surgery

Pediatric neurosurgical bellwether procedures for infrastructure capacity building in hospitals and healthcare systems worldwide

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OBJECTIVE:Quantifying the global burden of pediatric neurosurgical disease - and current efforts addressing it - is challenging, particularly in the absence of uniform terminology. We sought to establish bellwether procedures for pediatric neurosurgery, in order to standardize terminology, establish priorities, and facilitate goal-oriented capacity building.
MATERIAL-METHODS:Members of international pediatric neurosurgical and pediatric surgical societies were surveyed via the Research Electronic Data Capture (REDCap) platform. Among 15 proposed neurosurgical procedures, respondents assigned numerical grades of surgical necessity, and selected hospital-level designation within a three-tiered system. A procedure was considered a bellwether if a) the majority of respondents deemed it necessary for either a primary- or secondary-level hospital, and b) the procedure was graded at or above the 90th percentile on a continuous scale of essentiality. Data were compiled and analyzed using Stata software.
RESULTS:Complete responses were obtained from 459 surgeons from 76 countries, the majority of whom practiced in a tertiary referral hospital (88%), with a primarily public patient population (64%). Six bellwether procedures were identified for pediatric neurosurgery: shunt for hydrocephalus, myelomeningocele closure, burr holes, trauma craniotomy, external ventricular drain (EVD) insertion, and cerebral abscess evacuation. Few differences in bellwether criteria designations were observed among respondents from different World Health Organization regions and World Bank income groups.
CONCLUSION:The six bellwether procedures identified can be used as markers of infrastructure capacity at various hospital levels, hence allowing targeted capacity-building in low-resource settings in order to avert disability and death from childhood neurosurgical disease.

PF-044

Special Topic: Global Children's Surgery

Practice of Mobile Pediatric Neurosurgery: a cost-effective solution in Benin rural communities

Hugues Jean Thierry Gandaho[1], Max Chanhoun[2], Joseph Guy Latame[3], Bonnventure Vigan[4]
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[3]Department of Intensive Care
[4]Division of Pionner

OBJECTIVE:Situations related to pediatric neurosurgery care providing, generate catastrophic out pocket expenditures. Department of neurosurgery Military hospital is developing periodic mobile pediatric neurosurgery procedures with a mobile neurosurgical unit. Regarding this innovative strategy, cost analysis was performed related to direct and indirect surgical care providing aspects.
MATERIAL-METHODS:Senior expertise teams were involved, from Division of medicine as well as other technical components, in Benin Armed forces. Months before deployment, nationwide patients' selection and recruitment was achieved via tele transmission between Department of neurosurgery and peripheral medical centers. Logistic was assessed by combined funding.
RESULTS:In June and December 2017, Two operative missions had been conducted. Seventy nine children out of 432 patients (18,28%) were reviewed in Benin rural communities. Fifty-nine surgical procedures(75%) could be managed on board compared with 6% of cases tht required more equipment, better assessment or longer duration for treatment, and consequently transfer to military hospitl. Local medical staff is strengthened rural communities and parents could save close to 80% of out pocket expenditure when compared with regular hospitalization. There was no compromise in family well being.
CONCLUSION:In developing countries, mobile pediatric neurosurgery in rural areas is cost effective, compared with management of surgical units located in those rural areas. Commitment of armed forces for maintenance and logistics, allows cost reducing and guarantees its sustainability.

PF-045

Special Topic: Global Children's Surgery

Surgical Treatment of Epilepsy in Vietnam: Program Development and International Collaboration

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[3]Department of Pediatrics, University of Alabama at Birmingham, Children's of Alabama, Birmingham, AL, USA
[4]Department of Neurosurgery, National Cancer Hospital, Hanoi, Viet Nam

OBJECTIVE:The purpose of this report is to describe an international collaboration to facilitate the surgical treatment of children with epilepsy in Viet Nam.
MATERIAL-METHODS:We have used 3 methods to achieve our OBJECTIVE: US providers visiting Viet Nam; Vietnamese providers visiting the US; and ongoing communication, including case review and real-time mentorship with internet-based communication platforms.
RESULTS:Initial introductions took place during a visit by a US neurosurgeon to Vietnam in 2015. Given the Vietnamese surgeon's expertise in intraventricular tumor surgery, the focus of the initial visit was corpus callosotomy. After 2 operations performed jointly, the Vietnamese surgeon went on to perform 10 more in the ensuing 6 months with excellent results and presented a poster at the Asian & Oceanian Epilepsy Congress.

Collaborative work grew and matured in 2016-2017. Because pediatric epilepsy care requires far more than neurosurgery, our teams travelling to Viet Nam included a pediatric neurologist and EEG technologist. Also, in 2016-17, a neurosurgeon, two neurologists, and an EEG nurse from Viet Nam completed 2 to 3-month fellowships at Children's of Alabama (COA) in the US. These experiences improved EEG capabilities and facilitated the development of intraoperative electrocorticography (ECoG), making non-lesional epilepsy treatment more feasible.

The final component has been ongoing, regular communication. The Vietnamese team regularly sends case summaries for discussion at the COA epilepsy conference. Seven cases were reviewed in 2015-16; 13 in 2017 (three of which underwent surgery during the 2017 visit of the US team); and 3 reviewed to date in 2018. Most importantly, three additional patients underwent resection, guided by ECoG, in Vietnam without the US team present, but utilizing internet-based communication between Vietnamese and US EEG technologist. To date, these 3 patients remain seizure free.
CONCLUSION:Ongoing international collaboration has improved the surgical care of epilepsy in Viet Nam. Continued work is planned.

PF-046

Special Topic: Global Children's Surgery

The NED Institute Paradigm: a model for sustainable Global Neurosurgical Care and Education in low-income countries

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OBJECTIVE:Neurosurgery Education and Development Foundation (NED) was founded in 2008. NED's two objectives are to provide humane neurosurgical care and training. NED has operated in diverse hospitals in sub-Saharan Africa and supported many surgical camps.

After building the NED Institute (Zanzibar 2014), and attaining COSECSA Accreditation for neurosurgical training, NED Foundation has refocused on supporting a self-sustainable neurosurgical centre in Zanzibar. The objective of this presentation is to communicate our experience and our thoughts on the "ideal model" for future Global Neurosurgical Initiatives in low-income countries.

MATERIAL-METHODS:Between 2014 and 2018, surgical camps, organized courses and volunteer coordinators have been deployed at the NED Institute. We collected data about all visited patients and patients undergoing surgery. We collected data regarding all the projects in which NED Foundation has been involved.

RESULTS:Since 2014, NED Institute hosted 384 surgical volunteers along 87 surgical camps. During which, 750 neurosurgical procedures were performed at a dedicated theater and over 9150 visitations were made. Eight coordinators were deployed for periods of 3 months. The most treated pathologies were: Hydrocephalus (25.9%), Spine surgery (22,2%), traumatic brain injury (18.2%) and brain tumors (16.5%).

Local surgeons continued performing clinic weekly and performed over 100 surgical procedures.

The NED Institute hosted 15 Workshops, Courses and Symposiums.

CONCLUSION:NED Foundation has implemented a neurosurgical center in East Africa. The NED Institute is a haven for the poorest patients, but also for African residents, who can receive international high-quality training, while remaining exposed to the reality of African Neurosurgery.

Wednesday, 10 October 2018
08:00 – 10:00

Platform Presentations: Infections

PF-047

Special Topic: Infection

Pediatric Ventriculoperitoneal shunt infections – A clinical audit of contributory risk factors

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OBJECTIVE:Ventriculoperitoneal (VP) shunt infections forms second most common cause of shunt complications leading to high morbidity in all age groups. The objective of this study is to estimate infection rate complicating shunt surgery in pediatric population and identify factors associated with shunt infections. Identification of etiology, risk factors, and microbiological aspects will help to predict, prevent and treat shunt infections.

MATERIAL-METHODS:A prospective cohort analysis of patients aged less than 16 years undergoing VP shunt procedures at our institution over 30 months was undertaken with primary focus on shunt infections. The data was analyzed with emphasis on etiology, demographic, clinical and surgical variables, and culture reports of CSF & shunt tubes. Multivariate logistic regression analysis was used to analyze relationship between variables and development of shunt infection.

RESULTS:Among 336 VP shunt procedures; 96(28.57%) cases constituted shunt revisions including 37(11.01%) cases of shunt infections. Median time to infection was 47 days. Factors significantly associated with infection were etiology of hydrocephalus as post traumatic (OR:4.60,CI:1.65-12.78) or Intraventricular haemorrhage (OR:3.52,CI:1.12-11.01); age less than 1 year (OR:2.47,CI: 1.13-5.43) and operating time>75 mins (OR:2.46,CI: 1.04-5.80). The following had no independent associations with shunt infections: gender, operating conditions, neural tube defects, tracheostomy or ryles tube, surgeon experience and volume. Staphylococcus aureus (64.9%) was the most common isolated organism. Organisms showed decreased sensitivity to cephalosporins, quinolones and greater sensitivity to imipenam.

CONCLUSION:Shunt infections present early with nonspecific symptoms and should be viewed with suspicion. This study indicates that infants and higher operative duration are risk factors while surgeon's experience and emergency conditions have no role in shunt infection. Areas of improvement should focus on addressing associated risk factors, optimizing revision procedures and development of institutional antibiotic policy to fight shunt infections.

PF-048

Special Topic: Infection

Matrix metalloproteinases may act differently in paediatric and adult tuberculous meningitis

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OBJECTIVE:Paediatric tuberculous meningitis (TBM) is associated with high morbidity and mortality. Hydrocephalus can be effectively treated but patients often worsen due to complicated secondary brain injury mechanisms. Moreover, childhood and adult disease may differ. The disease process needs to be better understood to discover therapies to complement conventional surgical and medical treatment. Matrix metalloproteinases (MMP) are important gelatinases that are associated with poor outcomes in adult TBM. It has been suggested that MMPs may be a target in the mechanism of action of steroid therapy. However, this has not been studied in children. Therefore, we aimed to examine gelatinases and their inhibitors in paediatric TBM.
MATERIAL-METHODS:Lumbar and ventricular CSF, as well as serum, were collected from admission to week 4 in 40 children treated for TBM and hydrocephalus. MMP-9, MMP-2, and their tissue inhibitors, TIMP-1 and TIMP-2, were quantified using Luminex® technology and compared to 8 control patients undergoing filum terminale section. Clinical, radiological and chemistry data were also collected.
RESULTS:MMP-9, TIMP-1 and TIMP-2 were significantly elevated in the lumbar CSF from admission, and MMP-2 from week 1. MMP-9 concentrations decreased significantly in the first week post-admission and increased from week 2-4 in some patients. In contrast to adult studies, an increase in lumbar MMP-9 levels was associated with a good outcome at 6 months (RR: 2.1; CI: 1.231 – 3.528; p=0.008). MMP and TIMP concentrations were different across the CSF compartments, and serum concentrations were significantly higher than CSF concentrations for all analytes besides TIMP-1.
CONCLUSION:Our results suggest that gelatinases may act differently in children compared to adults, possibly related to their role in neurodevelopment, and that these are unlikely targets in the mechanism of action of steroid therapy. Our results also advance our understanding of gelatinase distribution within the central nervous system and periphery in TBM

PF-049

Special Topic: Infection

Trends and decisions in management of shunt infection and criteria for shunt reinsertion: A global ISPN survey

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OBJECTIVE:determining the level of expertise in the management of pediatric CSF shunt infections and its impact upon decision making in the election of treatment, therapy duration and specific criteria taken into account for shunt reinsertion after infection has been treated.
MATERIAL-METHODS:A survey was sent to the ISPN membership, the Pediatric Section of FLANC and shared contacts among members of these two organizations. The questionnaire was designed to pick up practice demographics pertaining to global location, type of delivered pediatric neurosurgical care, caseload, number of shunts inserted per year, estimated rate of new CSF shunt infection and specific clinical scenarios designed to identify criteria for establishing the diagnosis and treatment of an infected shunt and its specific management based on CSF report analysis for removal and reinsertion of shunts.
RESULTS:116 responses were obtained from all 5 continents. 44% came from the Americas. 88% of institutions managed more 200 cases per year and more than half were exclusively pediatric. 66% inserted more than 50 shunts per year and 64% had a rate of shunt infection <5%, the vast majority would establish the diagnosis of shunt infection based on leucocyte count and gram stains with later culture reports. The main criteria for reinsertion were obtaining 3 negative serial CSF cultures and 44% would wait until there were less than 20 leucocytes per field although 21% would shunt irrespective of leucocyte count as long as cultures were negative. 71% of centers had antibiotic impregnated catheters but only 28% would use them in first time shunting procedures while 31% would only use them in complex cases.
CONCLUSION:This survey emphasizes the worldwide clinical concept of serial negative cultures and adequate length of treatment as the main parameters for treating and reinserting CSF shunts.

PF-050

Special Topic: Infection

Intracranial empyema in children. Burr hole technique or craniotomy ? Review of management in 19 cases

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OBJECTIVE:Intracranial subdural empyema in children is a rare but severe condition. We reviewed our series from 2008 to 2017 and analyzed the management and the outcome.
MATERIAL-METHODS:19 patients (16M and 3F, average 10.5 years, median at 12.4 years) were treated for a primary

subdural empyema (SE) in this period. Two patients had post meningitis subdural effusions (PMSE), 13 were subdural empyema (SE) and 4 were extradural empyema (EE). 18 needed surgery and one was treated only by antibiotics (AB) and sinus drainage by ENT surgeon. Initial clinical picture was dominated by headache (60%) followed by signs of intracranial hypertension (29,1%) and epilepsy (20.8%). Overall functional deficit was present in 57,1%. Two patients (10.5%) presented with alteration of consciousness needing admission in ICU before surgery. All patients benefited a targeted intravenous AB-therapy for at least 3 to 4 weeks.
RESULTS:Surgery was done in 18 patients: 2 subdural drainage's (PMSE), 3 burr holes (SE) and 13 had craniotomy (9 SE and 4 EE). Five patients needed re-operation for a recurrence: 2 of 3 (33,3%) patients treated with burr hole and 4 of 13 (30%) patients with initial craniotomy. Streptococcus type germs was present in more than 70% of cases. In 16% of cases the association of 2 or 3 germs was found. Deficit resolved in all but one with slight residual aphasia (7%). Slight scholar difficulties were present in 35% of cases. There was no mortality in this series.
CONCLUSION:Although rare, the subdural empyema is a severe infectious condition in children. Analysis of the series shows that, in selected cases, the burr hole technique seems to be no less efficient than craniotomy. Residual slight cognitive impairments have to be actively searched and rehabilitation systematically proposed.

PF-051

Special Topic: Infection

Ventricular CSF is a valuable proxy to study brain tissue processes

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OBJECTIVE:Brain pathology research often relies on lumbar CSF as a site of disease sample. However, anatomical, physiological and pathological mechanisms may limit its usefulness. Neurosurgeons have access to ventricular CSF, which is closer proximity to the brain tissue and may be a better proxy. We examined differences between lumbar and ventricular CSF using various methods in children with tuberculous meningitis (TBM).
MATERIAL-METHODS:All analyses were conducted in lumbar and ventricular CSF in 3 substudies in which we examined:

1) CSF chemistry (glucose, protein, chloride) and leukocyte count in 75 children with TBM

2) Biomarkers of brain tissue injury (S100B, neuron-specific enolase and glial fibrillary acidic protein) and markers of inflammation (pro- and anti-inflammatory cytokines) in 44 patients

3) Whole genome RNA transcriptomics in 20 patients. These were compared with CSF from children with bacterial shunt infections.

RESULTS:In TBM, lumbar CSF showed lower glucose, lower chloride, higher protein, and higher leucocytes as expected. It also showed higher concentrations of inflammatory mediators (eg. TNF-α, IFN-γ). In contrast, ventricular CSF showed significantly greater concentrations of brain injury biomarkers. It also showed a much stronger transcriptomic neuronal and brain injury signature. Transcriptomics also showed significant differences between TBM and bacterial shunt infections.
CONCLUSION:Ventricular CSF more closely reflects processes in the brain tissue. This is likely due to compartmentalisation and the fact that ventricular CSF is accessed by passing through the brain tissue. Lumbar CSF reflected less neural markers, likely because of the decrement due to the rostro-caudal gradient of CSF flow, and higher concentrations of blood-borne proteins, likely enhanced by aspects of CSF spinal block. Ventricular CSF offers a valuable means to examine pathology of the brain, and a unique opportunity for neurosurgical research.

Wednesday, 10 October 2018
10:00 – 10:30

Platform Presentations: Craniofacial

PF-052

Special Topic: Craniofacial

Radiation-free 3D head shape and volume evaluation after endoscopically assisted strip craniectomy followed by helmet therapy for scaphocephaly

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OBJECTIVE:Post-operative follow-up in craniosynostosis is still mainly done using radiation techniques. Sequential radiation-free follow-up techniques (e.g. 3D stereophotogrammetry) are hindered by the lack of consistent markers like bony landmarks often restricting evaluation to subjective comparison. However, using the computed cranial focal point (CCFP), it is possible to perform correct sequential image superposition and objective evaluation. We used this technique for mean volume and 3D shape change evaluation of the head based on 3D Photos after endoscopically assisted scaphocephaly surgery with helmet therapy.
MATERIAL-METHODS:We performed a mean head 3D shape and volume evaluation on age grouped 3D Photos (n=176) of children that underwent endoscopically assisted scaphocephaly surgery with helmet therapy. We used CT scans (n=96) of age grouped children as reference for comparison. We performed a mean 3D shape evolution analysis and calculated both the volume and cephalic index (CI) over time.
RESULTS:The mean volume followed the reference group with deviations at the time of pre-surgery. The mean CI was initially 69.5% and increased to 77.0% at around 9 months from where it gradually declined to between 72-73% from hereon. The 3D head shape showed the highest amount of growth in the parietal area especially in the first few months after surgery. There were minor differences in both the total volume and posterior to total volume ratios between the craniosynostosis group and healthy references.
CONCLUSION:Using a novel technique we were able to objectively evaluate 3D head shape, volume and CI using stereophotogrammetry after endoscopically assisted scaphocephaly correction. The most prominent 3D shape change was around the surgical site and the CI showed initial increase post-surgery with some decrease over time. Volumes showed minimal differences compared to the reference group.

PF-053

Special Topic: Craniofacial

Surgical treatment of sagittal craniosynostosis: a neurocognitive, imaging and genetic study

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OBJECTIVE:To make a comprehensive neurocognitive, neuroradiological and genetic analysis of children affected by sagittal craniosynostosis, in order to estimate possible predictive factors of neurocognitive impairment.
MATERIAL-METHODS:All children affected by isolated sagittal craniosynostosis treated at our institution from January 2014 to January 2017 were included in the present study. Before surgery all children underwent a comprehensive neurocognitive evaluation (T0) and a CT/MR scan. At surgery samples of the prematurely fused suture were genetically analyzed. A follow-up wide and selective neurocognitive function evaluation was planned 6 months after surgery (T1), one (T2) and 3 (T3) years after the surgical treatment.
RESULTS:82 children fulfilled the inclusion criteria. At T0 24% of them had borderline/lower scores in one or more scales; fifteen of them showed a specific drop in a single scale, the most frequently compromised one being the coordinate o-manual scale. The remaining five children showed a much more compromised profile, where borderline/lower scores were observed in two or more scales. The usual increase in subarachnoid spaces around the cerebral hemispheres was documented in 60 cases (73.1%) on CT/MR.

The T1 follow-up neurocognitive evaluation was completed by 56 children. Eight of them (14.2%) showed a borderline/lower score in one or more scale, 5 with a specific drop in a single scale, the most frequently compromised function resulting language.
CONCLUSION:The persisting drop of selective neurocognitive functions as well as the wider neurocognitive compromise in a selected proportion of children after the surgical treatment was related to the neuroradiological picture at diagnosis and to the genetic findings. The improvement in time in a consistent proportion of our children after the surgical treatment might be related to an immaturity in the sensory-motor system, resulting from a greater compression of parieto-occipital areas, involved in the dorsal stream.

PF-054

Special Topic: Craniofacial

Minimally Invasive Endoscopic Strip Craniectomy For Craniosynostosis: Outcome data of 100 consecutive cases

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OBJECTIVE:We present results of 100 consecutive cases of minimally invasive endoscopic strip craniectomy (ESC) and postoperative helmet therapy (PHT) for craniosynostosis.

MATERIAL-METHODS:This was an IRB-approved, retrospective study examining the results of patients with craniosynostosis treated with ESC and PHT. Data was collected regarding demographics, intraoperative data, and anthropometric measurements preoperatively and in follow-up.
RESULTS:Patients included 63 males and 37 females, with a mean age at surgery of 3.16 ± 1.15 months (range 1.61 - 6.22 months). The types of craniosynostosis were 62 sagittal, 22 unicoronal, 7 metopic,1 lambdoid, and 8 multisuture. Mean operative time in single suture craniosynostosis was 75.16 minutes. Multisuture cases took longer. Estimated blood loss (EBL) was 35.3 ml in single suture operations, versus 61.2 ml in multisuture operations. Mean hospital stay was 1.10 days (single suture) and 1.75 days (multisuture). Patients with sagittal craniosynostosis had improvement of cranial index (CI) from 0.70 (preop) to 0.77 (last follow-up) ($P<0.001$) with mean follow-up 1.75 years. Patients with metopic craniosynostosis had improvement in interfrontal divergent angle (IFDA) from 118.8 to 135.1 degrees ($P<0.05$) with mean follow-up of 2.33 years. In a cohort of patients with unicoronal craniosynostosis there was improvement in forehead asymmetry [from 0.84 to 0.31 cm ($P = 0.006$)], nasal tip deviation [12.3 to 4.3 degrees ($P < 0.001$)], and facial midline deviation [4.8 to 1.35 degrees ($P < 0.001$)] with mean follow-up of 2.62 years. There were a total of 5 reoperations, with 3/92 (3%) patients in the single suture group and 2/8 patients (25.0%) in the multisuture group. There were no mortalities.
CONCLUSION:Early treatment of craniosynostosis using ESC and PHT is a safe and effective treatment associated with excellent results. Comprehensive data, including preoperative and followup outcome measurements and photographs for each of the major types of craniosynostosis treated, will be presented.

Wednesday, 10 October 2018
10:55 – 12:40

Platform Presentations: Functional / Epilepsy

PF-055

Special Topic: Epilepsy

Imaging the temporal spread of seizures for surgical planning with ictal magnetoencephalography in children with drug-resistant epilepsy

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OBJECTIVE:Ictal events are uncommonly captured in routine magnetoencephalography (MEG) recordings due to the typically short duration of such recordings. However, recorded seizures could be of considerable value for outlining the seizure onset zone non-invasively given the unique combination high temporal resolution and good spatial resolution afforded by MEG.
MATERIAL-METHODS:We recorded MEG in 40 children (range: 3-18 y.o.) with drug-resistant epilepsy who underwent presurgical evaluation from 2015 to 2018. Simultaneous EEG and video were recorded. No sedation was used. Recording duration ranged from 45 minutes to 7 hours (one patient was recorded overnight sleeping in the MEG). Magnetic source imaging of MEG data and windowed time-frequency analyses of preictal and ictal time windows were performed to localise the seizure onset zone.
RESULTS:Seizures were recorded in 10/40 (25%) patients. A total of 34 seizures were obtained (range: 1-14; median: 1). Semiology was recorded on video in all 10/10 patients. In 2/10 patients, localisation of ictal activity was not possible due to movement artefact at or prior to electrographic onset. Amongst the remaining 8 patients, preictal spiking was observed in 2/8, and focal paroxysmal fast activity (PFA) in 7/8. Preictal spiking was successfully localised in 2/2 patients using distributed source imaging of averaged spikes. PFA was successfully localised in 7/7 patients using windowed time-frequency decomposition of beta band (15-29 Hz) activity. Localisation of PFA was concordant with the surgical resection in 2/2 patients having undergone surgery (Engel Ia outcome).
CONCLUSION:Ictal MEG in unsedated children is feasible and could contribute to the localisation of the seizure onset zone as part of the presurgical evaluation. Our method of windowed time-frequency analyses of the ictal onset is shown to be a useful way to assess the temporal spread of seizures. Overnight MEG recordings are proposed as a way to increase the yield of the technique.

PF-056

Special Topic: Epilepsy

Long term outcomes of Magnetic Resonance (MR)-guided laser interstitial thermal therapy (MRgLITT) in pediatric epilepsy surgery

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OBJECTIVE:To report our institutional experience with the use of MRgLITT in the management of drug resistant epilepsy due to a variety of etiologies and clinical scenarios, and identify conditions associated with good clinical outcome and complications.
MATERIAL-METHODS:We retrospectively reviewed 39 patients who underwent ablation of epileptogenic foci using MRgLITT. Patients underwent a detailed preoperative workup to identify the epileptogenic zone. Postoperative course and outcomes were analyzed including Engel and ILAE scores. Complications and technical challenges were also reviewed.
RESULTS:39 patients underwent MRgLITT from 2011 to 2017. Mean age at seizure onset was 8.4 years (range 6months-21years) and mean age at procedure was 15.5 years (range 3-26 years). Indications for the procedure were divided in 5 main groups: hippocampal sclerosis in 6 patients, hypothalamic hamartomas in 3, tuberous sclerosis in 4, MRI lesions mainly FCD and tumors in 11 and post resection residual targets in 14. One patient had a procedure based on a focal SPECT abnormality on a nonlesional MRI. Average follow up was 26.35 months (range 6-72 months). Outcomes at 6 months and at last follow up were analyzed for each group and the entire cohort. Engel class 1 and 2 outcome was achieved in 64% (25/39 patients), Engel 3-4 in 35.8% (14/39 patients). At last follow up 53.82% (21/39) were Engel 1-2 and 46.14% (18/39) Engel 3-4. Subgroup analysis will be discussed. There were 4 minor complications that resolved without lasting effects and 4 cases of incomplete treatment related to technical difficulties.
CONCLUSION:MRgLITT is a safe and effective alternative for epilepsy treatment. Patients with discrete lesions particularly HS, HH and TS or focal MRI abnormalities who were treated with MRgLITT as a first line treatment have better outcomes when compared to patients with prior surgical resections.
Keywords: Drug-resistant epilepsy, Epilepsy surgery, Laser ablation, Seizures, Minimally invasive epilepsy surgery, MRI guided laser interstitial thermal therapy.
AuthorToEditor: No conflict of interest

PF-058

Special Topic: Functional

Role of selective dorsal rhizotomy in patients with GMFCS IV

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OBJECTIVE:Selective dorsal rhizotomy (SDR) has been proven to be effective in patients with spastic diplegia with GMFCS I, II and III. There is limited data available showing its effectiveness in not walking patients with GMFCS level IV.
MATERIAL-METHODS:We have prospectively collected data about all patients undergoing SDR in our centre in the period between 2012-2018. Data collected included demographic, length of follow-up, surgical details, GMFM, MAS, MRC, CPChild/CPQoL, PEDI, Abilhand, CCHQ, VAS. We also collected, when possible, GMS, FMS, TUG, 6MWT. Measures were collected pre-operatively, and post-operatively at 3, 6, 12, 24 months.
RESULTS:We performed 18 patients with a predominant lower limb spastic diplegia with pre-operative GMFCS IV. All procedures were carried out with intra-operative monitoring by the same neurosurgeon and all patients received 3 weeks of equivalent inpatient post-operative physiotherapy.

The mean follow-up was 20 months. All patients showed a significant improvement in most domains, in particular MAS, MRC, CPQoL, PEDI, Abilhand and the results were consistent at longer follow-up. The details of the statistical analysis will be presented.

We also noticed a significant improvement in speech and urology function. Painful spasms were treated successfully in all patients.

We didn't experience any post-operative complication or adverse event.
CONCLUSION:SDR is effective in reducing spasticity in GMFCS IV and the improvements are sustained over time.

PF-059

Special Topic: Functional

Efficacy of new protocol guided single-level laminectomy selective dorsal rhizotomy followed by intensive rehabilitation for children with spastic cerebral palsy

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OBJECTIVE:To evaluate the efficacy of new protocol guided single-level laminectomy selective dorsal rhizotomy (SL-SDR) followed by intensive rehabilitation for children with spastic cerebral palsy for ≧ 12 months, and to investigate the factors affecting the outcomes.
MATERIAL-METHODS:A retrospective analysis was conducted for the clinical data of 67 pediatric cases with spastic cerebral palsy underwent new protocol guided SL-SDR followed by intensive rehabilitation for ≧ 12 months from 2015 Sep. to 2016 Oct., focusing on muscular tone, muscular strength, joint range of movement, the gross motor function classification system (GMFCS) grading and the gross motor function measure-66 (GMFM-66) scores pre, 6 months post and ≧ 12 months post-op. Multivariate logistic regression was utilized to identify the factors affecting the outcomes.
RESULTS:With a mean of 12.7 months' follow-up, there were 22 cases improved one level and 4 cases improved two levels with regard to GMFCS. Improvement of GMFCS was observed significantly better in cases with baseline of GMFCS II or III(20/37 vs.6/23), and cases ≤ 6 yrs (20/31 vs. 6/29)than those of IV or V, and > 6 yrs. Improvement of GMFM-66 was significantly better in cases with baseline of GMFCS I-III(13.4 vs.8.7), and cases ≤ 6 years old(13.5 vs. 9.8) than those of IV or V, and > 6 yrs, respectively. Multivariate logistic regression demonstrated that the age and status of pre-op GMFCS were independent factors associated with the presentation of GMFCS improvement and the children's GMFM-66 improved at least 10 points at 12 months post-op.
CONCLUSION:The gross motor function of children with spastic cerebral palsy underwent new protocol guided SL-SDR followed by intensive rehabilitation improved dramatically 12 months after the commencement of the treatment. Children could benefit from this procedure more for those with baseline of GMFCS I to III and younger than 6 yrs.

Wednesday, 10 October 2018
14:00 – 15:30

Platform Parallel Presentations: Epilepsy / Functional / Antenatal

PF-060

Special Topic: Epilepsy

Endoscopic hemispherotomy technique in pediatric epilepsy surgery: preliminary experience in clinical implementation

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OBJECTIVE:In order to minimize surgical exposure and decrease perioperative morbidity, implementation of endoscopic approaches to pediatric epilepsy surgery are of significant interest, though described by few groups to date. We present our preliminary results with a series of endoscopic hemispherotomy surgeries to treat intractable epilepsy in children.
MATERIAL-METHODS:A prospective series of endoscopic hemispherotomy surgeries is presented, with minimum 3 month follow up. Patient characteristics, perioperative data, clinical outcomes, and seizure outcomes are tracked.
RESULTS:5 patients (age range 2-18 years) underwent endoscopic hemispherectomy. Diagnoses included perinatal stroke and cortical dysplasia. Neuronavigation was used. Surgical approach included a 5cm paramedian incision with a 2cmx4cm craniotomy centered over the coronal suture, with an interhemispheric approach to the ventricle. Corpus callosotomy, frontobasal disconnection, insular cut with unroofing of the temporal horn, and hippocampectomy was done from the ipsilateral ventricle with a 3-hand endoscope-assisted technique with a straight rigid endoscope. Estimated blood loss ranged from 30cc to 120cc. Operative time ranged from 3.5 hours to 5.5 hours. Blood transfusion was required in one, the youngest of the 5 patients. Perioperative external ventricular drain was removed within 5 days in all patients. No patient has required cerebrospinal fluid shunt to date. There were no intraoperative or perioperative adverse events. 3 patients were discharged to home for outpatient therapies, while 2 patients benefitted from an inpatient rehabilitation unit stay. All patient remain seizure free at last follow up.
CONCLUSION:Endoscopic hemispherotomy can be safely implemented in clinical practice. The learning curve is steep. Careful patient selection is essential.

PF-061

Special Topic: Epilepsy

The clinical characteristics of posttraumatic epilepsy following moderate-to-severe traumatic brain injury in children

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OBJECTIVE:Children with traumatic brain injury (TBI) are at increased risk of posttraumatic epilepsy (PTE); the risk increases according to TBI severity. We examined the long-term incidence and risk factors for developing PTE in a cohort of children hospitalised at one medical centre with moderate or severe TBI
MATERIAL-METHODS:Moderate brain injury was classified as Glasgow Coma Score on Arrival (GCSOA) of 9-13, and severe brain injury as GCSOA ≤8. We collected demographics and clinical data from medical records and interviewed patients and parents at 5-11 years following the TBI event.
RESULTS:During a median follow-up period of 7.3 years, 9 (9%) of 95 children with moderate-to-severe TBI developed PTE; 4 developed intractable epilepsy. The odds for developing PTE was 2.9 in patients with severe compared to moderate TBI. CT findings showed fractures in 7/9 (78%) of patients with PTE, compared to 40/86 (47%) of those without PTE (p=0.09). Of the patients with fractures, all those with PTE had additional features on CT (such as haemorrhage, contusion and mass effect), compared to 29/40 (73%) of those without PTE. One of nine (11%) PTE patients and 10 of 86 (12%) patients without PTE had immediate seizures. Two (22%) children with PTE had their first seizure more than 2 years after the TBI.
CONCLUSION:Among children with moderate or severe TBI, the presence of additional CT findings other than skull fractures seem to increase the risk of PTE. In our cohort, the occurrence of an early seizure did not confer an increased risk of PTE.

Wednesday, 10 October 2018
15:05 – 15:13

Platform Presentations – Antenatal

PF-062

Special Topic: Antenatal diagnosis and treatment

Fetal intracranial tumors: what to do? A challenge from diagnosis to treatment

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OBJECTIVE:Little is known about fetal intracranial tumors. They represent a wide range of different entities. Even rare, their management remains a real challenge because of the dramatic early course of some of these tumors and the limited therapeutic options. On the other side, some have a spontaneous good evolution or are accessible to complete healing. Our goal is to find out the prenatal markers to approach the possible postnatal prognosis and help the prenatal counselling.
MATERIAL-METHODS:We reviewed retrospectively all the cases of fetal intracranial tumors treated in our institution since fourteen years. We compared our results with the ones of the series of Cassart and Al. in 2008.
RESULTS:between 2004 and 2018, we encountered 12 cases of fetal brain tumours. All but one were diagnosed before birth, one case was diagnosed at day one post delivery. The majority were choroïd plexus papillomas (6), then hamartomas (3). One teratoma, one ATRT, and one medulloblastoma were also encountered. Most of them were supra tentorial (9), the other 3 were infra tentorial (one vermian, one in the cerebellum, one in the brainstem). 7 were operated on (3 had more than one surgery). One needed oncological treatment (medulloblastoma). Among the 5 non treated surgically, two regressed spontaneously since birth, the other remain stable. We presently have a hindsight of 102 months of mean follow-up.
CONCLUSION:Fetal brain tumors are challenging due to the diversity of the aetiology and their prognosis. We found more benign tumors (choroid plexus papillomas and hamartomas) than in the Cassart series maybe due to the neurosurgical bias. In parallel to this first factual statement, we are at the end of a vast national multicentric retrospective study of all the cases of fetal intracranial tumors diagnosed since 2008. The results of this study will be presented and compared to our series.

PF-063

Special Topic: Antenatal diagnosis and treatment

Fetoscopic repair of myelomeningocele: Initial experience at a single center

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OBJECTIVE:The Management of Myelomeningocele (MMC) Study showed that prenatal repair of MMC with hysterotomy lowers the risk of hydrocephalus and improves motor outcomes

at 30 months of age. However hysterotomy is associated with maternal-fetal risks: uterine rupture/dehiscence, transfusion, placenta accreta for future pregnancies, preterm labor, and prematurity. Fetoscopic repair is a minimally invasive technique, which aims to minimize the aforementioned risks. We report our preliminary results with training and completing fetoscopic myelomeningocele repair at a single center.
MATERIAL-METHODS:Initial training occurred at Texas Children's Hospital followed by simulator work at our center. The technique for fetoscopic repair (ClinicalTrials.gov NCT03090633) was a two-port approach with carbon dioxide insufflation before 26 gestational weeks. The neural placode was dissected, freed, and primary skin closure was achieved using monocryl sutures. Pre-procedure and 6 week post-procedure MRI was obtained at 1.5 T following institutional protocol. All neonates were monitored for worsening hydrocephalus with head ultrasound (HUS) starting day of life 1.
RESULTS:8 enrolled fetuses underwent prenatal fetoscopic closure at an average gestational age of 24.6 weeks (range 22+6wks-25+2wks).All MMCs were in the lumbosacral region. All MMCs were successfully closed fetoscopically with primary skin closure. All but one infant showed significant reduction in the Chiari malformation on post-procedure MRI. 1 had a minor residual skin defect at birth that epithelialized without intervention. So far, 7 of the fetuses were born at an average gestational age of 35.3 weeks (range 29+2wks - 39+2wks). Two births at 29+2 and 30+6 weeks required lengthened NICU stays, but developed no intraventricular hemorrhage. Of 7 infants born, none have required shunting for hydrocephalus.
CONCLUSION:Fetoscopic MMC repair is feasible after appropriate training with an experienced center. Preliminary results suggest a lower rate of premature delivery compared to repair with an open hysterotomy and a very low rate of hydrocephalus.

PF-064

Special Topic: Antenatal diagnosis and treatment

Developmental Outcome in fetuses diagnosed with Isolated Vermis abnormality

Liat Ben Sira, Raz Shperling, Gustavo Malinger
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OBJECTIVE:Posterior Fossa (PF) and vermain developmental anomalies include a wide spectrum of conditions. Improvement in neurosonography and fetal MRI made prenatal diagnosis of these findings facile; however, prenatal counseling is still challenging.
The main objective of our study was to evaluate the neurodevelopmental outcome of children suspected to present with abnormal isolated vermis development during fetal life.
MATERIAL-METHODS:We retrospectively collected data from the OB-GYN US & Pediatric Radiology Units, between 2000-2017, of patients referred due to suspected Posterior fossa & vermian anomalies. In 79, the anomaly was considered isolated; 15 of them were loss to follow up and 26 underwent TOP (termination of pregnancy). The remaining 38 were contacted but 3 were excluded since their fetuses were diagnosed with genetic syndromes. Twenty four of these fetuses were diagnosed as having a Blakes 'pouch cyst and two with arachnoid cysts (Group 1); the remaining 9 had an isolated vermian abnormality (Group 2). The structures of the posterior fossa (PF) was assessed quantitatively by measuring Vermis length/width, Pons diameter, Transverse cerebellar diameter (TCD), Lateral ventricles, Brainstem vermis & Brainstem tentorium angles. The Festigium & Primary fissure were grossly evaluated as normal or abnormal. Neuro developmental evaluation was conducted using the Vineland-II questionnaire.
RESULTS:Children in Group 2 showed significantly low scores in the questionnaires domain and subdomains, predominantly in the social and communication skills. This group demonstrated significantly more developmental difficulties and ADHD, even when compared to the general population. In fetuses with either Blake's pouch cysts or isolated vermain abnormality, there was no differences in the degree of angulation of the brainstem/vermian angle.
CONCLUSION:Defining a "pure" vermian abnormality in the fetus, with small vermis, and abnormal configuration (abnormal primary fissure and festigium) are the most important factors for neurological outcome.

Wednesday, 10 October 2018
16:55 – 17:30

Platform Presentations: Main Plenary Session - Featured Abstracts

PF-065

Special Topic: Vascular

Exome Sequencing defines the molecular pathogenesis of Vein of Galen Malformation

Daniel Duran[1], Jungmin Choi[2], Xue Zeng[2], Sheng Chih Jin[2], Carol Nelson-Williams[3], Bogdan Yatsula[4], Jonathan R. Gaillard[1], Charuta Furey[1], Michael L. Diluna[1], Charles C. Matouk[1], Shrikant Mane[5], Seth L. Alper[6], Masaki Komiyama[7], Andrew F. Ducruet[8], Joseph M. Zabramski[8], Alan Dardik[4], Beverly Aagaard-Kienitz[9], Geoges

Rodesch[10], Edward R. Smith[11], Darren B. Orbach[12], Alejandro Berenstein[13], Kaya Bilguvar[14], Murat Gunel[1], Richard P. Lifton[15], Kristopher T. Kahle[16]
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OBJECTIVE:Vein of Galen malformations (VOGMs) are morbid and often lethal developmental arteriovenous malformations, with poorly described genetic underpinnings.[1] Despite improvement in endovascular treatment, mortality from VOGM remains high.[2] VOGM has been reported as a rare finding in Capillary Malformation-Arteriovenous Malformation Syndrome (RASA1; OMIM #605384) and Hereditary Hemorrhagic Telangiectasia (ENG, ACVRL1; OMIM #187300 and #600376).[3–4] Paucity of genetic data results from intrinsic limitations of patient recruitment in a frequently deadly disease, and constraints of traditional genomic techniques. Collaborative recruitment and whole-exome sequencing (WES) are poised to overcome these barriers for gene discovery.

MATERIAL-METHODS:Germline DNA was isolated from 50 unrelated probands harboring radiographically-confirmed VOGMs. Both parents were available for 48/50 probands. Exome capture, followed by paired-end WES was performed on DNA samples from participating individuals (n=148). Data was bioinformatically analyzed to identify rare de-novo and transmitted mutations. Binomial analysis tested for exome-wide significance of mutational burden. Transient transfection of constructs harboring VOGM mutations in HEK293 cells followed by immunoprecipitation and immunoblotting were performed.
RESULTS:Mutations in previously reported VOGM-associated genes were found in only 2/50 patients (4%; RASA1 n=1; ACVRL1 n=1) in our cohort. Significant enrichment of rare damaging mutations was found for a member of the EPHreceptor tyrosine kinase family (n=4; 8%; p = 3.64x10-7, 72.12-fold enrichment), and for a member of the claudin family (n=3; p = 8 x 10-7; 176.9-fold enrichment). Novel damaging mutations were found in five other genes of the ephrin family, and in a close paralog of the HHT-causing ACVRL1, never previously implicated in human disease. In vitro assays demonstrate VOGM-related EPHB mutants exhibit down-regulation of RAS/MAPK/ERK1/2 and PI3K/AKT/mTOR signaling.
CONCLUSION:This work represents the largest phenotyped and exome-sequenced VOGM cohort in the world. Our findings uncover genetic determinants and molecular mechanisms of VOGM pathogenesis, provide novel insight into vascular developmental biology, and identify potential therapeutic targets.

PF-066

Special Topic: Spine

Is Prophylactic Untethering Necessary in Myelomeningocele Patients Undergoing Scoliosis Surgery?

Richard Anderson[1], Hannah Goldstein[1], Belinda Shao[1], Michael Vitale[1], Peter Madsen[5], Sara Hartnett[7], Jeffrey Blount[2], Douglas Brockmeyer[3], Robert Campbell[5], Michael Conklin[2], Todd Hankinson[4], Gregory Heuer[5], Andrew Jea[8], Benjamin Kennedy[5], Amer Samdani[6], Gerald Tuite[7]
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OBJECTIVE:Over time, patients with myelomeningocele (MM) can develop both re-tethering and scoliosis. It is unknown if prophylactic untethering on asymptomatic MM patients prior to scoliosis surgery is necessary to minimize any potential neurological injury post-operatively.
MATERIAL-METHODS:We performed a multicenter, retrospective cohort study of asymptomatic patients with MM who were managed with or without prophylactic untethering prior to scoliosis surgery. Patients were divided into three groups: (1) prophylactic untethering performed concurrently with the scoliosis surgery, (2) untethering performed within three months prior to scoliosis surgery, and (3) no prophylactic untethering performed. Baseline data, intra-operative reports, and 90-day post-operative outcomes were analyzed to assess for differences in neurologic outcomes, scoliosis correction, surgical site infections (SSIs), and overall length of stay (LOS).
RESULTS:Preliminary results are based on 187 scoliosis surgeries from five institutions. Mean age at surgery was 9.4 years old. Changes in neuromonitoring were found in less than 3% of cases, with only one patient exhibiting worsened neurologic function post-operatively. Overall SSI rate was 13.4%; however, SSIs were seen in 27.3% of patients from Group 1, 37.5% of Group 2, and 11.3% of Group 3 ($p = 0.034$). Patients required return to the OR within 90 days in 45.5% of Group 1, 25% of Group 2, and 15.5% of Group 3 ($p = 0.003$). Finally, LOS averaged 9 days in Group 1, 12.5 days in Group 2, and 4.8 days in Group 3 ($p = 0.0001$).
CONCLUSION:The vast majority of asymptomatic MM patients undergoing scoliosis surgery have good neurologic outcomes regardless of prophylactic untethering. However, those who undergo prophylactic untethering concurrent or within three months of scoliosis surgery are more likely to experience SSIs, return to the OR, and longer hospital stays.

PF-067

Special Topic: Spine

Predicting motor outcome following intramedullary spinal cord tumor surgery: The role of D-wave monitoring in children

Francesco Sala, Fabio Paio, Pietro Meneghelli, Vincenzo Tramontano
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OBJECTIVE:Surgery plays the main role in the treatment of intramedullary spinal cord tumors (ISCT), but the risk of post-operative paresis is substantial. Among intraoperative neurophysiological monitoring (IONM) techniques, preservation of D-wave amplitude above 50% of baselines is the strongest predictor of good long-term motor outcome in adults. Given the paucity of data in children, we reviewed the role of D-wave monitoring in this population.
MATERIAL-METHODS:D-wave monitoring was attempted in 29 out of 34 children (mean age 10.4yrs.) with ISCTs, excluding those with tumors caudal to the bony level of T10-T11. We used a single-stimulus transcranial electrical stimulation (0.5ms duration,intensity up to 200mA) and spinal epidural recording immediately caudal to the tumor level.

Functional outcome was assessed through the McCormick Grade (MCG) pre-operatively, early after surgery and at the follow-up, MCG I being a child with no/minimal motor deficits and MCG IV one with severe paraparesis/paraplegia.
RESULTS:D-wave was monitorable in 20 (69%, mean MCG 1.6) and unmonitorable in 9 (31%, mean MCG 2.3) patients. D-wave was preserved above the critical 50% amplitude threshold at the end of surgery in 19 of the 20 monitorable patients (95%).

At a minimum follow-up of 1 year, available in all but two patients, 18 (56%) were in MCG I, 7 (22%) in MCG II, 3 (9.5%) in MCG III. Four children (12.5%) were in MCG IV, but 2 of these were in grade IV pre-operatively, and one developed a post-operative hematoma.

Excluding this latter patient, 16 with preserved D-wave were able to walk independently (MCG I-II) at the follow-up, while 2 needed support (MCG III).
CONCLUSION:D-wave is monitorable in the majority of children with ISCTs. A preserved D-wave at the end of surgery predicts motor recovery in the long-term. We strongly advocate D-wave monitoring to prevent permanent motor deficit in children undergoing surgery for ISCTs.

Wednesday, 10 October 2018
14:00 – 15:30

Platform Parallel Presentations: Endoscopy / Joint IFNE

PF-068

Special Topic: Hydrocephalus

Predict Validity of ETV success Score in 291 Children

Jose Aloysio Costa Val, Leopoldo Mandic

Pediatric Neurosurgery - Biocor/Vila da Serra – Nova Lima - Brazil

OBJECTIVE:Endoscopic Third Ventriculostomy Success Score is a model to estimate ETV success probability until six months after procedure. The goal of this study is to evaluate if ETVSS could be useful even over 12 months and it role in pediatric neurosurgeon decision-making
MATERIAL-METHODS:Children less than 18 years those undergone first third ventriculostomy were prospectively evaluated between 1996 to 2016. ETV success score was obtained for each patient and the real success rate after 12 months was compared. Clinical and radiological improvements was considered as success criteria. Minimum twelve months for follow-up was considered.
RESULTS:Two hundred ninety one third ventriculostomies were performed. The Majority of children had 2-10 years old.53,5% were boys. Aqueductal stenosis was the more common etiology (37,6%) followed by Chiari II (12%) and posterior fossa tumors (8,6%). ETV global success rate was 76% in the first 6 months and decreased for 69,2% until 12 months. There was statistically significance among ETVSS and success rate even in long term follow-up.
CONCLUSION:ETVSS seems to be a validity tool to evaluate the chances of ETV success.

PF-069

Special Topic: Hydrocephalus

Assessment of Short term Efficacy of Endoscopic third ventriculostomy combined with Choroid Plexus cauterization in the Management of Pediatric Hydrocephalus in Kenya

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OBJECTIVE:Over the last decade, Endoscopic third ventriculostomy combined with choroid plexus cauterisation has gained greater scrutiny over its efficacy in the treatment of hydrocephalus. This one year review of prospectively collected data on 122 paediatric patients in a single institution, assesses the short term efficacy of ETV/CPC in the management of hydrocephalus and post operative morbidity associated with treatment.
MATERIAL-METHODS:Patients under 18 years with a clinical and radiological diagnosis of hydrocephalus were treated with ETV alone or ETV/CPC as primary treatment for hydrocephalus. Patients with multiloculated hydrocephalus, holoprosencephaly and hydranencephaly were excluded from the study.

Technique. ETV/CPC was performed with a flexible neuroendoscope Karl storz. ETV was considered done with visualisation of naked neurovascular structures in the prepontine and premedullary cisterns. Greater than 90% Choroid plexus cauterisation was aimed for in the lateral ventricles.

Patients were followed up clinically at 10day, monthly for 3 months, at 6 months and 9 months post-surgery. When possible a follow up CT scan of head was obtained.
RESULTS:122 patients had ETV/CPC as treatment for hydrocephalus. 85 NPIH, 18 PIH, 19 shunt related complications. At 9 month follow up, 12.5% of patients had failure of ETV/CPC. 4 patients with thin cerebral mantle developed haemorrhagic subdural collections that required surgery.
CONCLUSION:Short term follow up data indicates ETV/CPC is efficacious in the treatment of paediatric hydrocephalus. Haemorrhagic subdural collections in patients post ETV maybe unreported in children with thin cerebral mantle as an early complication of ETV. Study is limited by duration of follow up.

PF-070

Special Topic: Neuro-Oncology

Endoscopic endonasal approach for suprasellar craniopharyngioma: Factors influencing tumor resection and outcome

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OBJECTIVE:The endoscopic endonasal approach (EEA) is commonly used for the treatment of suprasellar craniopharyngioma. Traditionally, a narrow surgical corridor, incomplete pneumatization of sphenoid sinus, calcification, adherence to hypothalamus, critical relationship with stalk, and post-operative and -radiation scarring are considered as limiting factors in gross total tumor resection. The authors present a series of consecutive pediatric patients in whom the endonasal endoscopic approach was used to remove craniopharyngiomas and analyze outcomes in order to understand the benefits and drawbacks of this approach.
MATERIAL-METHODS:Thirty-one consecutive pediatric patients (age ≤ 18 years) underwent surgery via an EEA from 2010 to 2016. The authors recorded the location, consistency, and size of the lesion, the calcification, stalk position, and hypothalamic invasion on preoperative MRI, and operative findings, and evaluated postoperative outcome with

parameters such as extent of resection, visual function, endocrinological function, weight gain, and functional status of the patients.
RESULTS:The average age at the time of surgery was 9.7 years (range 8–17 years) and the tumor sizes ranged from 1.3 to 41.7 cm3. Gross-total resection was achieved in 72% of the patients. Neartotal resection, subtotal resection, or biopsy was performed intentionally in the remaining patients to avoid hypothalamic/ stalk injury. Anterior pituitary dysfunction occurred in 31.8% of the patients, and 63.3% developed transient diabetes insipidus. Two patients had a greater than 9% increase in body mass index. Visual function was stable or improved in 73%. All children returned to their preoperative functional status. Twelve patients developed postoperative CSF leaks, four of them required repair.
CONCLUSION:The endoscopic transsphenoidal approach is suitable for removing pediatric craniopharyngiomas even in young children with suprasellar tumors, conchal sphenoid sinus, recurrent tumors, and tumors with solid components. The extent of resection is dictated by degree of capsular calcification, anatomical orientation of the stalk, and invasion of the hypothalamus.

Wednesday, 10 October 2018
14:00 – 15:30

Platform Parallel Presentations: Craniofacial

PF-071

Special Topic: Craniofacial

Non-syndromic craniosynostosis patients operated between 1978 and 2000. How do they do as adults?

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OBJECTIVE:Non-syndromic craniosynostoses are common, but still little is known about these patients as adults. The purpose of this study was to evaluate the late outcome, including socioeconomic situation and cosmetic issues, of non-syndromic craniosynostosis patients treated in Oulu University Hospital during early childhood.
MATERIAL-METHODS:During the years 1978 to 2000 there were done 165 operations coded as cranioplasties. Patients with syndromes, shunts and missing contact data were excluded. 115 adult patients were contacted. 83 patients responded and 61 came for follow-up. From them 2 didn't meet the inclusion criteria. From the rest 59 patients 41 had scaphocephaly, 8 had trigonocephaly, 9 had anterior plagiocephaly and one had posterior plagiocephaly. An age and gender matched controls were also recruited. At follow-up visits facial appearance and head shape were evaluated by the surgeon. Wide questionnaires, including queries on socio-economic situation, were completed by the study persons. Later cosmetic outcome was evaluated by independent observers from the standard photographs taken during the visits.
RESULTS:The patients mean age at follow-up was 27 years. In all subgroups patients were as satisfied with their own appearance as the controls, though in majority of plagiocephaly patients (6 out of 10) there was some residual deformity observed (grade 3, fair on 4-point scale). There was no difference in general or mental health, housing, marital status, employment, education in neither diagnosis group between patients and controls. In the trigonocephaly subgroup two patients had developmental delay and one more had dyslexia, but only one of them had development delay serious enough to make the patient dependent of caregivers.
CONCLUSION:Patients treated for non-syndromic craniosynostoses do as well as their controls in adulthood, though different degree of developmental delay was seen in some of trigonocephaly patients.

PF-072

Special Topic: Craniofacial

Defining critical ages for orbital shape changes after frontofacial advancement in Crouzon syndrome

Roman H Konsari[1], Quentin Hennocq[2], Johan Nysjö[3], Ronak Sandy[4], Samer Haber[2], Syril James[2], Jonathan A Britto[2], Giovanna Paternoster[2], Éric Arnaud[2]
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[4]Department of Oral and Maxillofacial Surgery, Aalborg University Hospital, Aalborg, Denmark

OBJECTIVE:Orbital anomalies are a central clinical concern in Crouzon syndrome (CS). Here we have assessed the volume and the shape of the orbits in a series of patients with CS treated using fronto-facial monobloc advancement osteotomy with internal distraction, and

provide quantitative time-related data on orbital shape modifications.
MATERIAL-METHODS:Twenty-four patients with CS and 48 control patients were included. CT-scans at pre-operative, early post-operative, 6 months post-operative and 12 months post-operative were used to compute orbital volume and orbital shape parameters (Maximum Absolute Distance (MAD), Hausdorff Distance (HD) and Dice Similarity Coefficient (DSC)). A hierarchical linear model was used in order to assess age-related variations of volumes, symmetry, MAD, HD and DSC.
RESULTS:Orbital volumes were smaller in CS and surgery induced stable volume overcorrection. Crouzon orbits were more asymmetrical than controls and surgery did not correct this parameter in average. Nevertheless, surgery performed before 20.65 [16.30 – 25.36] months improved symmetry. Orbital morphology quantified by MAD, HD and DSC was modified in a stable manner by fronto-facial advancement. Maximal shape modification was obtained when surgery was performed between 13.73 [+/- 1.40] and 64.57 [+/- 1.89] months. Over 80% of orbital growth was achieved in all groups at the age of 64.57 [+/- 1.89] months.
CONCLUSION:We defined a critical period between 1 and 5.5 years of age during which the effects of frontofacial advancement are maximal on the orbital shape. This period corresponds to a peak in orbital growth, accounting for the major influence of surgery on shape parameters.

PF-073

Special Topic: Craniofacial

Perioperative Outcomes and Management in Midface Advancement Surgery: A Multicenter Observational Descriptive Study from the Pediatric Craniofacial Collaborative Group

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[4]Comer Children's Hospital and The University of Chicago Medicine
[5]Johns Hopkins School of Medicine
[6]The Children's Hospital of Philadelphia and the Perelman School of Medicine at the University

OBJECTIVE:The aim of this descriptive observational study was to utilize data from the multicenter Pediatric Craniofacial Surgery Perioperative Registry (PCSPR) to present and compare patient characteristics and outcomes in children undergoing midface advancement with distraction osteogenesis.
MATERIAL-METHODS:We queried the PCSPR for children undergoing midface advancement involving distractor application from June 2012 to September 2016. Data extracted included demographics, perioperative management, complications, fluid and transfusion volumes, and length of stay. The extracted patient characteristics and perioperative variables were summarized and compared.
RESULTS:The query yielded 72 cases from 11 institutions- 49 children undergoing Le Fort III and 23 undergoing Monobloc procedures. Monobloc patients were younger, weighed less, and more likely to have tracheostomies along with elevated intracranial pressure. Greater transfusion was observed in the Monobloc group for nearly all of the transfusion outcomes evaluated. Median ICU and hospital length of stay were 2 and 3 days longer, respectively, in the Monobloc group. Perioperative complications were not uncommon, occurring in 18% of patients in the Le Fort III group and 30% in the Monobloc group.
CONCLUSION:We present a comprehensive description of demographic and perioperative outcomes following Le Fort III and Monobloc procedures with distraction osteogenesis. Monobloc procedures were associated with greater transfusion and longer ICU and hospital length of stay. Perioperative complications are described and were more prevalent in the Monobloc group.

PF-074

Special Topic: Craniofacial

Abnormal Cranial Growth in Children with X-linked Hypophosphatemic rRckets

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OBJECTIVE:X-linked hypophosphatemic rickets (XLH) represents the most common form of hypophosphatemia and leads to vitamin D resistant rickets in children.

Even though cranial vault and craniovertebral anomalies of potential neurosurgical interest, namely early closure of the cranial sutures and Chiari type I malformation- have been observed in XLH patients their actual incidence is not established yet. Aim of this study was to analyze the incidence of cranial and cranio-vertebral junction (CVJ) in children with XLH.

MATERIAL-METHODS:Retrospective study of CT scans of the head in 44 XLH children, followed at the French Reference Center for Rare Diseases of the Calcium and Phosphate Metabolism. Fifteen of the children considered for the study were boys and 29 girls, age 8.7 ± 3.9 years at time of CT scan. The patency of the cranial sutures and the position of the cerebellar tonsils were analyzed.

RESULTS:Twenty-six children (59%) presented an associated craniosynostosis due to the early fusion of the sagittal suture. Ten (23%) presented a descent of the cerebellar tonsils (7 children > 5 mm and 3 children < 5 mm). Craniosynostosis was associated to abnormal descent of cerebellar tonsils but a protrusion of the cerebellar tonsils was noted in one child without an associated craniosynostosis. A history of dental abscesses was associated to craniosynostosis.

CONCLUSION:A surprising high percentage (59%) of children with XLH present a sagittal synostosis. This conditions concurs to the particularly frequent caudal dislocation of the cerebellar tonsils in these subjects. Our results highlight sagittal suture fusion and descent of cerebellar tonsils, often referred to as Chiari Malformation, as common features of XLH children. The diagnosis of these complications of XLH are underestimated on a purely clinical basis, consequently radiological studies should be considered in the standard work-up of XLH children to adequately manage the condition.

Thursday, 11 October 2018
08:00 – 09:20

Platform Presentations: Neurotrauma

PF-075

Special Topic: Neurotrauma/Critical Care

A Program to Prevent Abusive Infant Head Trauma - Eight Year Outcome Results in a Prospective Population Based Study

Ash Singhal[1], Ronald G. Barr[2], Marilyn Barr[4], Fahra Rajabali[3], Claire Humphreys[3], Ian Pike[2], Rollin Brant[5], Jean Hlady[2], Margaret Colbourne[2], Takeo Fujiwara[6]
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OBJECTIVE:Abusive head trauma is a devastating form of infant abuse, with significant mortality and morbidity. Efforts to reduce the burden of disease are best achieved with prevention efforts, but evaluation of prevention effectiveness is challenging. The current study prospectively evaluates the 8-year outcome of abusive head trauma (AHT) admissions following implementation of a comprehensive prevention program across a population (Province of British Columbia, Canada).

MATERIAL-METHODS:A 3-dose primary, universal education program (the Period of PURPLE Crying) was implemented through maternal and public health units and assessed by retrospective-prospective surveillance of AHT. Surveillance included monitoring of AHT cases seen by a specialized child evaluation and protection team, and monitoring of AHT cases seen or reviewed by all Pediatric Neurosurgeons.

With Parents of all newborn infants born from January 2009-December 2016 (n=354,477), trained nurses discussed crying and shaking while delivering a booklet and DVD during maternity admission (dose 1). Public health nurses reinforced 5 Talking Points by telephone and home visits post-discharge (dose 2) and community education was instituted annually (dose 3).

RESULTS:During admission, program delivery occurred for 90.0% of mothers and 74.4% of fathers. By 2-4 months, 70,9% of mothers and 50.5% of fathers had reviewed the provided materials.

AHT admissions across the entire population of our province, determined by prospective surveillance monitoring, decreased for <24 month-olds, from 6.7 (95% CI: 5.4-8.3) to 4.4 (95% CI: 3.1-6.2) cases per 100,000 person years. Relative risk of admission was 0.65 (95% CI: 0.43-0.99, p=0.048).

CONCLUSION:The intervention was associated with a 35% reduction in infant AHT admissions, that was statistically significant for <24 month-olds. The results are encouraging - despite a low initial incidence and economic recession, reductions in AHT may be achievable

with a system-wide implementation of a comprehensive parental education prevention program.

PF-076

Special Topic: Neurotrauma/Critical Care

Bicycle helmets in the setting of TBI and neurosurgical intervention

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OBJECTIVE:Over the past decade, in an effort to reduce head trauma, numerous communities have enlisted measures to increase utilization of helmets when riding a bicycle. While reduction of risk would appear intuitive, we reviewed the incidence of TBI at our institution to determine whether use of a bicycle helmet reduced the overall risk of injury requiring Neurosurgical intervention.
MATERIAL-METHODS:A retrospective review was undertaken of all children who were diagnosed with head injury at Children's National Medical Center, Washington from 2008-2017 from an IRB approved registry of all pediatric trauma at our institution.
RESULTS:From 2008-2017, 164 children were identified(out of 565 trauma patients) who suffered head injuries while riding a bicycle with 85% of the children not wearing a helmet and only 15% with a helmet. Placing these patients into three cohorts(no radiological findings, non-surgical radiological findings and neurosurgical intervention), the percentage of injuries is significantly higher in children not wearing helmets($p<0.00001$). Overall, 59% did not have radiological findings(i.e. concussion) while 41% did. Neurosurgical intervention was required in 5%. When there were no radiological findings, 16% were noted to be wearing a helmet while 84% were not. However, when Neurosurgical intervention was required, only 10% wore a helmet ($p=0.86$). While this was not statistically significant, the small sample size may be a factor.
CONCLUSION:Despite the surprisingly low use of helmets when riding a bicycle, their utilization reduces the risk of injury requiring Neurosurgical intervention. In the US, the law regarding helmets is remarkably variable and we plan to assess jurisdictional differences in regard to outcomes. Within the Washington metro are, three regions have different approaches depending upon age, location and vehicle (bike vs skateboard). There is also a tremendous need to look across international boundaries particularly in nations with innumerable bikes but few helmets.

PF-077

Special Topic: Neurotrauma/Critical Care

Examining thresholds for treating clinical parameters against a measure of brain metabolism in severe traumatic brain injury

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OBJECTIVE:Guidelines to manage clinical parameters in children are based on weak evidence and so most recommendations are made at the level of an option. No clear guidelines exist for specific thresholds of intracranial pressure (ICP) and cerebral perfusion pressure (CPP). Even for advanced methods like brain oxygen (PbtO2) monitoring, two current recommendations for thresholds are markedly divergent, i.e. 10-15mmHg and 30mmHg. In this study we examined the relationship between a measure of brain metabolism against thresholds of ICP, CPP and PbtO2 in children with severe TBI.
MATERIAL-METHODS:We examined patients who underwent multimodality monitoring with ICP, CPP (MAP-ICP), PbtO2, and microdialysis. The microdialysis-based lactate-pyruvate ratio (LPR) was used as a measure of brain metabolism. LPR>40 is typically associated with mitochondrial dysfunction and/ or anaerobic metabolism. Catheters were placed in the same region of the brain. Time-linked analysis was performed for hourly variables of each and correlations were calculated.
RESULTS:There were 29 patients who underwent full monitoring with all parameters. The LPR was significantly correlated with ICP ($p<0.01$) and PbtO2 ($p<0.01$), but in general the correlations co-efficients were weak ($r=0.2$ and 0.29 respectively). LPR was not correlated with CPP. There was no clear difference of LPR below or above an ICP threshold of 20mmHg. With respect to PbtO2, LPR was only consistently elevated at very low levels of PbtO2 (<10mmHg).
CONCLUSION:Our data support a lower, more conservative, threshold for treatment of PbtO2. Treating at a higher threshold (i.e. 30mmHg) may expose patients the adverse effects of aggressive interventions with little benefits. Our data do not support a single threshold for ICP treatment. This threshold may vary between patients and may be affected by different cerebral haemodynamic patterns in children compared to adults. Inter-individual variability should

be considered before rigorous application of guidelines based on weak evidence.

PF-078

Special Topic: Neurotrauma/Critical Care

Machine-Learning Predicts Clinically-Relevant Traumatic Brain Injury in Children

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OBJECTIVE:Pediatric traumatic brain injury (TBI) is common, but not all injuries require hospitalization. A computational tool for ruling-in patients who will likely suffer a clinically-relevant TBI (CRTBI) would provide an evidence-based tool to safely discharge children who are at low risk for a CRTBI. We hypothesized that using a machine-learning (ML) approach on clinical and imaging metrics would provide a highly-predictive tool for identifying patients likely to suffer from a CRTBI.
MATERIAL-METHODS:Using the prospectively-collected, publicly-available, multicenter Pediatric Emergency Care Applied Research Network (PECARN) TBI dataset, we included TBI patients under the age of 18 with radiologist-interpreted admission head computed tomography (CT) imaging data. The primary outcome was the presence of a CRTBI, which included patients in the following groups: 1) Neurosurgical procedure 2) Intubated > 24 hours as direct result of the head trauma 3) Hospitalization ≥ 48 hours and evidence of TBI on CT or 4) Death due to TBI.
RESULTS:Among 12,902 patients included in this study, 480 patients were determined to have a CRTBI by standard clinical data and imaging. Our ML-based prediction tool had a sensitivity of 99.73% with 98.19% precision, 97.98% accuracy, 91.23% negative predictive value, 0.0027% false negative rate, and 60.47% specificity. The area under the ROC curve was 0.9907.
CONCLUSION:Using clinical and radiographic data, ML can inform a highly-predictive tool for ruling-in CRTBI in children. Adoption of this algorithm could provide an automated decision-making tool for providers to confidently confirm CRTBI in children and provide an evidence-based decision for safe discharge, potentially reducing healthcare expenditures. Further iterations of this algorithm may bring real-time, data-driven updates to the hands of pediatric emergency providers in order to provide the most accurate evidence-based care that can also be updated prospectively in real-time.

PF-079

Special Topic: Neurotrauma/Critical Care

Osteopontin is a Promising Candidate Blood Biomarker for Severe Traumatic Brain Injury in Children

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OBJECTIVE:Identification of a reliable biomarker of traumatic brain injury (TBI) remains elusive. Using controlled cortical impact to CX3CR1 mice in pre-clinical studies, we demonstrated preferential induction of plasma osteopontin (OPN), a phosphoprotein associated with microglial activation, in symptomatic TBI mice (unpublished data). The goal of this translational human pilot study was to evaluate plasma OPN as a biomarker in pediatric TBI.
MATERIAL-METHODS:Sixty-six patients with TBI (50 severe, 5 moderate, and 11 mild; aged 1 to 18 years) admitted to Children's Healthcare of Atlanta were enrolled. Serial blood samples were collected at admission, 24, 48, and 72 h and correlated to clinical and radiographic findings. Correlations of OPN or GFAP (glial fibrillary astrocytic protein) with short-term outcomes (mortality, on-ventilator days, in-ICU days) and CT findings were analyzed using Spearman's rank correlation test. OPN or GFAP levels were compared using the Mann-Whitney test.
RESULTS:Levels of OPN at admission were found to be a better predictor of outcomes compared to GFAP. Plotting peak plasma levels of both biomarkers against mortality, length /days on-ventilator, and in-ICU, OPN showed significant correlation with clinical outcomes (P=0.0186 for mortality, p=0.0024 for

on-ventilator days and p=0.0126 for ICU stay),whereas GFAP did not (P>0.05). OPN levels showed the steepest upward trajectory within 72 h among deceased children. ROC analysis supported a higher accuracy of plasma OPN over GFAP levels to diagnose intracranial lesions on CT (AUC for OPN, 0.72; 0.65 for GFAP). Plasma OPN, but not GFAP, were significantly higher in children with severe TBI versus those with mild TBI (p=0.0188 for OPN; p=0.7509 for GFAP).
CONCLUSION:Initial plasma OPN level and its trajectory in the acute phase of pediatric TBI may be a useful blood biomarker to predict the severity, clinical course, and outcome in pediatric TBI.

Thursday, 11 October 2018
09:20 – 10:45

Platform Presentations: Neuro-Oncology

PF-080

Special Topic: Neuro-Oncology

WNT pathway hyperactivation: pathogenetic and prognostic influence on craniopharyngiomas progression

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OBJECTIVE:Management of craniopharyngiomas (CFGs) remains a great challenge in pediatric neurosurgery and progression of each individual lesion after surgery is difficult to predict. Literature shows association between beta-catenin misregulation and CFGs. Aim of this study was to analyze association between most of the WNT pathway genes expression with pathogenesis and outcome of CFGs.
MATERIAL-METHODS:The expression of the canonical Wnt pathway components in CFGs was assessed, as well as its association with CTNNB1 mutations and tumor progression. Samples from 14 CFGs patients and normal anterior pituitary samples from eight individuals without pituitary disease were studied. Gene expression of Wnt pathway activator (WNT4), beta-catenin gene (CTNNB1), inhibitors (SFRP1, DKK3, AXIN1, and APC), transcriptional activator (TCF7) and target genes (MYC, WISP2, and CDH1) were analyzed using real time polymerase chain reaction (rT-PCR). Additionally, beta-catenin, myc and wisp2 expressions were also studied using immunohistochemistry (IHC).
RESULTS:All studied genes, except APC, had higher transcriptional levels in tumors when compared to controls. TCF7 mRNA levels correlated with CTNNB1 mutation. CDH1 mRNA was overexpressed in tumor samples of patients with disease progression compared to those with stable disease. Beta-catenin was positive and aberrantly distributed in 11 out of 14 tumor samples. Stronger beta-catenin immunostaining associated positively with tumor progression. Myc positive staining was found in 10 out of 14 cases, whereas all CFGs were negative for Wisp2. Wnt pathway genes were overexpressed in CFGs harboring CTNNB1 mutations and in patients with progressive disease.
CONCLUSION:Our results point out a role for the Wnt pathway activation in the pathogenesis and prognosis of CFGs. This way, Wnt pathway could be used in the future as a marker for CFGs aggressiveness as it is already the case for meduloblastomas.

PF-081

Special Topic: Neuro-Oncology

H3K27M, IDH1 and ATRX expression in pediatric GBM(pGBM) and their clinical and prognostic significance

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OBJECTIVE:To identify the spectrum of pathological and genetic alterations encountered in pGBM and to correlate them with clinicoradiological features and prognosis; and to study the expression of various molecular markers viz, H3K27M, IDH-1, ATRX, P53 in pGBM and evaluate their prognostic significance.
MATERIAL-METHODS:We retrospectively analyzed 29 pGBMs (3 - 18 years) operated at our institute between 2009 and 2014. Clinical details were collected from case records. The tissue blocks were processed and appropriate immune histochemical staining were performed. Appropriate statistical tests were employed for various sets of data analysed.
RESULTS:The median overall survival (OS) was 6.00 ± 0.882 months. The mean OS was 7.571 ± 1.118 months. Preoperative KPS, extent of surgical resection, adjuvant radiotherapy, were found to be the clinical factors strongly influencing median survival and results showed statistical significance.($p<0.05$). Loss of ATRX expression was found in a high percentage of lobar tumors(84%), whilst P53 staining was maximum in thalamic tumors. H3K27M mutant protein expression was noted in 8 out of 9 thalamic tumors and 5

out of 7 tumors in brainstem-cerebellar peduncular region. Patients with H3K27M mutation had the worst prognosis with mean OS was 5 months ±0.832 months, as against patients who did not have H3K27M mutation,which was 10.143 ±1.866 months(p=0.006). Other markers like P53, ATRX, and IDH1, did not influence the prognosis in this patient cohort. ATRX loss of expression was associated with a better OS, with a trend to significance, and such an association has not been reported earlier.
CONCLUSION:This study is one among the few studies from India describing the clinicoradiological parameters, and evaluating the molecular alterations in pGBM and their prognostic significance. In the present study, we were able to identify a set of potential prognostic biomarkers that may be of use for the stratification of pGBM cases into clinically relevant subsets.

PF-082

Special Topic: Neuro-Oncology
Comparative natural history and management of paediatric and adult tectal plate gliomas; not always an indolent disease

Athanasius Chawira[1], David Giraldi[2], Mitchell Foster[1], Benedetta Pettorini[1], Chris Parks[1], Sasha Burn[1], Ajay Sinha[1], James Walkden[2], Andrew Brodbelt[2], Emmanuel Chavredakis[2], Michael Jenkinson[2], Conor Mallucci[2]
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OBJECTIVE:Tectal plate gliomas are a rare subset of gliomas which tend to follow a more benign, indolent course compared to other midbrain and brainstem gliomas. This study aims to investigate the clinical outcome of patients with tectal plate gliomas and compare and contrast children with adults.
MATERIAL-METHODS:Retrospective case note review of patients with a radiological or histological diagnosis of tectal plate glioma between January 2007 and January 2018. Data were collected on clinical presentation, radiological features, operative management and surveillance. Median follow up 6 years (3 months – 18 years).
RESULTS:50 (14 children, 36 adults) patients were identified. Median age was 19 years (range: 3 months – 62 years). Presenting complaints included hydrocephalus-related symptoms (n=40) and others (n=10).

All 14 children had primary ETVs. 5 (35.7%) experienced ETV failure. Of these, 4 had redo ETVs and 1 had a VP shunt. 13 (92.9%) children remain shunt independent. Of the 36 adults, 24 had primary ETV and 8 (33.3%) of these failed; 6 required conversion to a VP shunt and 2 had re-do ETVs. 2 had primary VP shunts with 1 failure requiring conversion to secondary ETV. 10 adults had no intervention. 29 (80.6%) adults remain shunt independent. Overall, 42 (84.0%) patients remain shunt-free.

In total, 18 patients were biopsied due to atypical appearances on imaging or radiological progression. 2 (14.2%) children demonstrated radiological progression requiring chemotherapy (n=1) or open surgery (n=1) vs. 8 (22.2%) adults requiring radioactive seeds (n=3), radiotherapy(n=2), debulking (n=2) or chemotherapy (n=1).
CONCLUSION:In this mixed adult and paediatric series, 20% demonstrated radiological progression requiring treatment indicating that the natural history and course of these lesions are not entirely benign and that patients should remain under close annual MRI surveillance with consideration of biopsy in the case of atypical appearances on imaging or if radiological progression is observed.

PF-083

Special Topic: Neuro-Oncology
Updated proteomic analysis of pediatric glioblastoma

Luca Massimi[1], Claudia Martelli[2], Alessia Nesticò[2], Paolo Frassanito[1], Gianpiero Tamburrini[1], Massimo Caldarelli[1], Massimo Castagnola[2], Claudia Desiderio[3]
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OBJECTIVE:The proteomic analysis of malignant brain tumors traditionally addresses the adult glioblastoma (GBM). The few studies concerning the pediatric GBM are based on the enzimatic pre-digestion of the proteins. We present the result of a study realized through the top-down approach (no pre-digestion) to find out new tumor markers
MATERIAL-METHODS:The samples of the last consecutive 6 children (4 males, 2 females; mean age at surgery: 8 years) operated on for GBM at our Institution were analyzed. The steps consisted in: 1) Extraction of the protein acid soluble fraction from tissue samples; 2) Analysis by HPLC-ESI-LTQ-Orbitrap Elite; 3) Identification and characterization of the proteins
RESULTS:Pediatric GBM includes several “eloquent” proteins, as hemoglobin alpha-chain, beta-thymosin 4 peptide, ubiquitin proteoforms, alpha-defensins, protein S100A6 and Heat Shock 10 kDa protein. The most relevant observations are: 1) Missing entire form of ubiquitin, which was replaced by truncated forms (des-RGG form). Ubiquitin is known to be involved in the tumorigenesis; 2) High levels of des-AGES form of thymosin beta-4 (the most abundant among the beta-thymosin family), which is involved in the tumor invasion; 3) The presence of defensins would not characterize the GBM but could indicate a patient-related inflammatory reaction

against the tumor; 4) The presence of hemoglobin chains has been confirmed, thus encouraging a deeper investigation on its role of in the GBM cells; 5) S100A6 and Heat Shock proteins could be involved in the tumor-related oxidative stress
CONCLUSION:Compared with other pediatric brain tumors that we investigated by a proteomic analysis (medulloblastoma and pilocytic astrocytoma), GBM is characterized by the absence of entire ubiquitin and by the presence of truncated forms of this protein and truncated forms of thymosin beta-4. These proteins can be considered as new markers of GBM and new hints for investigating possible therapeutic targets

PF-084

Special Topic:Neuro-Oncology

Second-look surgery for intracranial germ cell tumors

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OBJECTIVE:The role of second-look surgery in intracranial germ cell tumors (GCTs) needs to be reviewed.
The authors present their experiences of second-look surgery in patients with intracranial GCTs who showed less than complete response despite normalizing or decreasing tumor markers after chemotherapy.
MATERIAL-METHODS:Retrospective review of 9 patients who underwent second-look surgery for an intracranial GCT was performed.
RESULTS:Of 29 consecutive patients with newly diagnosed intracranial GCTs treated between August 2003 and June 2016, 9 patients (31%) underwent second-look surgery. The mean age was 8.2 years. The initial diagnoses were mixed germ cell tumor in 5 and immature teratoma in 4. Second-look surgery was performed after 1-3 courses of chemotherapy. Magnetic resonance imaging (MRI) at the surgery demonstrated increasing residual tumor in 6 and stable residual tumor in 3. Tumor markers were normalized in 6 and nearly-normalized in 3. Gross total resection was achieved in all patients. Histopatholgy at second-look surgery revealed mature teratoma in 6, immature teratoma in 1, fibrosis with atypical cells in 1, and fibrosis in 1. All patients subsequently underwent additional chemo-radiation therapy according to the initial diagnosis. All patients are alive with no evidence of recurrence with a mean follow-up of 67 months.
CONCLUSION:Second-look surgery plays an important role in the treatment of intracranial GCTs. Surgery may be encouraged at a relatively early phase after chemotherapy when the residual tumor increases or does not change the size despite normalized or nearly-normalized tumor markers in order to achieve complete resection and improve the outcome.

Thursday, 11 October 2018
11:00 – 13:00

Platform Presentations: Main Pleanary Session – General Interest

PF-086

Special Topic: Neuro-Oncology

Subcortical mapping using an electrified CUSA in pediatric supratentorial surgery

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OBJECTIVE:Intraoperative electrophysiology is increasingly used for various lesion resections, both in adult and pediatric brain surgery. Subcortical mapping is often used in adult surgery when lesions lie in proximity to the corticospinal tract (CST). We describe a novel technique of continuous subcortical mapping using an electrified Cavitron UltraSonic Aspirator (CUSA) in children with supratentorial lesions.
MATERIAL-METHODS:We evaluated the method of subcortical mapping using a CUSA as a stimulation probe. Included in this study were children (<18 years of age) with supratentorial lesions in proximity to the CST in which the CUSA stimulator was applied. Data was collected retrospectively.
RESULTS:11 children were included. Lesions were located in the thalamus (3), basal-ganglia (2), lateral ventricle (1), and convexity (5). Lesions included low-grade gliomas (6), AVM (1), cavernoma (1), cortical dysplasia (1), ependymoma grade II (1), and high-grade glioma (1). Seven patients had positive mapping responses to CUSA-based stimulation at various stimulation intensities. These responses led to a more limited resection in 5 cases. There were no complications related to the mapping technique.
CONCLUSION:Continuous CUSA based subcortical stimulation is a feasible mapping technique for assessing proximity to the CST during resection of supratentorial lesions in children. Future studies should be performed to better correlate the current threshold for eliciting a motor response with the distance from the CST as well as the effect of age on this technique.

PF-087

Special Topic: Vascular

Stroke Following Elective Craniotomy in Children

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OBJECTIVE:A cerebrovascular accident (CVA) following an elective craniotomy is a complication that can result in temporary or permanent neurologic deficits, seizures, medical complications such as pneumonia or deep venous thrombosis, an increased hospital length of stay, and the need for inpatient or outpatient rehabilitative services. Here, we investigated the factors associated with the occurrence of stroke following pediatric elective cranial surgery.
MATERIAL-METHODS:We performed a retrospective review of all pediatric patients who developed a postoperative stroke following an elective craniotomy from 2010-2017. Demographic, medical, imaging, and outcome data were collected.
RESULTS:A total of 1,450 patients underwent an elective craniotomy at our institution during the study period. Of these, 25 patients (1.7%) developed a postoperative stroke. Overall, 85.2% of cases occurred following a craniotomy that was performed for resection of a tumor. Radiographic diagnosis of the infarction occurred at a mean of 1.7 days (range 0-9 days) from the time of surgery, and neurological deficits were apparent within 24 hours of surgery in 18 patients (66.7%). Infarcts tended to occur adjacent to the site of resection (88.9% of cases), in a unilateral (92.6%), unifocal (92.6%), supratentorial (92.6%) location. Overall, 44% of the infarcts were related to an iatrogenic injury of a perforating artery, 37% were due to a large vessel injury (ACA, MCA, PCA, AchoA), and 15% were secondary to venous injuries. Strokes conferred an increased morbidity and a longer hospital stay.
CONCLUSION:Although the incidence of stroke following elective pediatric craniotomy is low, it can lead to worse neurological outcomes. The surgeon must be familiar with the anatomical and technical etiologies underlying postoperative infarction in order to prevent this complication.

FL-134

Special Topic: Neuro-Oncology

Inter-rater reliability of a method for determining the pre-operative hypothalamic involvement of pediatric craniopharyngioma

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OBJECTIVE:Pediatric craniopharyngioma confers significant morbidity, with injury to the hypothalamus representing a particular challenge. This insight led to reconsideration of goals of surgery for certain patients. Puget et al (2007), proposed a pre- and post-operative grading system based on the degree of hypothalamic invasion on MRI. Their system defined three grades: 0, 1, and 2 where 0 represents no involvement of the hypothalamus, 2 represents hypothalamic involvement and 1 is defined as tumor abutting the hypothalamus. In a prospective cohort, they found that use of the system decreased morbidity. This system, however, has not been externally validated. We present the results of an inter-rater reliability study to predict the feasibility of this approach in the treatment of pediatric craniopharyngioma.
MATERIAL-METHODS:Six experts graded twenty-nine pre- and postoperative MRI scans according to the methods of Puget and colleagues. Inter-rater reliability was calculated using Fleiss K and Krippendorf alpha values.
RESULTS:Inter-rater reliability in the pre-operative context was in the range of 0.57-0.58 (K and alpha values respectively), demonstrating only moderate agreement. Inter-rater reliability in the post-operative context was in the range of 0.39 for both methods of statistical evaluation.

CONCLUSION:Inter-rater reliability for the system as defined is moderate. It may be possible that slight refinements of the MRI grading system, such as collapsing the 3 grades into 2, will allow for improvement in reliability.

PF-089

Special Topic: Neuro-Oncology

Role of repeat surgery in management of pediatric low-grade intramedullary gliomas

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OBJECTIVE:Not all intramedullary astrocytomas are amendable for radical resection with acceptable functional result. This leads to incomplete removal and relapse. The main objective of this study was to determine safety and feasibility of repeat resection of residual or recurrent pediatric low grade IMSCT
MATERIAL-METHODS:This is a retrospective analysis of clinical data on 25 children, who underwent more than one surgery for removal of low-grade IMSCT. This data was extracted from author's IMSCT database of 541 patients with the initial diagnosis of IMSCT operated on from 2002 to 2016. This included 264 pediatric (≤18 years old) patients. In pediatric group, 191 (72.3%) patients harbored low-grade tumors. The statistical analysis was done, p value of < 0.05 was considered significant
RESULTS:Twenty-five children (13%) with low-grade gliomas were reoperated for progression of residual or relapse of a previously "totally" removed tumor. A total of 27 surgeries were performed. Mean age at the time of first surgery in reoperation group was 7.2±4.2 years, and 9.6±5.1 years in control group. Both groups had similar distribution of pathological diagnoses. Mean time between first and second operations was 27.9±23.1 months (IQR=9.4-47.6 mns). There was no difference in time to second surgery between GTR and incomplete resection groups (27.8±25 and 28±25 months respectively). GTR at first operation in study group was achieved in 7 (28%) patients: six JPA and one ependymoma. At second surgery, GTR was possible in 9 (36%) patients: 5 patients after original GTR and in 4 patients with previously incompletely resected tumors (four JPA and one fibrillary astrocytoma). Malignant transformation was identified in two patients
CONCLUSION:The second and third surgery in patients with recurrent low-grade pediatric IMSCT is a feasible option. This approach in experienced hands may be as safe as primary surgery and has a potential benefit of GTR in over 30% of patients

PF-090

Special Topic: Neuro-Oncology

Natural growth behavior of NF2-associated vestibular schwannomas during childhood and young adulthood

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[2]Department of Neurology, University Hospital Eppendorf, Hamburg, Germany

OBJECTIVE:To evaluate natural tumor volume and growth rate of vestibular schwannomas without any treatment (e. g. surgery, bevacizumab) or during therapy-free interval in young patients with NF2.
MATERIAL-METHODS:We reviewed retrospectively 36 patients (72 tumors) with NF2 under the age of 25 and performed tumor volumetric measurements in contrast T1 MR images (MRI), slice-thickness (< 3 mm) using BrainLab software. Growth rate was calculated by volume changes over time and significance tested with two independent sample t-test and paired sample t-test (SPSS Version 24).
RESULTS:Tumor volumetry was done in 813 MR images, mean follow-up per patient was 37.64 months (range 12–167 months). For this analysis, data of 53 tumors were selected to calculate natural growth rate between age 2 until 25. A saltatory growth dynamic during first 2 decades with several peaks, drops and periods of stable growth rate was found. The mean natural growth rate was 0.692 +/- 1.296 ml/year and the mean tumor volume during the observation period 3.338 +/-4.972 ml. There was no significant difference of natural growth rate between the genders (female mean growth rate 0.912 +/- 1.705 ml/year, male growth rate 0.462 +/-0.734 ml/year, p > 0.05).
CONCLUSION:Regarding natural growth rate and non-influenceable factors such as sex or tumor side our results confirm previous findings in a large cohort. Over time, NF2-associated VS in children and young adults exhibit different growth dynamics being probably influenced by hormones, puberty, peripuberty or growth factors, which are difficult to predict. Further investigations (clinical, neuroendocrine and receptor dependency) as well asmolecular genetics and long-term natural history studies are needed for further evaluation.

PF-091

Special Topic: Neuro-Oncology

Minimally Invasive Resection of Subcortical Pediatric Brain Tumors and Vascular Malformations using a Novel Navigable Tubular Retractor Syste

Erin N Kiehna[1], Ronald L Young, Ii[2]
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OBJECTIVE:Resection of subcortical and intraventricular brain tumors and vascular lesions in children is often challenging due to the impact of conventional retractors on immature cortex. Modern navigable tubular retractors combined with a transsulcal approach offer a minimally invasive alternative to traditional microscopic resection and may limit white matter injury by dissipating the retractor force radially. We present the largest pediatric experience with tubular retractor systems for pediatric brain tumors and vascular malformations.
MATERIAL-METHODS:A prospective secure database of BrainPath™ (NICO Inc. Indianapolis, IN) cases is maintained by NICO, with physician consent. Patients are de-identified. The database was queried for patients <18 years, tumor/lesion location, size, pathology, and operative details.
RESULTS:A navigable tubular retractor system enabling a transsulcal approach was used in 36 pediatric patients for subcortical/deep seated tumors (n=21), intraventricular tumors (n=9) or vascular lesions (n=6) with a median age = 9.6 yrs (range 23 days-17 yrs). Lesion volumes average 12.5 cc (range 4-33 cc). Mean operative time was 3:11 and median length of stay was 48 hours. Extent of resection matched the intended resection without complication. Patients were neurologically intact on follow up, with the exception of a preexisting visual field cut in one.
CONCLUSION:Our experience with 36 pediatric patients demonstrates that safe and effective surgery using a small craniotomy and a navigable tubular retractor can be used in children as young as 23 days to resect lesions located in the subcortical, deep white matter and intraventricular regions. Reduced surgical times and hospital length of stay may trend towards improved outcomes.

Thursday, 11 October 2018
08:00 – 09:40

Platform Presentations: Spine

PF-092

Special Topic: Spine
Biomechanical Finite Element Analysis of the Developing Craniocervical Junction

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OBJECTIVE:The biomechanical properties of the developing craniocervical junction (CCJ) are poorly understood. It is assumed that there are age-dependent maturation processes that occur within the structures that stabilize the CCJ, but little data supports this notion. In this study, finite element modeling (FEM), a computational technique that enables quantitative biomechanical analysis, was used to test this hypothesis.
MATERIAL-METHODS:Validated FEMs of four normal pediatric CCJ's, age 13 months, 10 years and 14 years old, were compared to two validated adult CCJ FEMs, age 26 years and 59 years. A moment of 0.1 Nm was applied to the occiput in flexion and extension in the pediatric models while a moment of 1.0 Nm was applied to the adult models. The pediatric soft tissue stiffness was reduced to 10% of adult values, a finding previously reported.
RESULTS:When compared to adult CCJ FEMs, the three pediatric FEMs demonstrated a gradual age-dependent increase in stiffness. Flexion ROMs for the FEMs, by increasing age, were 34.5° (13 months), 30.0° (10 years), 27.6° (14 years), 22.4° (29 years), and 21.7° (59 years). Furthermore, given the fact that the pediatric models contain identical soft tissue material properties, this study demonstrates that age-based increase in CCJ stiffness are, in part, a result of pure bony geometrical scaling, a finding not previously reported.
CONCLUSION:These results demonstrate that both soft tissue and bony maturation contribute to the overall stiffening of the CCJ over time. These results reflect previous findings from cadaveric testing and lay the groundwork for further computational advances in this area.

PF-093

Special Topic: Spine

Clinico-radiological features of congenital anomaly-related atlantoaxial dislocation and modified classification system

Olga M Pavlova, Sergey O. Ryabykh, Alexander V. Burcev, Alexander V. Gubin
Ilizarov Center

OBJECTIVE:To determine the clinical and radiological features of congenital anomaly-related atlanto-axial dislocation (AAD) and to find optimal grading system for assessing the severity of the symptomatic atlanto-axial displacement.
MATERIAL-METHODS:We evaluated a group of patients with atlantoaxial symptomatic displacement occurred due to congenital anomalies of the CVJ, treated in Ilizarov Center in 2010-2017. An assessment was made for certain clinical and radiological criteria and scales.
RESULTS:Among 29 patients there were 14 males (48.3%) and 15 females (51.7%). Odontoid abnormalities were present

in 16 cases (55.2%): odontoid hypoplasia or aplasia in 5 cases (31.3%) and OsO in 11 cases (68.7%). We divided patients into three groups, according to the abnormalities: 1) non-syndromic patients (six patients, 20.7%) with isolated abnormality; 2) patients with Klippel-Feil Syndrome (KFS) (14 patients, 48.3%); 3) syndromic patients (nine patients, 31%). In non-syndromic group four patients had AAD and two patients had atlantoaxial rotatory fixation within the limit of normal motions (AARF). In KFS group 7 patients had AAD, 1 patient had atlantoaxial subluxation and 6 patients had AARF. In syndromic group all patients had AAD.

CONCLUSION:Syndromic AAD often are accompanied by anterior and central dislocation and myelopathy, atlanto-occipital dissociation. These patients require early aggressive surgical treatment. Whereas non-syndromic and KFS-related AAD, atlantoaxial subluxation and antlanto-axial fixation often manifest by local symptoms. The existing classifications of symptomatic atlantoaxial displacement are not always suitable for patients with odontoid abnormalities. We have proposed modified classification based on the Fielding and Hawkins, Kulkarni and Goel classification systems (table 1).

PF-094

Special Topic: Spine

Does occipital fixation help in Craniovertebral junction anomaly?

Suchanda Bhattacharjee, Kiran Karamtoat Sugali, Barada Prasad Sahu, Vijay Saradhi
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OBJECTIVE:Craniovertebral junction (CVJ) anomaly is challenging in kids. We review our 6year surgical experience in treating CVJ anomalies with the aim of knowing whether occipital fixation is useful.
MATERIAL-METHODS:33 kids were studied in this group (2011-2016). A retrospective review was performed. Posterior surgical approach was the norm. The follow up was taken as the latest available.
RESULTS:The study group comprised of 20 males and 12 females, with a mean age of 13 years (5 -18 years). 72% had quadriperesis, 63% axial neck pain, 28% paraesthesias, 9% torticollis and 12% had gait disturbances. Only a single child presented with urinary incontinence. The duration of symptoms ranged from 1-180 months. Trauma was the triggering factor in 34% of cases. Radiologically this cohort comprised of AAD in 84%, basilar invagination(BI) in 37%, Os odontoideum in 31%, absent C1 posterior arch in 15%. AAD with BI was the commonest anomaly. Occipito – C2 fusion was done in 59% and C1-C2 fusion in 34%. Sublaminar wiring was done in only 9% of cases and odontoidectomy in 2 cases. There was a single event of vertebral artery injury and a metal spacer slipped in another case. New onset weakness happened in 3 cases,all in C1-C2 fixation group. Follow up ranged from 1 to 7 years. Rod got extruded in a case after 2yrs and two cases expired after one year. 75% are independent, 9%require assistance and 6% has severe neck movement restriction.
CONCLUSION:CVJ anomaly is treated well with fixation – fusion and have long term good outcome. Morbidity and mortality was more in C1-C2 fixation group but neck movement restriction was a complaint in O-C2 group. Occipital fixation has less morbidity in the long term at the cost of some neck movement.

PF-095

Special Topic: Spine

Correction of severe craniocervical dislocation in children by posterior approach and fusion

Matthieu Vinchon
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OBJECTIVE:The indication for anterior or posterior approach in craniocervical junction instability (CCJI) is debated. In children in particular, postoperative spinal growth is a concern after posterior fusion, because of the fear of crankshaft effect.

In cases with CCJI, we perform posterior occipito-cervical fusion (POCF) as fist-line surgery using occipital squamma autograft. We reviewed retrospectively our experience with POCF in children over the last 15 years.
MATERIAL-METHODS:We perform reduction by external maneuvers followed by POCF using occipital squamma autograft. According to the patient's age and pathology, arthrodesis with occipito-cervical instrumentation was performed or not; after surgery the patient was immobilized by halo or minerva.
RESULTS:Fifteen patients, aged 8 months to 15 years (mean 104 months), underwent POCF for malformative disease in 14 (12 of these in a genetic context) and tumor in one, with trauma as a precipitating factor in 3.

Reduction was obtained preoperatively in 5 cases, with halo in 3 and Gardner's tong in 2, and intraoperatively in the 9 others; plate-rods were used in 11 cases; postoperatively, 4 patients were kept in halo while the 11 others were braced.

The mean postoperative follow-up was 59 months (1 months to 13 years). All patients showed satisfactory fusion. Two patients required reoperation, one postoperatively for epidural hematoma, and one five years later for cervicothoracic kyphosis. None required anterior approach.

CONCLUSION:Excellent posterior fusion is obtained using autologous occipital squamma graft; residual anterior spinal growth does not lead to clinically significant neuraxial compression.

PF-096

Special Topic: Spine

Surgical management of symptomatic paediatric vertebral haemangiomas presenting with myelopathy with long term follow up

Pankaj Kumar Singh, P Sarat Chandra, Shashank Sharad Kale, Dattaraj Parmanand Sawarkar, Satish Verma, Amandeep Kumar
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OBJECTIVE:Vertebral hemangiomas (VH) are very rare in pediatric age group. There is no published large series with long term follow up. The purpose of this study was to look for long term outcome of surgical management.
MATERIAL-METHODS:All patients up to 18 years age of VH treated at our hospital from may 2003 to august 2014 were included with follow up till august 2016. All had features of myelopathy.Patients demography, clinical details and follow up and complications were retrieved from hospital records. Functional clinical outcomes were measured using ASIA score. Mean age was 14.57 years with range of 10 years to 18 years. Mean follow up was 54.79 months with range from 25 month to 90 months.
RESULTS:There were 7 male and 7 female patients. All were located in dorsal spine with single level involvement. Upper dorsal spine involvement was more common (12 cases 85.71%) than lower dorsal spine involvement (2 case 14.29%). All patients had weakness of lower limbs with features of myelopathy, urinary bladder symptoms were present in five patients. One patient had local site pain also. All patients have improvement in power of both lower limbs. Local pain which was present in 1 patient resolved, bladder symptoms present in 5 patients
also resolved.
CONCLUSION:This is largest series on symptomatic pediatric VH with long term follow up Good postoperative results can be achieved with minimal complications. Individualization of treatment for each patient should be done with avoidance of selecting more blood loss procedures
like corpectomies.

PF-101

Special Topic: Spine

The price we pay: urological and neurological consequences of the early de-tethering cord procedures in infants

Laura Grazia Valentini[1], Giorgio Selvaggio[2], Stefania Bova[2], Alessandra Erbetta[1], Roberto Cordella[1], Elena Beretta[1], Francesca Destro[2], Federica Marinoni[2], Marika Furlanetto[1]
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OBJECTIVE:Early de-tethering cord procedures are performed to reduce the risk of neurological and urological deterioration. The objective of present study is to evaluate the urological and clinical consequences of early de-tethering cord surgical procedures in infants.
MATERIAL-METHODS:In a series of 154 patients detethered for filum and conus lipomas at FINCB, 40 children less than 24 months old at surgery were selected; all had been submitted to complete pre- and post-operative Urological and neurological assessment and to Intraoperative neurophysiological monitoring (IOM) according to anesthesia regimen. All cases of conus lipomas were reclassified according Pang's recent articles.
RESULTS:Pre-operatively, urological impairments were detected in 9 patients, and two had motor disturbances. Intraoperatively, electromyography and nerve roots mapping were recorded in all procedures. Bulbocavernosus reflex (BCR) and anal sphincter Motor Evoked Potentials were not
recorded. All children were operated following the Pang's indications and total or near-total lipoma removal was persecuted in every case. It was achieved in 84% of the surgeries. At the first follow-up, patients with pre-operative motor disturbances remained stable; 56% of patients with pre-operative urodynamic study (UDS) alterations improved, and the remaining were unchanged; 7 patients had new urodynamic impairments. Of these latter, 2 improved at the 6months follow-up, as well as 1 patient with pre-operative urodynamic impairments. The majority of patients with urodynamic impairments had chaotic lipoma (n=4) and transitional lipoma (n=3).
CONCLUSION:Early de-tethering might prevent the progression of the symptoms. IOM has some limits evaluating urodynamic functions. The reasons might be patients' age, anesthetic regimen and technical elements. Post-operatively, UDS improved in more than 50% of the patients, although it was assessed new UDS impairments but not new motor deficits. Nevertheless, the post-operative UDS impairments appear to be associated to the embryological type of lipomas, with chaotic subtypes carrying the higher risk.

Thursday, 11 October 2018
09:45 – 10:45

Platform Presentations: Vascular

PF-097

Special Topic: Vascular

Comparative Study of multimodal treatment outcome of brain AVMs in children and adults

Anna Sergeevna Brusyanskaya[1], Alexey Leonidovich Krivoshapkin[2], Kirill Yur'evich Orlov[1]
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[2]Department of Neurosurgery, European Medical Center, Moscow, Russia

OBJECTIVE:The purpose of the study was to compare the results of multimodal treatment of cerebral AVM in children and adults. It was single center non-randomized, retrospective study.
MATERIAL-METHODS:Between 2010 and 2017, 481 consecutive patients with brain AVM (411 adults and 70 children) underwent multimodal (endovascular embolization, microsurgery, SRS) treatment. The pediatric group (PG) consisted of children aged from 6 to 18 years (average 13), the adult group (AG) consisted of patients aged from 19 to 69 years (average 35).

The subtentorial localization of AVM was as follows: 8.03% of patients in AG and 18.6 of cases in PG.
RESULTS:To date, 57% of patients had been cured in PD and 55.9% in AG.

There were neurological deteriorations in three patients 4.2% of cases in PG due to treatment: one case partially and other 2 children completely recovered. Two severe patients (2.8%) with recurrent preoperative hemorrhage died after treatment in PG. In AG, complications occurred in 12.6%: 4 patients (1%) remained severely disabled (on the scale mRS 4 and> scores), 15 (3.6%) incompletely recovered (on the scale mRS from 1 to 3 points). The mortality rate was 2.7% (11patients)
CONCLUSION:In PG, hemorrhagic type was more common, as well as subtentorial localization of malformation. In PG there were fewer complications because of treatment and the recovery of the neurological deficit was better than in AG. The current multimodality treatment of brain AVM in children was as effective as in adult group and much safer.

PF-099

Special Topic: Vascular

Cranial Pial Arterio Venous Fistulae in Children - A Series of 19 cases

Leve Joseph Devarajan Sebastian, Nishchint Jain, Ajay Garg, Shailesh B Gaikwad, Nalini K Mishra
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OBJECTIVE:1.To analyze the angiographic features and their clinical correlates of cranial pial arteriovenous fistulae (CPAVF) in paediatric population.

2. To analyze the implications of clinical presentation and angioarchitecture in the management and outcome of our set of CPAVF kids.
MATERIAL-METHODS:From our Departmental neurovascular database 19 cases of paediatric CPAVF who presented during January 2005 to December 2017 were identified. Details on demographics, clinical presentation, imaging, management and follow up were obtained for each patient. Angiographic records were independently reviewed by two neuroradiologists for location, type of fistula, venous varix, arterial feeders,venous drainage,pial venous refflux, venous ectasia/stenosis/thrombosis and status of dural sinuses.
RESULTS:Of the 19 patients (Mean age 8.77yrs) 22 were males. Eight patients were less than 5 yrs at presentation. Acute intracranial bleed (9/19) was the leading presentation followed by seizures (8). Imaging showed venous varix in all of the cases with 8 of them showing wall calcification. Fresh or old bleed, focal atrophy and local edema were among other major imaging findings. DSA showed 20 fistulae (in 19 patients)- 13 single hole and 7 multihole fistulae. Venous angiopathic changes were seen in 12 cases while arterial angiopathy was seen only in one case. Dural sinus thrombosis or stenosis were seen in 12 cases. Size of the venous varix and venous wall calcification were inversely related to hemorrhagic presentation, the correlation reaching statistical significance. Seventeen patients were treated.Trans-arterial embolization was the preferred treatment modality (16/17) with good angiographic and clinical outcome in 87.5%(14/16) of patients. One patient died after embolization whereas 1 patient had permanent neurological deficit. One patient was treated by radiosurgery with good clinical outcome.
CONCLUSION:CPAVF in children have varied presentation, angioarchitecture and clinical outcome. Smaller non calcified venous varix is significantly associated with bleed. Endovascular embolization is safe and effective in the treatment of CPAVF.

PF-100

Special Topic: Vascular

Paediatric developmental venous anomalies (DVAs): a 10-year review

Adikarige Silva, Nilesh Mundil, Haren Wijesinghe, Desiderio Rodrigues, William Lo, Anthony Richard Walsh, Guirish A Solanki
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OBJECTIVE:Developmental venous anomalies (DVAs) are congenital anomalies of venous drainage and considered a low flow malformation. They are commonly associated with other vascular malformations. Studies evaluating natural history and risk factors for intracranial haemorrhage (ICH) in the paediatric population are rare. We evaluate clinico-radiological features, risk-factors and outcome of paediatric DVAs.
MATERIAL-METHODS:We conducted a retrospective review over a 10-year period. Medical records, imaging and prospective neurosurgery databases were reviewed. 303 radiological studies were evaluated.
RESULTS:52 children (20 girls and 32 boys (median age 6-years) were identified with DVAs with age distribution as follows: 1.9% neonates, 11.5% infants, 30.8% 1-5 years of age, 30.8% 5-12 years of age and 25% 12-16 years. 92.3% presented with asymptomatic DVAs. Neither age, gender or ethnicity were significant to DVA-bleeds. Half of DVAs occurred in children over 5-years. Left-sided DVA bleeds predominated (75%; $p = 0.29$).

Anatomical distribution revealed predilection for frontal region (42.3%) with the other common sites being posterior fossa (17.3%) and basal ganglia (13.5%). Temporal (11.5%), parietal (9.6%) and occipital (5.8%) were the remainder. Associated cavernomas were present in 3/52 (5.8%; $p < 0.01$) and there were no DVAs with associated aneurysms or AVMs. Relative risk of a cerebellar DVA-bleed was 5.35 fold greater with Odds ratio 6.83, 95% CI (0.8-58).

3 patients had more than one DVA. 7.7% (4/52) suffered DVA-related ICH presenting with neurological deficits. There were 3-deaths unrelated to DVAs over median follow up of 3.8 years.
CONCLUSION:Most DVAs occur frontally. DVA-haemorrhage was over 7-fold greater compared to an adult study and significantly associated with cavernomas and cerebellar bleeds.

FLASH PRESENTATIONS

Monday, 8 October 2018
10:00 – 10:35

Flash Presentations: Neuro-Oncology

FL-001

Special Topic: Neuro-Oncology

10 year surgical outcomes of paediatric brain tumour surgery in Alder Hey Children's NHS Foundation Trust

Libby Van Tonder, Dawn Hennigan, Benedetta Pettorini, Ajay Sinha, Chris Parks, Sasha Burn, Barry Pizer, Conor Mallucci
Department of Paediatric Neurosurgery, Alder Hey Children's Hospital, Liverpool, UK
OBJECTIVE:To assess morbidity and mortality related to paediatric brain tumour surgery in Alder Hey Children's NHS Foundation Trust.
MATERIAL-METHODS:Alder Hey's paediatric neurosurgery department has prospectively maintained a database of all tumour cases since 2008.

The following are recorded: demographics, source of referral (local / national / international), new diagnosis / repeat tumour surgery, initial presentation & duration of symptoms, operation date, surgical intent (complete, radical debulk, debulk, biopsy),type of surgery(including CSF diversion) surgical site, surgical outcome(including morbidity/mortality), IOMRI (in routine use since 2009) /Post op MRI usage, delayed discharge reason.
RESULTS:432 patients had 597 procedures performed over the 10 year period. 250 (58%) were male and 182(42%) female. The median length of stay was 7 days.84 patients were referred from out of catchment area (56 national and 28 international referrals).

Procedure related Morbidity: 56(9%) patients developed neurological deficits of which 28(5%) persisted to the 30 day record. 44(7%) endocrine problems were seen, of which 24(4%) persisted to 30 days (within this group 21 had craniopharyngioma, 3 had hypothalamic hamartoma). 10 seizures and 8 bleeding events were recorded. Overall there were 21 infections (3.5%).

Same day procedure-related mortality was zero. 7 mortalities were noted <30 days after tumour surgery-all related to disease progression. Post 2009, 92% of tumour resections had IOMRI.

From 2009 onwards (post IOMRI introduction), when complete resection was the surgical aim, 98% of cases achieved this aim. Our group has previously published our rate of second-look surgery (27.5%) after IOMRI when complete resection was the aim (Tejada et al 2018).

CONCLUSION:We have demonstrated that modern brain tumour related surgery should carry mortality of ~0%. Predefined surgical aims such as achieving complete tumour resection can be achieved, with adjuncts such as IOMRI, with an acceptably low added burden of new neurological deficit.

FL-002

Special Topic: Neuro-Oncology

Clinical Features of 1027 Tumors of Central Nervous System in Children: Single Institutional Report from Shanghai Xinhua Hospital, the Founding Member of CNOG

Jie Ma, Yipeng Han
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OBJECTIVE:Central nervous system (CNS) tumor is the most common solid neoplasm in children. Here we report clinical features of children with CNS tumor treated in our institute during recent 10 years.

MATERIAL-METHODS:Retrospective study was conducted in children with CNS tumor treated in Xinhua Hospital Affiliated to Shanghai Jiaotong University School of Medicine, during 2006 to 2016. Clinical data were collected. Statistical calculation was conduct for characteristic analyses.

RESULTS:Our data revealed that there were 1027 cases of CNS tumor in children, which was third surgically treated disease, following trauma and arachnoid cyst. There were 611 males and 336 females, with gender ratio of 1.81:1; age ranges were 10.22% in infants (below 1 year-old), 27.07% in toddler (1 to 3 years-old), 35.15% in preschool children (3 to 7 years-old), 26.78% in school-age children (7 to 15 years-old) and 0.78% in adolescence (over 15 years-old). According to tumor grades, 423 cases were diagnosed with low grade tumors (WHO I-II) while 367 cases were with high grade tumors (WHO III-IV); intriguing, there was no significant difference in tumor grade in age groups between early-childhood group that under 3 years-old (low:high =160:133) and late-childhood group over years-old (low:high=263:234). There were 538 supratentorial tumors and 424 subtentorial tumors. The most common tumor type was pilocytic astrocytoma (141 cases, 13.80%), followed by medulloblastoma (132 cases, 12.92%).

CONCLUSION:According to our results, the gender ratios in different age ranges were stable, with high incidence in male than in female. In different age ranges, low grade tumors were more common to high grade tumors. There were more supratentorial tumors in young children than subtentorial tumors. Pilocytic astrocytoma was most common tumor, followed by medulloblastoma. Our clinical features of pediatric CNS tumor were distinguished from previous reports, which may indicate the epidemiology characteristics between different nations.

FL-005

Special Topic: Neuro-Oncology

Medulloblastoma surgery: does molecular subgroup matter?

Andrea Carai[1], Alessandra Marongiu[1], Alessandro De Benedictis[1], Silvia Cossu[1], Franco Randi[1], Angela Mastronuzzi[2], Giovanna Stefania Colafati[3], Francesca Diomedi[4], Alessandra Savioli[5], Evelina Miele[2], Carlo Efisio Marras[1]
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[4]Pathology Department, Bambino Gesù Children's Hospital, Rome, Italy
[5]DEA-ARCO Department, Anesthesiology Unit, Bambino Gesù Children Hospital, Rome, Italy

OBJECTIVE:Maximal safe surgical resection remains the first and fundamental step in medulloblastoma treatment. Molecular characterization of medulloblastoma has evolved in recent years allowing further risk stratification and treatment allocation. However, few data are available regarding the impact of molecular subgrouping on surgical management of the disease.

MATERIAL-METHODS:We retrospectively reviewed data from 50 consecutive children treated for medulloblastoma at our Center.

All children underwent the same surgical treatment including preliminary endoscopic third ventriculostomy whenever indicated, and neuronavigate resective surgery with intraoperative neurophysiological monitoring.

Clinical data, including molecular subgrouping, were collected.

A possible correlation between preoperative clinical data and surgical variables was analyzed.

RESULTS:Hydrocephalus was extremely frequent at the time of diagnosis, prompting endoscopic third ventriculostomy. We observed a very low rate of post-operative hydrocephalus, mainly in children with additional risk factors and independently of molecular subgroup.

Pre-operative cranial nerve signs were more frequent in WNT and significantly not associated to Group 3 tumors. We were able to obtain a gross total/near total resection in about 80% of cases. Post-operative cerebellar mutism syndrome was not associated to specific molecular subgroups.

Post-operative deficits, mainly strabism, were more frequent in WNT and Group 4 tumors, namely those typically infiltrating the barinstem.

CONCLUSION:Surgical strategy did not differ significantly among subgroups. Surgical removal was more challenging for tumors infiltating the brainstem and was significantly associated to post-operative neurological impairment. This was mostly seen in WNT and Group 4 tumors, namely those with a good/intermediate prognosis.

More data is warranted to confirm the need for aggressive resection in medulloblastoma with brainstem infiltration,

FL-006

Special Topic: Neuro-Oncology

Involvement of Tumor Suppressor p53 in Medulloblastoma Subtypes: Finding Therapeutic Targets

John V Wainwright[1], Raphael Salles Scortegagna De Medeiros[2], Sidnei Epelman[2], Anubhav G Amin[1], Michael Tobias[1], Avinash Mohan[1], Chirag Gandhi[1], Meic H Schmidt[1], Nelci Zanon[3], Meena Jhanwar Uniyal[1]
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OBJECTIVE:Medulloblastoma (MB) is the most common primary pediatric malignant brain tumor, which is genetically classified into 4 groups: classic (WNT), sonic hedgehog (Shh), group 3 and group 4. Further, aberrant p53 and MYC are shown to be associated with disease progression and confer poor prognosis. This study investigates the frequency and status of p53 mutation in disease progression and metastasis. A p53-mutant MB cell line was utilized to investigate the signaling pathway leading to proliferation, migration, cell cycle, and drug resistance using a single inhibitor of HDAC and PI3K and dual inhibitor.

MATERIAL-METHODS:MB tumors (n=49) were evaluated for the expression of GLI-1, GAB-1, NPR, KV1, YAP and mutant p53 by immunohistochemistry. The effect of small molecule inhibitors such as, HDAC (LBH-589) and PI3K (BKM-120) or explore the efficacy of dual (CUDC-907). CUDC-907 was examined in functional analysis (cell proliferation, migration, cell cycle and drug resistance) and signaling pathway of AKT/mTOR in an MB cell line.

RESULTS:GAB-1 and YAP was highly expressed in the Shh group while KV1 expression was evenly distributed in all subtypes. There was no obvious correlation of the status of p53 with metastasis or disease progression. Both HDAC and PI3K inhibitors (BKM-120 and LBH589) as well as combined HDAC/PI3K inhibitor, (CUDC-907), caused a dose and time dependent inhibition of MB cell proliferation and migration. The drug resistance study revealed that the MB cells were resistant to PI3K inhibitor BKM-120. These inhibitors functions via altering components of mTOR pathway.

CONCLUSION:In conclusion, expression GLI-1, GAB-1, NPR, KV1, YAP expression and the status of p53, are important criteria for defining the subtypes of MB, and its metastatic potential. Although a significant number of MB samples displayed mutant p53, their association with the disease remains elusive. Furthermore, the use of small molecule inhibitors may be useful in treatment of MB.

FL-008

Special Topic: Neuro-Oncology

Functional connectivity of the cerebellum – A systematic review

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OBJECTIVE:Although a frequent localization of pediatric brain tumors, little is known concerning the functional connectivity of the cerebellum, compared to general knowledge about eloquent supratentorial brain areas. Considering the severe potential sequelae of cerebellar injury, e.g. postoperative cerebellar mutism syndrome (CMS), aim of the present study was to improve understanding of cerebellar function by systematically analyzing the modern data on connectivity of the cerebellum.

MATERIAL-METHODS:Following the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)" guidelines, a systematic literature search was performed for the terms "cerebellum" and "tractography". Results were manually filtered for studies on healthy humans, which provided complete connectivity information of cerebellar localization, neuronal tract and extracerebellar localization.
RESULTS:From 162 records, ultimately 25 were included in the analysis, providing magnetic resonance imaging (MRI) tractography and/or functional MRI data for 1,917 patients with an age range from 30 gestational weeks to 87 years. Fifteen studies reported sensorimotor connectivity, with the anterior and posterior cerebellar lobes, the middle and superior cerebellar peduncles (MCP, SCP) and the primary motor cortex being the main pathway. Cognitive, associative and limbic connectivity was described in 14 studies, with the posterior vermis and crus I/II, the MCP and SCP and frontal, parietal, temporal and limbic cerebral areas being the main pathways. Additionally, the dentate nucleus, pons, red nucleus, inferior olivary nucleus and thalamic nuclei are involved in these cerebro-ponto-cerebellar and cerebro-olivo-cerebellar connections.
CONCLUSION:This study provides a comprehensive analysis of the literature on functional connectivity of the cerebellum. Involvement in sensorimotor function, but also in cognitive, associative and limbic functions explains the complex and widely scattered symptoms found in CMS. In addition to the cerebellar cortex, the dentate nucleus, MCP and SCP are major posterior fossa structures involved in cerebellar connectivity, and thus might provide the key to understanding and avoiding CMS.

FL-009

Special Topic: Neuro-Oncology

Pediatric Posterior Fossa Incidentalomas: The Role of Individualized Judgment

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OBJECTIVE:Pediatric brain incidentalomas are increasingly being diagnosed. As the posterior fossa, is the location of most benign and malignant brain tumors in children, lesions in this region are of specific interest. Currently, the natural history of incidental lesions in the posterior fossa is unknown. We present our experience treating such lesions.
MATERIAL-METHODS:A retrospective chart review was carried out at our institution. All patients less than 20 years of age with an incidentally diagnosed posterior fossa lesion were included in the study. Treatment strategy, pathological results, and outcome of operated and non-operated cases were analyzed.
RESULTS:Forty-three children (17 males) with a mean age of 8.3±5.9 years were included. Indications for imaging were headaches (11, assumed to be unrelated to the lesions), seizures (5), endocrine evaluation (5), trauma (5), work up of unrelated conditions (9), and other (8). Four patients were operated immediately, and 39 followed. Eleven patients were operated due to radiological changes in size and/or characteristics 27.9±17.3 months after diagnosis. Pathology of operated cases included pilocytic astrocytomas (8), medulloblastomas (3), dermoids (2), and epidermoids (2). The average follow up of 28 non-operated patients was 47.7 months. These included 23 stable lesions, two lesions that mildly grew, and three lesions that decreased in size.
CONCLUSION:Incidentally diagnosed posterior fossa lesions in children may represent benign as well as malignant tumors. Certain lesions may be followed while others provoke surgical treatment. Individualized judgment is affected by radiological appearance, change in radiological characteristics over time, location, and symptoms.

Monday, 8 October 2018
12:40 – 12:50

Flash Presentations: Neuro-Oncology

FL-010

Special Topic: Neuro-Oncology

Retrospective analysis of the clinical characteristics, therapeutic aspects, and prognosis factors of 18 cases of childhood pineoblastoma

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OBJECTIVE:Pineoblastoma is a rare pineal gland malignant tumor, which is more common in children. This paper is to provide the possible factors that affects the survival rate for these patients
MATERIAL-METHODS:We retrospectively reviewed 18 cases of pineoblastoma in children (10 girls), including general, clinical, and therapeutic information, and factors affecting prognosis.
RESULTS:The median age of children was 51.7 months (19-156 mo). Presenting symptoms included vomiting (64.70%); headache (47.06%); weak or unsteady walking (35.29%), and nausea (29.41%). Rarer symptoms (one patient each) included limb rigidity, inability to speak, double vision, fever, and Parinaud's syndrome. Five and 13 children underwent subtotal and gross total resection, respectively; 5 and 13 children received adjuvant craniospinal irradiation therapy and chemotherapy. Two children received both craniospinal irradiation and chemotherapy. The 5-year overall survival (OS) of the patients was 27.8% (5/18). The survival rate of children older than 4 years (66.7%) was significantly higher than that of younger children (8.3%). The 5-year OS rate of boys (50.7%) was higher than that of girls (10.0%); of children who underwent gross total resection (30.8%) was higher than that of children who received subtotal resection (20.0%); and of children treated with adjuvant craniospinal irradiation (50.7%) was higher than that of those not given craniospinal irradiation (10.0%); however, in each of these 3 comparisons the differences were not significant.
CONCLUSION:Pineoblastoma is rare but often fatal, especially in children younger than 4 years. Survival rates tend to be higher in boys, children given gross total resection (rather than subtotal), and those given craniospinal irradiation.

Monday, 8 October 2018
14:50 – 15:15

Flash Parallel Presentations: Dysraphism / General

FL-014

Special Topic: Dysraphism

Correlating intraoperative monitoring data in surgery for a tethered cord with long term outcome: How close can we get?

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OBJECTIVE:To correlate the observations of intraoperative monitoring to long-term outcome in surgery for tethered cord.
MATERIAL-METHODS:The study was prospective and included 150 patients who were operated for the tethered cord (TCS) under electrophysiological monitoring, between the period March 2013 to March 2017. Their preoperative neurological, urological and orthopaedic status compared with post-operative status clinically. Intraoperative monitoring (IOM) (SSEP, MEP, and Direct stimulation) was done with XELTEK PROTEKTOR 32 IOM System. All statistical analysis was done with IBM SPSS version 19. For finding an association with categorical variables Pearson Chi-square test was used.
RESULTS:Out of 150, 18 were revision surgeries. Preoperatively, 36% had a motor deficit, 64% had normal bladder function, 30% had abnormal bowel function. The follow up ranged from 1 month to 6 years (Mean 2.2 years). During the immediate post-operative period, 89% had preserved motor function, while 81% had maintained bladder function, 94% had maintained bowel functions. On follow up none had any motor deterioration, one had bladder function deterioration, and one had bowel function deterioration. The sensitivity of IOM in predicting new neurological deficit was 95.4%. Specificity of IOM in predicting new neurological deficit was 66.7%. The positive predictive value was 97.7%, and negative being 50% with a diagnostic accuracy of 93.6%
CONCLUSION:Intraoperative monitoring is sensitive but not specific in diagnosing any neural injury during spinal dysraphism surgery. IOM has a good diagnostic accuracy. The correlation with long-term neurological outcome was very high.

FL-015

Special Topic: Dysraphism

Is Limited Dorsal Myeloschisis truly a benign form of Spinal Dysraphism as postulated??? A series of 15 cases at a Tertiary Level Hospital

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OBJECTIVE:Limited dermal myeloschisis(LDM) is a form of congenital spinal dysraphism characterized by a fibroneural stalk tethering to the underlying spinal cord and an external globular or flat lesion. The lesions are supposed to have good prognosis post detethering.

The study was conducted with an objective to study the epidemiological, clinical, radiological, therapeutic and prognostic aspects of this less known condition.

MATERIAL-METHODS:All patients of treated LDM's from 2012 January to 2018 January were evaluated and followed up prospectively.
RESULTS:Fifteen cases of LDM presented to the department. Thirteen of them underwent definitive surgery (one refused surgery). Another adult with saccular LDM had ulcerated squamous cell carcinoma over the swelling with wide spread metastasis was referred for radiotherapy.

Median age was 6 months (range 1 month - 50 years). Male: female ratio ratio was 6: 9. Lesions were classified as saccular or flat variety. There were 9 saccular and 6 flat lesions. Associations were: syrinx in six cases, one case each of meningocoele, atretic encephalocoele, dipolmyelia, diastamatomyelia and filar lipoma. Presentation was in the form of lesion at the back in most of the cases. 3 patients had lower limbs weakness. All patients underwent exploration of lesion and detethering. Biopsy was characterized by a characteristic fibro-neural stalk.

One patient of dorsal saccular variety developed hydrocephalus, one developed retethering for which he was re explored while another case of wound infection with CSF leak was managed conservatively. No deterioration of power was seen. Rest of the patients had an uneventful recovery with a normal follow-up which ranged from 6 months to 6 years.
CONCLUSION:LDM's are a distinctive clinicopathologic spinal dysraphic condition. Though most have good results post surgery, one needs to be vigilant about development of complications such as hydrocephalus (particularly in saccular variety) and rarely development of malignancies in chronically untreated lesions.

FL-016

Special Topic: Dysraphism

Expression of GST-sigma in Fetal and Pediatric Tethered Cord Filum Terminale Samples: A Comparative Study

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OBJECTIVE:Despite significant improvement in diagnosis and treatment of children with tethered cord syndrome (TCS), the pathophysiology of this rare disorder is still not elucidated. Inelastic filum terminale (FT) may contribute to the stretching of the spinal cord. The aim of this study is to investigate in children with TCS whether expression of glutathione-S-transferase relates to the elasticity of FT.
MATERIAL-METHODS:FTs of 10 children with TCS underwent histological and immunohistochemical examinations. In addition, FT samples from the 15 normal human fetuses were also examined with the same method. The results were compared. The results were compared using Chi-square test.
RESULTS:GST-sigma expression was positive in 8 (80%) of 10 FT samples obtained from the patients with TCS. But this expression was less frequent in 9 (60%) of 15 FT samples from the fetuses. The difference between the groups was not statistically significant (p=0.197).
CONCLUSION:In children with TCS, high expression of GST may be associated with decreased elasticity of FT. Large scale prospective investigations are required to clarify the mechanism of this association in TCS.

FL-017

Special Topic: Dysraphism

Congenital dermal sinus and limited dorsal myeloschisis: "spectrum disorders" of incomplete dysjunction between cutaneous and neural ectoderms

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OBJECTIVE:The existence of tethering tracts in spinal dysraphism, other than congenital dermal sinus (CDS), has been recognized and has been summated into an integrated concept of limited dorsal myeloschisis (LDM). By focusing on the pathologic features of special cases of tethering tracts, this study aimed to elucidate the underlying embryology of LDM in relation to CDS.
MATERIAL-METHODS:From an archive of operations, 389 spinal dysraphism patients who were operated on from 2010 to 2016 were retrieved and reviewed. Five patients (3 nonsaccular and 2 saccular types) who had tethering tracts composed of both CDS and LDM (or 'probable LDM' if only fibrous tissue was identified) were identified. Their clinical presentation, radiological images, operative findings, and pathology were reviewed.
RESULTS:Three nonsaccular-type patients harbored stalks in which the squamous epithelial lined sinus (CDS) was found in the distal portion, and fibroneural (LDM) or fibrous (probable LDM) tissue was present in the proximal part. Preoperatively, although radiological features were suggestive of LDM, all of the patients had skin stigmata that were not typical for an

LDM (fibrous crater) but rather for that of a CDS (tunnel-like small opening).

Two patients had saccular lesions on their backs, and a stalk was found inside the sac, connecting a small pit on the skin through a spinal defect to the spinal cord. The tracts were pathologically identical to a CDS.

CONCLUSION:This study reports the coexistence of CDS and LDM (or probable LDM) components. These cases support the hypothesis that the CDS and LDM are among a spectrum of an anomaly that is caused by failure of complete dysjunction between cutaneous and neural ectoderms. Neurosurgeons should be aware of the possibility of coexisting 'CDS' components in cases suggestive of LDM. In such cases, not only untethering but also meticulous removal of the squamous epithelium is critical.

FL-018

Special Topic: Dysraphism

Assessment of clinical, radiological, urological profile and their outcome after surgery in children with spinal dysraphism - a prospective study

Shighakolli Ramesh
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OBJECTIVE:The aim was to assess the clinical, radiological, urological profile, uro-dynamics and their outcome of surgery in children with spinal dysraphism

MATERIAL-METHODS:21 children with spinal dysraphism were treated at Virinchi hospital between January 2016 and June 2017 were studied prospectively. Mean age of children was around 11 months, 8 were males and 14 were females. Spectrum of patients was myelomeningocoele, split cord malformation, tethered cord and intra dural lipoma. The clinical profile and urodynamic study (UDS) was done preoperatively in each child. Urodynamic study included bladder compliance, capacity, instability and leak pressures. Based on clinical symptoms and UDS abnormalities patients were divided in 3 categories. Category A: Normal group- No h/o voiding or UDS abnormalities. Category B: Silent group – Asymptomatic child but evidence of bladder dysfunction on UDS. Category C. Symptomatic group – Symptomatic child with evidence of bladder dysfunction on UDS. All underwent surgery for their primary malformations with intra op neuro monitoring. Post-operatively, re-evaluation of neurological status and UDS was performed at 6–8 months

RESULTS:Of the 21 children, 6 were in category A, 9 were in category B and 6 were in category C respectively. Most common finding on UDS was detrusor-sphincter dyssynergia, detrusor over activity associated with decreased compliance of bladder. In case of leak, detrusor leak point pressure was around 40 cm of H2o which was detrimental for upper urinary tract. Urodynamic studies showed evidence of bladder dysfunction in 15 of 21 children. Postoperative urodynamic studies showed improvement in 14, status quo in 6 while deterioration was noted in 1 patient.

CONCLUSION:A pre-operative UDS helps to detect, quantify bladder dysfunction in clinically overt cases and also identifies subtle bladder dysfunction in clinically silent cases. Post operative UDS helps in detection of bladder improvement or deterioration, follow up of patients and management plan.

FL-019

Special Topic: Dysraphism

Postnatal Evaluation of Children After Open Fetal Surgery for Myelomingocele

Daniel Dante Cardeal, Hamilton Matushita
Department of Neurosurgery of Clinics Hospital of Sao Paulo University

OBJECTIVE:To analyze skin closure, ventriculoperitoneal shunt rate and postnatal complications in open surgeries for spina bifida.

MATERIAL-METHODS:25 patients underwent open fetal surgery for myelomeningocele. The inclusion criteria for surgery were the same as those used in MOMs trial. The difficulties for intraoperative skin closure were documented. In the post natal period, ventriculoperitoneal shunting rates were analyzed, as well as lower limb deformities.

RESULTS:Difficulty in closing the skin was observed in 7 cases (28%). In these cases lateral relief incisions were performed in 4 cases and implants of collagen graft in 3 cases. Hydrocephalus occurred in 5 cases (20%) and was present at birth in 3 cases (12%) and late (up to one year) in 2 cases (8%). Some degree of lower limb deformity was present in 7 cases (28%). As postnatal complications there was one case of ventricululoperitoneal ventriculitis and one death due to pulmonary complications.

CONCLUSION:Fetal treatment of myelomeningocele offers low rates of ventriculoperitoneal shunting, lower limb deformity and postnatal complications.

FL-020

Special Topic: Dysraphism

Urodynamic studies are useful for identifying neurogenic bladder in children with sacrococcygeal dimples

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OBJECTIVE:Children with sacrococcygeal dimples often undergo observation without further investigation unless they show clinical symptoms. Detecting early signs of clinical symptoms before they become irreversible is difficult. Surgical untethering of the spinal cord improves urological symptoms in only about 20-30% of patients and rarely achieves full recovery. We performed urodynamic studies in patients with both sacrococcygeal dimples and minor spinal anomalies to evaluate the presence of subclinical neurogenic bladder.
MATERIAL-METHODS:All children who were referred to us due to lumbosacral skin abnormalities were investigated using MRI. Patients with minor spinal anomalies on MRI were further assessed with urodynamic studies. Those with either an anatomical tethered cord (defined as the conus medullaris below the L2-3 intervertebral disc) or "functional tethered cord" (defined in this study as neurogenic bladder with a normal conus position) underwent surgical untethering.
RESULTS:Among the 103 children with sacrococcygeal dimples, 20 patients presented with the following types of minor spinal anomalies: 14 cases of filum lipoma, two cases of thickened filum, and four cases of anatomical tethered cord without other spinal anomalies. We encountered six cases of anatomical tethered cord (6/103 = 5.8%) and eight cases (8/103 = 7.8%) with functional tethered cord. All eight cases of functional tethered cord were associated with filum lipoma. The median age of the 20 patients at the time of their first outpatient visit was 7 months. Urological assessment revealed the presence of neurogenic bladder in 12 patients. Surgical untethering was performed without any complications in the 14 patients with either anatomical or functional tethered cord. Postoperative urological assessment revealed improved bladder function in seven of 12 patients with neurogenic bladder (58.3%).
CONCLUSION:Urodynamic studies were effective for identifying patients with subtle urological symptoms of tethered cord syndrome regardless of the conus position. Earlier surgical intervention resulted in a better urological outcome.

Monday, 8 October 2018
15:15 – 15:30

Flash Presentations: General Neurosurgery

FL-087

Special Topic: Craniofacial

Familial incidence and associated symptoms in non syndromic craniosynostosis in Japan

Takayuki Inagaki[1], Erika Yamada[2], Goichiro Tamura[1], Hirofumi Iwamoto[1], Takeshi Narushima[3], Sho Hanai[3], Kazuki Akutagawa[3], Takao Tsurubuchi[3], Ai Muroi[3]
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OBJECTIVE:It is well know that across all suture types, siblings had a greater incidence of craniosynostosis than sporadic cases. However, it is not studied thoroughly in Japan, how many familial cases exist and which suture are affected most in those cases.
MATERIAL-METHODS:We retrospectively reviewed the records of the patients. We operated 32 cases of craniosynostosis in the past three years. Eleven cases out of 32 were so called familial cases. One of the 11 cases has older brother who was operated in another institute earlier. We evaluated 6 pairs of siblings including this case.
RESULTS:Synostosis of the metopic suture was found in 5 pairs of siblings; 4 pairs showed little changes in appearance, while one had developed dolicocephaly. Sagittal synostosis was found in 1 pair of girls who had a similar elf like appearance with low set ears. Three pairs of metopic suture synostosis are boys. The other one pair of metopic suture sysostois is the combination of girl and boy. Remaining two pairs were girls. All cases except girl pair with metopic suture synostosis with dolicocephalic appearance have developmental delay in some degree at the time of surgery. None of them has chromosomal anomaly. We are conducting genetic study for the pair of sagittal synostosis cases because of slight metabolic problem including renal failure.
CONCLUSION:Familial craniosynostosis are relatively common than we previously thought. It will be important for us to conduct systematic study to evaluate the incident of familial craniosynostosis in Japan.

FL-090

Special Topic: Craniofacial

Predictors for improvement of neuropsychological examination after decompressive cranioplasty in patients with mild metopic suture synostosis associated with developmental delay

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OBJECTIVE:We have previously reported that improvement of neuropsychological tests are seen after decompressive cranioplasty in mild metopic suture synostosis associated with developmental delay. We had retrospectively analyzed our cases whether we can find a predicting factor for the improvement.
MATERIAL-METHODS:25 patients were included in this study. All children had developmental delay with a bony ridge in the middle forehead. They had underwent 4 neuropsychological examinations in 3 periods (6 or 3 months before surgery, just before surgery and 6 months after surgery). Additionally they underwent CT and MRI before and after surgery. An overnight epidural intracranial pressure (ICP) monitoring was conducted first. When raised ICP was detected, decompressive cranioplasty was performed. 11 factors, the age at surgery, first Developmental quotient (DQ) score, first PARS (Pervasive Developmental Disorders Autism Society Japan Rating Scale) score, Orbital ratio (distance between the orbit/width of the skull) measured with CT image and craniogram, mean pressure and the pulse wave in intraoperative ICP, baseline ICP and plateau waves during overnight ICP monitoring was chosen to see whether they could be a predictor for the improvement of neuropsychological examinations. The definition of improvement was defined as an improvement of the scores in 4 factors of either examinations.
RESULTS:14 out of 25 patient had shown an improvement compared before and after surgery. Within the 11 factors, only the first DQ had shown a difference statistically significantly ("p=0.005") compared with the improved group and the unimproved group. A Receiver Operating Characteristic (ROC) curve was plotted and the area under the curve (AUC) was 0.831 which is a moderate accuracy. (Cut Off value 68.5, Sensitivity78.6%,1-Specificity81.8%.)
CONCLUSION:In this study, improvement of the neuropsychological tests was seen in 14 case (56%). “At this point” among the 11 factors which was analyzed, only the initial DQ score was the predictor of improvement.

FL-091

Special Topic: Craniofacial

The surgical indication of distraction osteogenesis for craniosynostosis in our facility

Hirokatsu Osawa, Masamune Nagakura, Mihoko Kato Department of Neurosurgery, Aichi Children’s Health and Medical Center

OBJECTIVE:The standard surgical treatment for craniosynostosis would be still controversial. Distraction osteogenesis has been widely applied to various kinds of fused sutures because of less invasiveness and large skull volume gain over conventional remodeling methods. Recently, the paper of a Multi-directional Calvarial Distraction Osteogenesis (MCDO), a kind of DO, sowed the balanced volume gain and proper reshaping by vertical traction. However, appropriate surgical indication for MCDO has not been well understood.
MATERIAL-METHODS:In order to investigate the operative roles and the characteristics of MCDO & conventional DO, we evaluated 75 cases with initial craniosynostosis surgeries between 2010 and 2017 using CT scan, MRI images and chart review retrospectively.
RESULTS:Comparing with 35 cases before 2013 (F) and 40 cases since 2014 (P), the percentage of conventional DO and conventional remodeling decreased slightly, on the other hand, only MCDO increased from three (9%) to ten (25%) cases, especially for sagittal or bilateral coronal synostosis. In the MCDO, the number of cases with sagittal related fusion was one in the F period and five in the P period. The median age at the operation and preoperative cephalic index operated by the MCDO for sagittal synostosis were 22.5months & 89.4 in the conventional DO and 57 months & 84.6. On the basis of CT scan data, the change of postoperative cephalic index in the MCDO was smaller than in the conventional DO though the average surgical duration was 110 minutes longer.
CONCLUSION:In this study, MCDO had the benefits to gain smooth skull surface as well as large skull volume, thus we tended to apply the technique for more cases with anterior part of craniosynostosis and without severe asymmetric deformities. However, long term follow-up study would be needed to decide surgical indication and roles of MCDO as one of DO methods.

FL-107

Special Topic: Spine

A study on the management of the pediatric syringomyelia associated with craniocervical junction diseases

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OBJECTIVE:The purpose of this study is to assess natural histories and surgical outcomes of pediatric syringomyelia, which can be highly influenced with immaturity, vulnerability, and deformity of children’s developing spine.

MATERIAL-METHODS:Clinical data were retrospectively collected on 20 patients of pediatric syringomyelia associated with craniocervical lesions who were followed in Chiba Children's Hospital from 2009 to 2016. The radiological features of the syringomyelia were also examined with regard to its size and location on MRI sagittal and axial sections. Syrinx was classified based on its size and morphological pattern.
RESULTS:The etiology of syrinx were Chiari type 1 malformation (11 patients), Chiari type 2 malformation (four patients), and miscellaneous conditions (five patients). Thirteen large syrinx and seven small syrinx were identified. Six of 13 large syrinx cavities showed asymmetrical pattern on axial MR imaging, while none of seven small syrinx cavities showed such extension pattern. All of six patients (100%) with large syrinx with asymmetrical pattern had segmental neurological signs or scoliosis, whereas six of 12 patients (50%) with symmetrical pattern remained asymptomatic. Surgeries were performed on 12 patients, including 10 decompressions at craniocervical junction. Of 12 patients who underwent surgical interventions, nine obtained syrinx deflation, however, two showed the regrowth of syrinx. Among eight patients who were conservatively managed, four showed the spontaneous resolutions, three stayed asymptomatically stable. Eleven patients developed scoliosis. One underwent surgical correction and stabilization, and three wore corrective spinal orthoses, and the rest only require observation.
CONCLUSION:Syrinx size or morphological pattern of the cavity on axial MR imaging can play an important role on the symptomatology and the management strategy for pediatric syringomyelia. Especially, large and asymmetrical syrinx should be treated actively.

Monday, 8 October 2018
14:50 – 15:30

Flash Parallel Presentations: Hydrocephalus

FL-022

Special Topic: Hydrocephalus

Laparoscopic revision of ventriculoperitoneal shunts in pediatric patients may result in fewer subsequent peritoneal revisions

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OBJECTIVE:Ventriculoperitoneal shunts (VPS) are the mainstay of treatment of hydrocephalus but frequently need revision. We sought to directly compare the impact of laparoscopic peritoneal shunt revision on the need for subsequent VPS revisions in pediatric patients.
MATERIAL-METHODS:A prospectively maintained, externally validated database of pediatric patients who underwent a first peritoneal VPS revision at a single center between 2008 and 2016 was reviewed. Outcomes including subsequent revisions, shunt infections, operative time, and hospital stay between open and laparoscopic groups were compared.
RESULTS:148 patients underwent a first peritoneal VPS revision during the time period – 40 laparoscopically and 108 open – with no significant difference in age or gender between the groups. Operative time, length of stay after shunt revision, and shunt infection rates did not vary between laparoscopic versus open revisions. There was no significant difference between need for subsequent overall (peritoneal or ventricular) shunt revisions in the laparoscopic (20%) versus the open group (34%), p=0.07. However, there were significantly fewer frequent peritoneal revisions in the laparoscopic group (3% versus 15%, p=0.04).
CONCLUSION:This first cohort analysis of laparoscopic versus open VPS revision in pediatric patients suggests that laparoscopic peritoneal VPS revision may reduce the rate of subsequent peritoneal revisions without increasing shunt infections or operative time in pediatric patients.

FL-023

Special Topic: Hydrocephalus

Measuring Maximum Head Circumference within the Picture Archiving and Communication System. A Fully Automatic Approach

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OBJECTIVE:Like height and weight, head circumference (HC) is a standard measurement in patients two years of age

or less. Making an accurate HC measurement can be difficult with an uncooperative infant/child. Knowing the HC is useful to neuroradiologists in evaluation MRI/CT scans. Presented is a fully automated method to accurately determine HC from MRI/CT images.
MATERIAL-METHODS:Using artificial intelligence and staying completely within the picture archiving and communication system (PACS) we have developed a method to automatically measure the maximum HC even with abnormally shaped heads (Figure. 1). These HC measurements were then compare with those obtained with a standard measuring tape. The process was run in 50 randomly selected patients.
RESULTS:A 98% of accuracy was found between the HC measures performed with the automatic instrument and the results yielded by manual assessments. Figure 2 depicts the rigor of the automatic method in a Nellhauss plot.
CONCLUSION:Accurate HC can be automatically determined from MRI/CT images staying within PACS and be routinely make part of the report.

FL-024

Special Topic: Hydrocephalus

Non-invasive assessment of intracranial pressure (ICP) and ventricular size using combined ultrasound determination of Optic Nerve Sheath Diameter (ONSD) and Third Ventricle Diameter (TVD) in children

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OBJECTIVE:In pediatric neurosurgery many pathologies are associated with increased intracranial pressure (ICP), as for example hydrocephalus, pseudotumor cerebri (PTC), tumors or edema. Non-invasive diagnostics to assess ICP and ventricular size to differentiate between hydrocephalus and other entities, facilitate diagnostics and avoid radiation exposure, anesthesia or imaging. This study investigates the combined use of ultrasound ONSD and TVD to assess ICP and ventricular size in the clinical management of pediatric patients.
MATERIAL-METHODS:This prospective study includes 95 patients (median 7 years) diagnosed with hydrocephalus (53%), PTC (22%), tumor (8%) and other intracranial pathologies (17%). Binocular ONSD was measured transorbitally using a 12MHz linear probe. TVD was quantified transtemporally using a phased-array 1-4MHz transducer. All measurements were done with patient in supine position
RESULTS:35 patients presented increased ONSD (mean 5.9 ±0.6mm) and TVD (mean 7.86±5.86mm) suggesting hydrocephalus or shunt/ETV failure and underwent appropriate therapy with or without further imaging. In 18 ONSD was increased (5.9±0.6mm) while TVD (3.97±2.39mm) was only marginally elevated. In these cases further diagnostic procedures were recommended, e.g. to prove/rule out PTC. 44 patients presented with normal ONSD (4.98±0.6mm) and normal to marginally increased TVD (4.25±3.58mm). Watch-and-wait was performed and none needed an intervention up to now. In 23 TVD was measured in FU after hydrocephalus therapy and in 10 without intervention. The relative difference was higher in patients with therapy (31 ± 19.7%) than without (4.8± 4.2%), $p<0.001$. A TVD change of > 7.65% was highly sensitive and specific for true and relevant ventricle enlargement (sensitivity 90.5%, specificity 87.5%, AUROC 0.939, OR 57).
CONCLUSION:Transorbital ONSD is a reliable method to assess ICP and can be combined with transtemporal TVD for identification of possible ventricular enlargement. Changes of ONSD/TVD over time can be used for diagnosis of clinically relevant development of ICP increase and/or ventricular enlargements in pediatric patients.

FL-025

Special Topic: Hydrocephalus

Modulation of choroid plexus immuno-secretory function to restore cerebrospinal fluid homeostasis in post-infectious hydrocephalus

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OBJECTIVE:Hydrocephalus is often a fatal disease in developing countries due to a lack of access to neurosurgical care. Recent data has challenged dogma by showing intraventricular hemorrhage (IVH) triggers inflammation-dependent CSF

hypersecretion from the choroid plexus (CP) to cause acute post-hemorrhagic hydrocephalus (PHH), and this can be prevented by FDA-approved drugs targeting Toll-like receptor-4 (TLR4) or SPAK kinase. Like PHH, post-infectious hydrocephalus (PIH) exhibits non-obstructive ventriculomegaly, CP inflammation, and a positive response to endoscopic choroid plexus cauterization. LPS, the canonical TLR4 ligand, is a component of many PIH-causing bacteria. We hypothesized that PHH/PIH share a common pathogenic mechanism of TLR4-SPAK-dependent CSF hypersecretion.
MATERIAL-METHODS:We developed a novel rat model of PIH via the continuous intracerebroventricular infusion of LPS. In vivo CSF secretion measurements and MRI imaging evaluated the impact of LPS on CSF dynamics. RNAseq and LC-MS/MS phospho-proteomics assessed changes in the CPe transcriptome/phospho-proteome in response to IVH and LPS. Immunoblotting evaluated LPS-induced changes in the functional expression of specific TLR4- and SPAK-kinase-associated molecules in the CPe.
RESULTS:ICV-LPS infusion triggered a striking increase in CSF secretion (~3.5-fold; $p<0.01$) and ventriculomegaly (>300%; $p<0.01$). IVH and LPS induced a shared signature of TLR4-dependent signal transduction mediators and SPAK-regulated ion transporters in the CPe. LPS stimulated the activating phosphorylation of TLR4-NF-kB-mediated SPAK-NKCC1 ion-transport pathways to a greater extent than even IVH (>450%; $p<0.01$).
CONCLUSION:IVH metabolites and bacteria-derived LPS similarly promote TLR4-NF-kB-dependent CSF hypersecretion and acute hydrocephalus via up-regulation of a SPAK-regulated network of ion transporters in the inflamed CP. Instead of being classified as "secondary" forms of hydrocephalus, PHH/PIH may be better termed "inflammatory hydrocephalus" to highlight disease mechanisms and therapeutic vulnerabilities. Non-surgical modulation of CP immunosecretory function with repurposed FDA approved drugs targeting TLR4 or SPAK could create a breakthrough for health systems with resource limitations.

FL-026

Special Topic: Hydrocephalus

Health state and daily living level in patients treated with ETV for shunt removal

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OBJECTIVE:In children with shunt-dependent hydrocephalus, ETV is sometimes effective for conversion into shunt independency. However, definite increasing in size of the ventricle and thinning of the brain mantle is sometimes demonstrated compared to those in shunted state. Therefore, pediatric neurosurgeons concern about future self-reliance in life and social activity. The aim of this study is to know health state and daily living level in patients completed ETV with shunt removal after they grow up.
MATERIAL-METHODS:Retrospective review was conducted in a cohort of 12 patients performed follow-up investigations for more than ten years (av. 15.2 year) after a point of time wherein the patients were converted into shunt independency. As evaluation methods for health states, employment and schoolwork situation, 'IADL' by Lawton&Brody and 'EQ-5D' were selected. In addition, administered annual MRI was evaluated.
RESULTS:Seven patients with any complicated neurological deficits did not get full marks in EQ5D. EQ-5D is a standardized instrument for use as a measure of health state, designed for self-completion by respondents. Among those seven, three could not be the worker with satisfactory level and get a full score in IADL known as an instrument to assess independent living skills. MRI demonstrated some kind of brain anomalies, damages or tissue defects in those three patients. However, Evans index (EI) and FOHR at last follow-up point were definitely above the standard level (minimum score: 0.29 in EI and 0.42 in FOHR) in all cases.
CONCLUSION:Acceptable daily living level can be expected even in patients with large ventricle after shunt removal. Good in health states and daily living level is affected by the presence of complicated brain damages or dysplasia

FL-027

Special Topic: Hydrocephalus

Efficacy and Safety of Ventricular Lavage Therapy for Post Intraventricular Hemorrhagic Hydrocephalus in Low Birth Weight Infants

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OBJECTIVE:The management of post intraventricular hemorrhagic hydrocephalus (PIVHH) in very and extremely low birth weight infants (LBWIs) is challenging and controversial. We tried to remove out bloody cerebrospinal fluid via external ventricular drainage (EVD) combined with urokinase (UK) injection into lateral ventricle, called "Ventricular Lavage (VL) therapy" from the early stage of disease. The aim of this

study was to evaluate safety and efficacy of our unique therapy with presenting illustrative cases.
MATERIAL-METHODS:In total 38 consecutive LBWls with PIVHH (IVH grade 3: 16 cases, IVH grade 4: 22 cases) were analyzed. The majority of infants was extremely LBWls (<1000g birth weight at birth). We conducted early EVD management in 20 cases and additionally performed VL therapy in 16 cases. On the other hand, according to the judgment of neonatologists, treatment was delayed in 18 cases.
RESULTS:Thirteen of the sixteen extremely LBWls who underwent VL therapy did not require V-P shunt surgery. And there were no serious complications associated with VL therapy including secondary hemorrhage and infection. In most of eighteen patients treated in the late stage, permanent shunt placement was necessary, and serious shunt related complications occurred frequently. We defined their neurological outcomes were good, if self-walking, verbal communication and self-feeding were satisfactory at 36 month-old. Nine of eleven cases in the early treatment group and six of twelve cases in the late treatment group were good clinical results. Surprisingly, despite the majority of severe IVH grade 4, the early treatment group was significantly better.
CONCLUSION:Permanent shunt surgery was dramatically reduced compared with the late treatment group. Continuous reducing intracranial pressure, acceleration clot dissolution and prevention of fibrin adhesion could reduce not only the shunt dependency rate but the white matter damage.

FL-028

Special Topic: Hydrocephalus

Characterization of a Novel Rat Model of X-linked Hydrocephalus by CRISPR-mediated Mutation in L1cam

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OBJECTIVE:Emergence of the CRISPR/Cas9 genome editing technology provides a robust method for gene targeting in a variety of cell types including fertilized rat embryos. We used this method to generate a rat model of congenital hydrocephalus. The object of this study was to use the CRISPR/Cas9 system to knockout the L1cam gene to create a rat model of X-linked hydrocephalus (XLH).
MATERIAL-METHODS:We injected two guide RNAs, designed to disrupt exon 4 of the L1cam gene on the X chromosome, into Sprague Dawley rat embryos. Following embryo transfer into pseudopregnant females, rats were born and sequenced for evidence of L1cam mutation. The mutant and control wild-type rats were monitored for their growth and the XLH phenotypes. Their macro- and micro-brain structures were also studied with T2-weighted MRI, diffusion tensor imaging (DTI), immunohistochemistry, and transmission electron microscopy (TEM).
RESULTS:We successfully obtained two independent L1cam knockout alleles and one missense mutant allele. Hemizygous male mutants from all three alleles developed ventriculomegaly and delayed development. Significant reductions in fractional anisotropy and axial diffusivity were observed in the corpus callosum, external capsule, and internal capsule at 3 months of age. The mutant rats did not show reactive gliosis by then but exhibited hypomyelination and increased extracellular fluid in the corpus callosum.
CONCLUSION:The CRISPR/Cas9-mediated genome editing system can be harnessed to efficiently disrupt the L1cam gene in rats for creation of a larger XLH animal model. This study provides evidence that the early pathology of the periventricular white matter tracts in congenital hydrocephalus can be detected in DTI. Furthermore, TEM-based morphometric analysis of the corpus callosum sheds new light on the underlying cytopathological changes accompanying hydrocephalus-derived variations in DTI. The CRISPR/Cas9 system offers opportunities to explore novel surgical and imaging techniques on larger mammalian models.

FL-029

Special Topic: Hydrocephalus

Personalisation of treatment syndrome of hydrocephalus at prematurely born with intraventricular haemorrhage (22 years' experience)

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OBJECTIVE:Premature newborns constitute a high-risk group for intraventricular hemorrhage (IVH). One of the main complications of IVH is the development of the syndrome of hydrocephalus (GC).

The purpose of the real research is generalization results of 22 years of experience in treatment of GC at IVH among premature newborns.
MATERIAL-METHODS:634 newborns with severe forms of IVH 2-3 degrees. (ICD -10), to become complicated GC were an object of a research. All children were on treatment in intensive care unit of newborns and Neonatal pathology unit of children's municipal hospital № 1 of St. Petersburg during the period from 1995 to 2017.

From 1995 to 2013 at 404 children "VV" the protocol was used ("V1" – ventriculosubgaleal drainage, "V2" – VP shunting). Since 2014 till present at 230 children "LVV" the act is applied ("L" - lumbar punctures, "V1" – ventriculosubgaleal drainage, "V2" – VPS).
RESULTS:Results and discussion. When using "VV" of the act stabilization of hydrocephaly is reached in 25% of cases; the need of carrying out VP shunting in 75%. The use of the "LVV" of the act has improved the result of stabilization of hydrocephaly in 55%, and the necessity of shunting was in 45%. Complications: migration of a catheter – 1%, an infection – 1,5%, catheter occlusion - 2%, "sticking" of a subgaleal pocket – 4%.
CONCLUSION:Among premature newborns with IVH application of VSD the receptacle catheter is an appropriate way of treatment of the progressing post-hemorrhagic hydrocephalus, however insufficiently effective concerning post-hemorrhagic hydrocephaly (the need of shunting – 75%).

The personalized application tactics of the lumbar punctures and VSD the receptacle catheter in the conditions of ultrasonic monitoring allows not only to neutralize a hydrocephalic syndrome, but also to reduce the risk of development of the progressing post-hemorrhagic hydrocephaly (the need of shunting - 45%).

FL-030

Special Topic: Hydrocephalus

Ventriculoperitoneal shunt infection rates using a standard surgical technique including intraventricular vancomycin: The Children's Hospital Oakland experience

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OBJECTIVE:Ventriculoperitoneal (VP) shunt infections are a common complication after shunt insertion. Despite intravenous antibiotics, the incidence remains unacceptably high. Many pediatric neurosurgeons use antibiotic-impregnated catheters (AICs); however, they remain costly. Another method of infection prophylaxis is the use of intraventricular (IVT) antibiotics, which has been shown to reduce shunt infections in adults. We describe our single-institution experience with prophylactic IVT vancomycin administration and a strict sterilization protocol and explore its effect on the incidence of shunt infections in children.
MATERIAL-METHODS:Two hundred fourty-seven patients undergoing consecutive VP shunt procedures between 2008 and 2016 were included in this study. Patients were excluded if age at insertion was less than 1 or greater than 18 years. Shunts were performed at a single institution using standard surgical technique including sterilization with soap, chlorhexidine, and betadine, as well as the use of intraventricular vancomycin, antibiotic irrigation, intravenous antibiotics, and antimicrobial suture for galeal closure. No AICs were used. Clinical data were retrospectively collected from the electronic health record.
RESULTS:Over the 9-year study period, 685 VP shunt procedures met inclusion criteria, with 12 total infections (incidence 1.75% per procedure). Six infections were caused by Staphyloccocus species, including 1 S. aureus and 5 coagulase-negative Staphylococcus infections. The remaining 6 infections were caused by gram-negative (4) and gram-positive (2) bacilli. All patients received the standard operative technique with IVT vancomycin and without AICs.
CONCLUSION:Using a simple surgical technique of a standardized sterilization protocol as well as IVT vancomycin, antibiotic irrigation, antimicrobial sutures, and intra- and post-operative intravenous antibiotics, we limited infections to 1.75% of shunt procedures. This compares favorably with the published literature in which infection rates vary between 1 and 15% (including with AICs). This regimen reduces the VP shunt infection rates to those of AICs without the additional cost.

FL-031

Special Topic: Hydrocephalus

Clinical profiles of trapped ventricles and their management strategy: A review of 31 cases

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OBJECTIVE:To study clinical profile of children with trapped ventricles /isolated ventricles/multi septate hydrocephalus, and the strategising the management options and outcomes.
MATERIAL-METHODS:This is a retrospective study of 31 patients managed in our institute during last 9 years. We categorized children into groups based on ventricle involved and etiology of trapped ventricle. Based on ventricles involved they are categorised into isolated lateral ventricles, isolated temporal horn/ third ventricle /fourth ventricle and multi septate hydrocephalus. On etiology they are categorized into congenital, post-surgical and post infectious.Surgery was tailored according to the pathology and location. NeuroEndoscope and Neuronavigation were used in all cases.

RESULTS:Anatomically categorised:-Isolated lateral ventricle -9,Isolated temporal horns-5,Trapped 4th ventricle -3,Trapped 3rd ventricle -1

Multi septate hydrocephalus -13.

Based on aetiology:-Congenital:5, Infectious:16, Post surgery:10 patients

Procedures:-All 9 patients with trapped frontal horn underwent endoscopic septostomy along with other CSF diversionary procedure (ETV in 6 patients and VPshunt in other three).

Isolated temporal horn in 5patients -3children underwent VPshunt & in2 patients endoscopic ventriculo cisternostomy was done under neuronaviagtion guidance.

Of the two patients with trapped 4th ventricle,fenestration of 4th ventricle and placement of ventriculo-ventricular stent was placed in1 and in 1 Aqueductoplasty and 4th ventriculoperitoneal shunt placement was done.

All 13 children with multiseptate hydrocephalus underwent Intra ventricular endoscopic septostomy and csf diversionary procedure.7 of these children required repeat procedures.

Navigation was used widely in all these cases for guiding the fenestration.

CONCLUSION:Infection and post-surgery is major cause of development of trapped ventricle and multiseptate hydrocephalus. Establishment of communication between trapped ventricle and ventricular system is key in management of trapped ventricles. Presence of Endoscopy (rigid, flexible and video) neuronavigation in armentarium had made management simpler and easier and thus obviating the need for multiple shunt placements

FL-032

Special Topic: Hydrocephalus

A Twelve Year Experience Treating Cranial Deformity after CSF Shunting in Cases of Extreme Neonatal Hydrocephalic Macrocranium with a Novel Early Postnatal Cranial Vault Reduction and Fixation Operation

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OBJECTIVE:Infants with severe hydrocephalus and extreme macrocephaly typically undergo CSF diversion early in life, which can result in significant cranial deformity. The authors have previously described a technique for early postnatal cranial vault reduction and fixation (CVRF), in which the calvarial bones are stabilized using absorbable fixation plates in the neonatal period, in an attempt to facilitate patient positioning, simplify hydrocephalus management, and improve cosmesis. Here, the authors describe their institutional experience managing patient with extreme neonatal hydrocephalus with CSF diversion, with and without CVRF, over the past 12 years.

MATERIAL-METHODS:The authors retrospectively reviewed the charts of infants with extreme hydrocephalus (head circumference > 49 cm) treated at their children's hospital with ventriculoperitoneal shunting, with or without CVRF, between 2005 and 2017. Clinical and developmental data, combined with photographic imaging, were used to determine outcome.

RESULTS:Eleven patients with extreme neonatal hydrocephalus (> 49-cm head circumference) underwent CSF shunting; 5 underwent shunting alone and 6 patients underwent shunting and CVRF. For patients who underwent shunting and CVRF, the median age at CVRF was 6 days and median interval between shunt placement and CVRF was 2.5 days. The mean extent of calvarial vault volume reduction was 44.5% (± 3.9). Of the 5 patients who underwent shunting alone, 3 developed severe cranial deformities. Of 6 patients who underwent shunting and CVRF, 1 had a poor cosmetic outcome. In the shunting-alone group, 2 patients died and 1 required extensive cranial vault correction at 10 years of age. One patient in the shunting and CVRF group also died.

CONCLUSION:CVRF in combination with CSF shunting in the neonatal period can simplify the treatment of the rare case of severe hydrocephalic macrocephaly and lead to cosmetic outcomes that are considered good by their families

FL-033

Special Topic: Hydrocephalus

Ventriculoperitoneal shunt valve pressure adjustments in hydrocephalic infants below the age of six months according to head circumferences and transfontanelle ultrasonography measurements

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OBJECTIVE:Ventriculoperitonal shunt (VP-Shunt) is the standard hydrocephalus treatment in newborns. However, there are still controversial debates concerning the right time of insertion and which type of VP-Shunt system should be used in developing children. Therefore, we observed hydrocephalic infants with VP-Shunt and performed valve pressure adjustments in order to avoid macro- or microcephaly and consequently disturbance during brain development.
MATERIAL-METHODS:We included 31 hydrocephalic children in a 3 years period between 2014 and 2017. All children were implanted with the proGAV VP-Shunt with adjustable valve pressure system. Prospective head circumferences (HC) and transfontanelle ultrasonographic (TU) ventricular size measurements were performed with follow-up amounted between 10 days and 2 month. Valve pressure lower adjustments were done when HC exceeded the 90th percentile and higher adjustments when HC was lower than the 10th percentile. Outcomes of children with post intraventricular haemorrhage hydrocephalus (pIVHH), and mature children with congenital or acquired hydrocephalus (non intraventricular haemorrhage hydrocephalus; nIVHH) were analysed separately.
RESULTS:Most children (n=23, 74%) needed valve pressure adjustments to maintain a normal head growth. Children with pIVHH (n=13) needed more valve pressure adjustments (3 versus 1.5 per children), had higher rate of shunt infections (61% versus 39%) and revisions (4.5 versus 2) comparing to nIVHH (n=18). Overall, 90% of all children had HC percentile improved (45% improvement; 45 % stabilisation and 10% degradation of HC).
CONCLUSION:These results indicate that using a permanent proGAV valves presents the advantage of adjusting pressure as needed to efficiently manage hydrocephalus in children regardless aetiologies.

FL-034

Special Topic: Hydrocephalus

Transseptal implantation of a ventricular catheter in ventriculoperitoneal shunting in children

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OBJECTIVE:The aim of the work is to reduce the risk of ventricular catheter (VC) dysfunction in the treatment of hydrocephalus in children by ventrikuloperitoneal shunting (VPS).
MATERIAL-METHODS:In the period from 1995 to 2015 in the children's city hospital №1 in St. Petersburg conducted 768 operations of VPS children about progressive hydrocephalus. Children are divided into 2 groups. In both groups, VC was injected into the anterior horn of the lateral ventricle by occipital access under the control of intraoperative ultrasonography (US). Patients of these groups differed only in the spatial arrangement of VC. In children of group 1 (n=420), the standard technology of VPS was used and VC was located in the anterior horn of the homolateral lateral ventricle. In children of group 2 (n=348), VC was injected into the anterior horn of the contralateral lateral ventricle. Catheter perforation of the interventricular septum (IS) was performed in the back of her departments. The principal feature of the technology of "transseptal VPS" is the impossibility of contact holes proximal end of the VC with the vascular plexus and ependyma in the early postoperative period and reduce the risk of their contact as the child grows. This is due to the fact that when transseptal implantation of VC is "suspended" on the IS and can not shift to the vascular plexus
RESULTS:In 1 group revision of in 71 patients (16.9 percent), and the vast majority of them (63 cases, 89.7%) of the reason for the audit was occlusion VK choroid plexus and/or ependymal scar tissue. In 2 group of children occlusion of VC was noted in 25 patients, which amounted to 7 percent of cases (catamnesis from 2 to 10 years). When carrying out transseptal implantation of a VC in children is required an ultrasound (US) navigation, which allows real-time visualization of all the stages of the VC displacement in the cranial cavity. Minimally invasive method of imaging the postoperative stages, monitoring of the adequacy of the functioning of the VPS and the location of VK is transcranial US.
CONCLUSION:The obtained results indicate the prospects of using transseptal implantation of VC during VPS in children of different age groups, reducing the risk of development of VPS dysfunction.

Tuesday, 9 October 2018
09:45 – 10:10

Flash Presentations: Chiari

FL-035

Special Topic: Chiari Malformation

Can the posterior fossa volume be a predictor of surgical success in Chiari I?

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OBJECTIVE:To assess whether the posterior fossa volume (PFV) could predict the likelihood of requiring further surgery after foramen magnum decompression (FMD) in clinically relevant Chiari I malformation (C1M).
MATERIAL-METHODS:A retrospective study was carried out at Great Ormond Street Hospital, London, comparing all failures (F) (16 out of 150) from the neurosurgery departmental database with 22 successfully treated patients (S). Failure was defined as the need for further surgery after primary FMD. Pre-operative and post-operative scans of all patients were processed to extract PFV and intracranial volume (ICV) using manual segmentation on OsiriX®. For F, post-operative processing was performed after the first and final surgical procedures. PFV/ICV ratio was calculated to account for varying head sizes. Age and ICV matched normal controls were obtained for both groups.
RESULTS:Group F patients were found to be younger than those in group S at the time of first procedure (S: 10.9±4.6, F: 5.9±5.4, p= 0.006), but both groups were of similar age at the time of final procedure (S: 10.9±4.6, F: 8.4±5.3, p=0.186). Initial PFV of group F was smaller than that of group S (PFVS =153±15cm3, PFVF = 130±34cm3, p=0.041) and both were smaller than their respective age-matched controls (164±20cm3 and 174±9cm3, p<0.05). After the final procedure, no significant difference was present in PFV between groups F and S (PFVS = 160±16cm3, PFVF = 156±30cm3, p=0.621), although PFV in both groups was smaller than age-matched controls (174±9cm3, p<0.05).
CONCLUSION:Regardless of age, C1M patients have a smaller PFV. Successful FMD increases this PFV but it remains smaller than age-matched controls. PFV in failures is smaller than in successfully treated C1M patients, but this group was younger, making age more likely to be a predictive factor for C1M patient re-operation. This could impact the way younger patients are currently managed.

FL-036

Special Topic: Chiari Malformation

Complex Pediatric Chiari Malformation – Is Fixation Necessary?

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OBJECTIVE:Chiari malformation Type I (CM-I) is a congenital anomaly often treated by decompressive surgery. Some of them may be associated with complex anomalies of the craniovertebral junction and brainstem compression, requiring reduction and occipitocervical fusion. We try to define specific radiographic risk factors that may help in predicting the need of occipitocervical fusion.
MATERIAL-METHODS:A retrospective review was conducted of clinical and radiographic data in pediatric patients undergoing surgery for CM-I between 2014 and 2017. Patients who had clinical or radiological features of brainstem compression were included. The following radiographic criteria were identified: tonsillar descent, syringomyelia, craniocervical angulation, odontoid retroflexion and ventral brainstem compression (pBC2). Statistical analysis was used to determine the independent association between occipitocervical fusion and each variable.
RESULTS:Patients were divided into two groups – A: underwent posterior fixation with bony decompression with/without transoral decompression (n=8), B: underwent foramen magnum decompression with/without subpial resection of tonsils (n=11). Mean age at surgery was 12.8 years, follow up was 32 months in Group A, whereas it was 13.5 years and 23 months respectively in Group B. Factors demonstrating a significantly increased risk of requiring fusion were craniocervical angulation and ventral brainstem compression.
CONCLUSION:A subset of patients with Chiari malformation, with ventral brainstem compression and decreased craniocervical angulation might benefit with occipitocervical fixation. These indices must be carefully examined in the preoperative MRI images and appropriate treatment offered to the patients.

FL-037

Special Topic: Chiari Malformation

Treatment Failure of Syringomyelia Associated with Chiari I Malformation Following Foramen Magnum Decompression: How Should We Proceed?

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OBJECTIVE:The natural history of Chiari I (CMI)-associated-syringomyelia following foramen magnum decompression (FMD) is not fully defined. The preferred treatment of patients with persistent, recurrent, or progressive syringomyelia after FMD is controversial, and may include: redo FMD, stabilization, or shunting procedures (such as syringopleural or syringo-subarachnoid shunts). We describe the natural history of this phenomenon, and treatment modalities for these patients.
MATERIAL-METHODS:We retrospectively collected data of CMI patients with persistent, recurrent, or progressive syringomyelia after FMD. In addition to baseline characteristics, surgical treatments, and neurological and radiological outcome were assessed.
RESULTS:Between 1998 and 2017, 48 consecutive patients (35 females (72.9%), average age 16.8 ± 11.5 years) underwent FMD for a syringomyelia-Chiari complex. Twenty-four patients (50%) underwent surgical treatment for a persistent (n=10), progressive (n=12), or recurrent (n=2) syringomyelia 21.4 ± 27.9 months, (median 14.6 months, range 12 days – 134.9 months) after FMD. Two patients (8.3%) underwent redo FMD, 18 (75%) underwent 19 syringo-subarachnoid-shunts, and 4 (16.7%) had 6 cranial CSF diversion procedures. Overall follow up time was 40.1 ± 47.4 months (median 25 months, range 3 months – 230 months).
CONCLUSION:Based on our results, 50% of the patients undergoing FMD for syringomyelia-Chiari complex may require further surgical treatment due to persistent, progressive, or recurrent syringomyelia. Treatment should be tailored to the suspected underlying pathology. A subgroup of patients may be managed conservatively; however, these patients need close clinical and radiological follow up.

FL-038

Special Topic: Chiari Malformation

Bony decompression for Chiari malformation type 1/1.5—an institutional case series

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OBJECTIVE:Singhal et a.l (3/2018) recently evaluated a shift in the management of Chiari(CH) 1 to less invasive surgical approaches. Meanwhile, other studies implied decompression with duroplasty more effective compared to pure bony removal. We review our case series of CH 1/1.5 treated with bony decompression.
MATERIAL-METHODS:Patients who received suboccipital craniectomy and C1-laminectomy for CH 1 or 1.5 (2015 to 1/2018) were reviewed. Their records were analyzed regarding clinical symptomatology, neurological status, polysomnography (PSG), electrophysiology. Pre- and post-surgical MRI were reviewed for cerebellar tonsilar herniation, syringomyelia, pre-syrinx-state. Foramen magnum decompression was performed measuring 3 – 4 cm wide and 3 – 4 cm above the foramen plus C1-laminectomy. The dural band was released. The superficial dural layer was split. Decompression was evaluated by intraoperative ultrasound.
RESULTS:23 patients were included (CH 1.5 n = 9). Mean age at surgery 13 y ± 7 (13 male, 10 female). Pre-operative mean tonsillar herniation: 15.47 ± 7.29 mm. Symptoms included sleep apnea, suboccipital headaches, positively related with vasalva maneuver, etc. No patient had papilledema. 5 presented with scoliosis, 13 with syringomyelia, one with pre-syrinx state. In 14 cases surgery resulted in resolution or improvement of clinical symptoms (for 7 patients follow-up is scheduled summer 2018, and will be reported afterwards). Mean tonsilar herniation after surgery was 11.55 ± 7.13 (in 7 cases tonsils ascended). Improvement in syringomyelia occurred in 3 patients. No postoperative complications. Repeated surgery was performed in 2 patients. In 3 cases pre-operative central sleep apnea improved (PSG was available in 7 cases). One patient was stabilized C0/C2 for craniocervical instability.
CONCLUSION:In our case series bony decompression for CH 1/1.5 resulted in improvement of clinical signs and in individual cases reduction of syrinx or improvement of sleep disorders. Along with other studies, bony decompressions is a save fist lane option for CH1/1.5.

FL-039

Special Topic: Chiari Malformation

Results of the surgical treatment in children with Chiari type 1 malformation

Marek Mandera, Pawel Jarski, Mikolaj Zimny, Michal Linart, Zofia Slosarek

Department of Pediatric Neurosurgery, Medicla University of SIlesia, Katowice, Poland

OBJECTIVE:The aim of our study was to evaluate the quality of life of the patients operated due to CM-I in the Department of Pediatric Neurosurgery, Medical University of Silesia in Katowice.
MATERIAL-METHODS:We performed a retrospective analysis of 11 patients diagnosed with CM-I who were admitted to our department from 2007 to 2016. There were 6 females and 5 males with median age 9 years (ranged 2–13 years). Short-term evaluation of the patients' state was based on comparison of the presenting symptoms and radiological images' results before and after the surgical treatment. Long-term follow-ups were carried out using survey questionnaires based on the Chicago Chiari Outcome Scale (CCOS).
RESULTS:Patients, based on their CCOS score were divided into the groups marked as: "improved", "unchanged", "worse" with a range of CCOS score: 13-16, 9-12, 4-8, respectively. Fifty-five percent of patients were marked as "improved", 45% marked as "unchanged" and no patient was marked as "worse" outcome. Significant negative Spearman correlation was found between CCOS score and patients' age in the time of surgery (R= -0.85, p = 0.0009).
CONCLUSION:Qualification for the surgical treatment of CM-I should be conducted very carefully. Surgery improves the quality of life measured with CCOS in symptomatic patients.

FL-040

Special Topic: Chiari Malformation
Conservative management for pediatric patients with chiari 1 malformation: A retrospective study

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[2]Department of Neurosurgery, Rabin Medical Center, Petah Tiqva, Israel
[3]Department of Neurosurgery, Hadassah University Medical Center, Jerusalem, Israel

OBJECTIVE:To understand the impact of nonoperative managment of the chiari 1 malformation on the impact of the natural history of the disease
MATERIAL-METHODS:Medical records and radiological exams of patients treated for CM1 at our institution between the years 2010 and 2016 were reviewed. The patients included in the study, met the following criteria: (a) patients diagnosed with CM1, having tonsillar descent ≥ 5 mm,(b) clinical follow-up period of at least one year, (c) A minimum of two MRI studies. Patients were excluded from statistical analysis in cases where surgery was indicated at the beginning of the follow up period.
RESULTS:A total of 29 patients (17 male and 12 female) met the criteria to be included in the study (see table for summary of patient characteristics). The average age of our patient population was 8.5 years old at the time of diagnosis. The average tonsillar herniation on first MRI was 9.4 mm (+/- 4.6) and the average tonsillar herniation on second MRI was 10.4 mm (+/- 4.8). The average follow up time of our sample of patients was 26 months. Of the 29 patients in our study 12 (41%) had symptomatic presentation. Nine patients (31%) had headaches. Two (6.9%) of our patients, aged 1 and 5 years old, presented with failure to thrive. One of our patients (3%) had a syrinx on follow up MRI. All of our patients had no dilatation of the ventricular system, indicating there was no associated hydrocephalus, generally there is an association of approximately 35% between hydrocephalus and chiari I malformation. Interestingly, four of our patients (13.8%) presented with epilepsy.
CONCLUSION:Our findings support the consensus of previous work that nonoperative management is best in asymptomatic or mildly symptomatic chiari patients.

Tuesday, 9 October 2018
11:37 – 11:50

Flash Presentations: Global Neurosurgery

FL-041

Special Topic: Global Children's Surgery
The Scope of Paediatric Neurosurgery Practice in Malawi – a One Year Review

Patrick Dongosolo Kamalo
Queen Elizabeth Central Hospital, Blantyre, Malawi

OBJECTIVE:Neurosurgery practice is evolving and it is important to understand our patient population and their needs. The objective of this study was to characterize the spectrum of operations and patient characteristics in Malawi with the aim of identifying specific skills and resources required to support our service.
MATERIAL-METHODS:This study was a retrospective analysis of consecutive operations at the neurosurgical unit at Queen Elizabeth Central Hospital, in Malawi from 1st January 2017 to 31st December 2017. Our data source was a hard copy theatre record book; all patients operated were extracted and entered in an Excel file and analyzed.
RESULTS:We found 408 operations recorded in 2017, of whom 74% (303) were children up to 16 years. The median

age was 6 months (age range 10 days to 16 years) and mode was 2 months. Two thirds of the children (67%) were infants under one year old. Hydrocephalus was the most common diagnosis in (87%), followed by brain tumor 18 patients (6%). Other diagnoses included encephaloceles (6); and two each of brain abscess, subdural empyema and acute epidural hematoma. The most performed operation was endoscopic third ventriculostomy (ETV) in 161 operations, of whom 74 operations included choroid plexus cauterization (CPC) in addition to ventriculostomy. Ventriculoperitoneal shunt insertion represented 34% of hydrocephalus operations. We had 20 craniotomies done in children, mostly for tumor, but also repair of frontonasal encephalocele, and traumatic brain injury.
CONCLUSION:Hydrocephalus surgery comprises the majority of cases in our setting. Most of our patients are infants aged 3 months and below. We therefore need to develop special skills in anaesthesia and postoperative nursing of very young infants as they form the majority of our patients. There is also need to define why we have so many young infants with hydrocephalus and explore if this cases can be prevented.

FL-042

Special Topic: Global Children's Surgery

The neuroendoscope for intracranial operations, a cost effective alternative in the resource-challenged environment

Teddy Totimeh
Greater Accra Regional Hospital

OBJECTIVE:The incorporation of endoscopy and neuronavigation has made minimally invasive surgery more effective in dealing with common neurosurgical challenges. The resource deprived environment has been bypassed as far as microneurosurgery is concerned because of expense involved in skills acquisition by surgeons, and maintenance of microscopes. Research proving the superiority of endoscopes over the microscope can be done in the developed world, for clinical applications in the developing world.
MATERIAL-METHODS:A comparative cadaver study of surgical working area and degrees of freedom was conducted using dissections in six formalin fixed cadaver heads. Six extended endonasal approaches and twelve eyebrow craniotomies were performed. Research was done in the Pacific Neuroscience Institute, Santa Monica, California, US.

A combination of microscopy, multiple endoscopy angles and neuronavigation were used to generate surgical working areas for 36 anatomical targets, and for six essential surgical targets. Degree of visualisation was noted and qualitatively and quantitatively analysed.

RESULTS:Signficantly more anatomical targets were visualised with the endoscope than the microscope. The 30 degree endoscope was superior in visualisation than the 0 degree, but the 45 degree endoscope did not add much advantage over the 30 degree.

In all eyebrow craniotomies, the endoscopes enhanced the visualisation of the poorly visualised areas, tenfold on average.
CONCLUSION:It is important for training in resource challenged environments to upscale emphasis on neuroendoscopy use by residents.

The proper use of the operating microscope must be taught, because microsurgical principals are important for neuroendoscopy, however the relative cost of the neuroendoscope, compared to the microscope should push training programmes more to neuroendoscopy training.

The major work horse of neuroendoscopy training in the resource challenged environment should be the 30 degree endoscope.

FL-043

Special Topic: Global Children's Surgery

Late diagnosis of childhood brain tumours at the Kenyatta National Hospital, Nairobi, Kenya

Nimrod Juniahs Mwangombe
Department of Surgery, University of Nairobi, Nairobi, Kenya

OBJECTIVE:To study the reasons for late diagnosis of children with brain tumours at the Kenyatta National Hospital with the aim of developing clinical guidelines for health workers for early diagnosis of childhood brain tumours in Kenya.
MATERIAL-METHODS:A cross-sectional study was done to review the pattern of presentation and pre-diagnostic symptomatic interval (PSI) in children age1-12 years with brain tumours over a period of seven months to establish reasons for late diagnosis. A questionnaire was used to collect the required data. The results of the cross-sectional study were utilized to formulate statements for a Delphi survey questionnaire to obtain a consensus amongst health workers at the hospital on the main reasons for delayed diagnosis. The questionnaires were coded and the data entered into a password protected data base. The data was analyzed using the statistical package for social scientists (SPSS).
RESULTS:61 children were enlisted in the cross-sectional study. The PSI ranged from 1 week to 3 years with a median PSI of 3 months and a mean PSI of 7.7+/-9.6 months. The predominant reasons for delayed diagnosis were lack of health workers and lack of awareness of the problem by the parent/guardian.

CONCLUSION:There was a marked delay in diagnosis of childhood brain tumours at the Kenyatta National Hospital. The main reason for the delayed diagnosis was lack of expertise by the health workers and lack of awareness of the problem by the parent/guardian. Development of guidelines based on these observations will assist health workers in developing countries appreciate the varied presentation pattern of childhood brain tumours and the need for early diagnosis.

FL-044

Special Topic: Other

Pediatric Neurosurgery at the neurosurgery department of the Fann teaching Hospital

Maguette Mbaye, Mbaye Thioub, Alioune Badara Thiam, Attoumane Fahad, Roger Mulumba Ilunga, Cheikh Sy, Mohamed Faye, Momar Code Ba, Seydou Boubakar Badiane
Neurosurgery unit of Fann Teaching Hospital, University Cheikh anta Diop, Dakar, Senegal

OBJECTIVE:The neurosurgery department of Fann University Hospital,have an adult and pediatric general neurosurgery activity. This study aims to report the pediatric activity during 10 years of exercise after the reopening of the service in 2007
MATERIAL-METHODS:We have identified the pediatric neurosurgery activity from September 2007 to December 2017. Thus, we have listed patients aged 0 to 18 years according to pathologies but also epidemiological data.
RESULTS:Thus on about 13000 hospitalizations, the pediatric population was 3224 patients.

Head trauma was the most common with 1298 hospitalizations, 60% of which were benign head injuries. With as dominant etiology the domestic accidents. Hydrocephalus was second (881 patients) with a majority of malformative hydrocephalus followed by tumor etiologies and finally post-infectious. Central nervous system malformations accounted for 344 patients, 250 of whom were spina bifida. 329 patients had brain tumors with a majority of tumors of posterior cerebral fossa. The collected cranio-encephalic suppurations accounted for 205 cases and we found 60 cases of vascular pathology.

The rest of the population represented pathologies such as spondylodiscitis, anterior fontanelle cysts, spinal trauma, lumbar disc herniation, etc.
CONCLUSION:This assessment made it possible to draw up the epidemiological profile of the pediatric population, but also to identify dysfunctions and make suggestions to improve the care of children in our neurosurgery unit.

Wednesday, 10 October 2018
09:53 – 09:56

Flash Presentations: Infections

FL-045

Special Topic: Infection

Plasmon-enhanced spectroscopic quantification of cerebrospinal fluid lactate and glucose for diagnosis and treatment monitoring

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OBJECTIVE:Our aim is to describe a sensitive, and accurate plasmon-enhanced spectroscopic (PES) assay that reliably quantifies CSF lactate and glucose at pico-molar levels.
MATERIAL-METHODS:The assay uses the in-situ oxidation of gold nanoparticle-labeled probes with H2O2 following biocatalysis of lactate or glucose by oxidase in silica nanochannels to produce a plasmon-enhanced ratio-type spectroscopic response that enhances molecule detection sensitivity and accuracy.
RESULTS:We demonstrate that the PES for CSF lactate and glucose distinguishes post-neurosurgical bacterial meningitis patients from aseptic meningitis patients and healthy subjects. The PES assay was also capable of indicating infection progression and of detecting early responses to antibiotic therapy, with better performance than a commercially used biochemical kit assay.
CONCLUSION:PES for CSF lactate and glucose can be used to distinguish post-neurosurgical bacterial meningitis patients from aseptic meningitis patients and healthy subjects, it is also capable of indicating infection progression and of detecting early responses to antibiotic therapy.

Wednesday, 10 October 2018
14:16 – 14:40

Flash Presentations: Epilepsy/Functional/Antenatal

FL-047

Special Topic: Epilepsy

The utility of intraoperative magnetic resonance imaging in epilepsy surgery: a literature review and meta-analysis

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OBJECTIVE:To review the literature evaluating iMRI-guided epilepsy surgery outcomes, with respect to the rates of gross-total resection (GTR), postoperative seizure freedom, surgical complications, permanent neurological deficits, and reoperations.
MATERIAL-METHODS:Medline, Embase, PubMed, and Cochrane Library databases were searched. Randomised control trials or cohort studies examining iMRI-guided epilepsy surgery outcomes were eligible for inclusion in qualitative synthesis. Studies that compared iMRI-guided epilepsy surgery versus a non-iMRI surgery control group were selected for quantitative synthesis (n=6). Meta-analysis was conducted using random-effects models. Effect size was represented as risk ratio (RR). Publication bias was assessed using contour-enhanced funnel plots and Egger's test was used to assess small study effects.
RESULTS:Twenty-five retrospective cohort studies addressed iMRI-guided epilepsy surgery outcomes alone, reported mean rates of GTR 88.9% (SD=16.5), seizure freedom 75.3% (20.5), surgical complications 8.9% (2.6), permanent neurological deficits 17.2% (13.8), and reoperations 6% (3.4). Overall, studies were limited by retrospective designs, predominantly adult patients, mixed epilepsy pathology, single-centre multi-surgeon data, and subjective reporting of GTR.

The meta-analyses demonstrated RR=1.40 for attaining GTR [predictive interval, 0.34–5.71, p=0.108; I^2=81.3% [95%CI 57-92]) (Figure 1); RR=1.55 for achieving seizure freedom (0.53-4.53, p=0.008; I^2=65% [8-87]) (Figure 2); RR=0.36 of getting postoperative neurological deficits (0.34–5.71, p=0.045; I^2=15.1% [0-87]) (Figure 3); and RR=0.48 for the need of reoperation (0->10^6, p=0.382; I^2=48.7% [0-85]) (Figure 4). Contour-enhanced funnel plots raised the question of publication bias. There was evidence of small study effects for seizure freedom outcome (p=0.037).
CONCLUSION:There was only level two evidence suggesting surgical benefits of iMRI-guided epilepsy surgery. Comparison between iMRI versus non-iMRI surgery outcomes remained inconclusive. The evidence was confounded by moderate to high level of study heterogeneity and publication bias favouring iMRI-guided surgery outcomes. These results justify future high-quality trials.

FL-048

Special Topic: Epilepsy

Surgical Management of Long-term Epilepsy Associated Tumours: A 20 year review

Nilesh Mundil, Adikarige Silva, Stuart Roberts, William Lo, Desiderio Rodrigues, Guirish A Solanki, Richard Walsh
Department of Paediatric Neurosurgery, Birmingham Women's & Children's Hospital, Birmingham, UK

OBJECTIVE:Paediatric cerebral tumours presenting with epilepsy first are mostly indolent. Two main types are recognised: dysembryoplastic neuroepithelial tumours (DNETs) and gangliogliomas. However other tumours in childhood can also be associated with neuronal disorganisation and potent epileptogenicity. Collectively, they are often termed long-term epilepsy associated tumours (LEATs). We review the outcome of surgical resection in those presenting primarily with seizures.
MATERIAL-METHODS:A 20-year retrospective review of all patients with suspected cerebral tumours undergoing surgery for epilepsy between 1996 and 2016. All patients were prospectively entered into a database at the time of surgical assessment and outcome was expressed using the Engel score. Our surgical strategy consisted of resecting the macroscopically abnormal tissue wherever possible with hippocampal preservation on the dominant side (unless evidence of clear infiltration).

37 (19 female) children aged between 2-18 years (mean 9.9) had all presented with primarily focal seizures in areas amenable to surgical resection.
RESULTS:30 tumours were frontal or temporal in location. DNETs (n=9) and gangliogliomas (n=11) were the commonest lesions while 10 were glial. 81%(30/37) were

almost or totally seizure free at mean follow-up of 23 months (12-60) (Engel 1). 5.4%(2/37) had no significant improvement (Engel 4) after dominant temporal lobe resections sparing the mesial structures. Further resection produced an improvement to an Engel score of 2A in a single patient.
CONCLUSION:In our series, surgical resection (tailored or otherwise) of LEATs was curative in over 80%. Surgery was aimed at resecting the tumour rather than removing the epileptogenic zone per se. Failure to achieve seizure control was not generally responsive to further intervention.

FL-049

Special Topic: Epilepsy

Trans-temporal approach for resection of hypothalamic hamartomas

Adikarige Haritha Dulanka Silva, Nilesh Rohan Mundil, Anthony Richard Walsh
Department of Neurosurgery, Birmingham Children's Hospital, Birmingham, United Kingdom

OBJECTIVE:Hypothalamic hamartomas (HH) are rare; in spite of the introduction of interstitial laser therapy, direct surgical resection or disconnection to cure associated intractable epilepsy is indicated in a number of cases. We report a trans-temporal approach suitable for Delalande type 1, 3 & 4 HH. This approach gives you optimal viewing of the plane between the HH and hypothalamus as well as good visualization of the brainstem and pituitary stalk, so these structures can be avoided, minimizing potential complications.
MATERIAL-METHODS:The approach is made via a 1 cm corticotomy in the middle temporal gyrus; using image guidance the surgical tract is deepened, in the plane of the intended disconnection, until the medial pia-arachnoid of the temporal lobe is reached. The pia-arachnoid is opened giving direct visualization of the HH, which can be resected or disconnected as required.
RESULTS:We have treated three children using this technique in the Birmingham Children's Hospital Children's Epilepsy Surgery Service (CESS) over the last 4 years.

Patient A (Delalande Type 1) remains seizure free off medication with no complications at 3-years follow-up post-surgery.

Patient B (Delalande Type 3) initially underwent trans-callosal interforniceal incomplete disconnection. Following surgery he had infrequent seizures over the first 18 months (Engel Class 2) with substantial improvement in cognition. There was subsequently an increase in seizure frequency and overall reduction in cognition and behaviour. He underwent trans-temporal completion of the disconnection without complication and he remains seizure-free at 6-months follow-up with improvement in cognition and behaviour.

Patient C (Delalande Type 4) had an incomplete disconnection without surgical complications; he had 3-4 months seizure freedom, before seizures recurred at a substantially reduced frequency and is Engel Class 3C, 3-years from surgery.
CONCLUSION:The trans-temporal approach can be safely performed with good outcomes in Delalande Types 1, 3 and 4 HHs.

FL-050

Special Topic: Epilepsy

Surgical treatment of patients with hypothalamic hamartoma and intractable epilepsy – short- and long-term outcome

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OBJECTIVE:Hypothalamic hamartomas are benign lesions associated with drug-resistant epilepsy. Surgical treatment has shown promising results, but questions regarding long-term follow-up still remain to be answered. This study aims to evaluate seizure outcome, cognition and complications of surgically treated patients with hypothalamic hamartoma and intractable epilepsy.
MATERIAL-METHODS:Patients with drug-resistant epilepsy and hypothalamic hamartoma who had undergone epilepsy surgery during the period 1995-2016 were included. Preoperative, two-, five- and ten-year prospective longitudinal data were collected from the Swedish National Epilepsy Surgery Register, including seizure types and frequency, duration of epilepsy, clinical characteristics, comorbidities and complications. In a subgroup from Gothenburg we also analysed classification of lesion, size of lesion, surgical procedures, cognition and type of seizures in more detail.
RESULTS:Three out of 17 patients were seizure free at the two-year follow-up and seven had a reduced seizure frequency by > 50 %. Three had a 0-50 % reduction and three an increased seizure frequency. Among patients with a long-term follow-up (five or ten years) 1/8 was seizure free, 5/8 had a > 50 % reduced seizure frequency and 2/8 had an increased seizure frequency compared to preoperatively. A majority was treated with endoscopic or pterional disconnection.

There was no deterioration in full scale IQ after surgery. Transient complications occurred in five of 21 operations.
CONCLUSION:In 17 patients surgically treated for hypothalamic hamartoma and epilepsy, short- and long-term follow-up resulted in considerable seizure frequency reduction among a majority of the patients which was persistent over time. No permanent complications and no deterioration in full scale IQ were seen.

FL-051

Special Topic: Epilepsy

Role of stereo EEG (SEEG) in identifying epileptogenic zone/networks for surgical planning in pediatric patients with refractory epilepsy

Kalyani Karkare[1], Carolina Sandoval Garcia[2], Ian Miller[1], Ann Hyslop[1], Prasanna Jayakar[1], John Ragheb[2], Sanjiv Bhatia[2]
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[2]Division of Neurosurgery, Brain Institute, Nicklaus Children's Hospital, Miami, FL, USA

OBJECTIVE:To identify the principles guiding strategic placement of depth electrodes for extraoperative localization of epileptogenic zones in patients with refractory focal epilepsy in a tertiary referral center.
MATERIAL-METHODS:We retrospectively reviewed 26 consecutive patients with medically refractory epilepsy, who had insufficient/divergent data on comprehensive non-invasive evaluation and subsequently underwent SEEG implantation. Data regarding lesional vs non-lesional cases, incidence of post-SEEG tailored resection and postoperative follow up was recorded.
RESULTS:SEEG was performed in 26 patients. There were 16 females and 10 males with age ranging from 3.7 to 21.6 years (median 17.19). Patients were monitored for an average of 3 to 10 days (median 8 days). 14/26 patients were non lesional on MRI. 9/26 implantations were bilateral. SEEG provided sufficient information to proceed with an operative plan in all except for 9 patients, where intraoperative ECoG supplemented post-stereo resection plan. None of the cases required additional subdural recordings to confirm the extent of the epileptogenic zone. Following SEEG, 25/26 patients had a definitive treatment plan for further management (21 had resection, 3 had VNS, 1 had CBD). Engel score at 6 months is available in 19/21 patients, with favorable outcome (Engel 1+2) in 10 patients (52%). There were no postoperative complications. Illustrative cases with strengths and limitations of SEEG will be discussed.
CONCLUSION:In a well-defined patient cohort with refractory epilepsy, SEEG proved to be useful in identifying the epileptogenic zone and in defining seizure networks. The technique seems to be especially valuable in cases of suspected multiple foci, undefined laterality, deep focus and to interrogate previous surgical failures.

FL-052

Special Topic: Epilepsy

Paediatric epilepsy surgery: a five year review of outcomes at a single surgeon centre

Catherine Jane Pringle, Vivek Josan
Department of Neurosurgery, Royal Manchester Children's Hospital, Manchester, United Kingdom

OBJECTIVE:To assess seizure control five years post-operatively for children undergoing epilepsy surgery by a single surgeon at our institution.

Procedures performed and assessed included temporal lobectomy and amygdalohippocampectomies, hemispherotomies and lesionectomies (temporal and extra-temporal).
MATERIAL-METHODS:Retrospective case note analysis of children undergoing epilepsy surgery by a single surgeon between 2008 and 2013. Engel Classification at one year and five year follow up was recorded.Good seizure control was classified as Engel 1 and 2, poor control as Engel 3 and 4.
RESULTS:29 children with complete data sets underwent epilepsy surgery between 2008-2013 consisting of: 17 temporal lobectomy and amygdalohippocampectomies, 4 temporal lesion surgeries, 4 extra temporal lesion surgeries and 4 hemispherotomies.

Temporal lobectomies and amygdalohippcampectomies for focal cortical dysplasia and mesial temporal sclerosis had good seizure control at 1 year of 80% and 100% respectively. These figures were sustained at 5 year follow up.

Lesional surgery for temporal lobe DNETs had 100% Engel 1 and 2 outcome and 1 and 5 years follow up. Temporal lesional surgery for non- DNET pathologies also had 100% good seizure control at 1 and 5 years.This included cavernomas and glioneuronal tumours.

Extra-temporal lesional surgery also had 100% good outcome at 1 and 5 years follow up.

Hemispherotomies had 75% good seizure control at 1 year follow up, and 100% good seizure control at 5 years follow up.
CONCLUSION:Epilepsy surgery at our institution offers excellent seizure control at 5 year follow up, converting treatment resistant to treatment responsive epilepsy. Temporal

lobectomy and amygdalohippocampectomy had better seizure control for mesial temporal sclerosis than for focal cortical dysplasia. We did not see a significant reduction in seizure control at 5 years for focal cortical dysplasia as documented in the literature.

We will continue to follow up this cohort beyond the 5 year study period alongside more recently operated cases.

FL-054

Special Topic: Epilepsy

Surgical treatment of pediatric focal cortical dysplasia

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[3]Department of Neurosurgery, Kangwon University, College of Medicine, Kangwon, Korea

OBJECTIVE:In order to confirm the effectiveness of resective epilepsy surgery,
MATERIAL-METHODS:we analyzed clinical profile and seizure and neurodevelopmental outcomes of 95 children with intractable epilepsy due to pathologically confirmed focal cortical dysplasia (FCD).
RESULTS:There were 14 cases of FCD type I, 44 of type IIa, 23 of type IIb, and 14 of type III. Among of them, 65 children presented clinically as focal epilepsy (FE) and 30 as epileptic encephalopathy (EE), including 22 with Lennox-Gastaut syndrome and 8 with West syndrome. We observed EE in 9 cases (64%) in FCD type I, 20 (44%) in type IIa, 3 (13%) in type IIb, and 1 (7%) in type III. EE was closely related to the following: seizure onset occurring at younger than 2 years, presence of intellectual disability before surgery. And children with EE required wider resection or multi-lobar resections. We can get seizure-free in 61 cases (64%); 43 out of 65 FE and 17in 30 EE. Most of children showed neurodevelopmental improvement after surgery. These improvement was well correlated with seizure outcome and FE compared to EE.
CONCLUSION:FCD can cause FE and EE in pediatric age, and resective surgery should be considered as a treatment option for both types of epilepsy.

Wednesday, 10 October 2018
14:40 – 15:03

Flash Presentations: Functional

FL-055

Special Topic: Functional

Surgical treatment of eloquent brain area tumors

Mikle Talabaev, Gleb Zabrodzets, Kevin Fernando Venegas Hidalgo, Volha Zmachynskaya
Republican Scientific and Practical Center of Neurology and Neurosurgery Minsk. Belarus.

OBJECTIVE:To Analysis the functional results of neurosurgical treatment after resection of eloquent brain area tumors (EBATs).
MATERIAL-METHODS:27 patients from 3 to 18 years old of age were treated. 24 patients were diagnosed EBATs, and 3 patients with vascular pathologies (AVM). In the preoperative period, all patients underwent magnetic resonance imaging (MRI) and fMRI.. During the operation, the motor cortex and speech centers were mapped. In 6 patients, awake craniotomy were performed, within the projection of the Broca's area - 2 patients and precentral gyrus 4 patients. Follow up after surgery was on the first day, 7 and 14 day.
RESULTS:The histological verification of 24 (88.9%) EBATs patients show (LGG-16, HGG-3). In 3 patients (12.1%) shown AVM. The pathological process was located in the projection of the motor cortex in 25 (92.6%) patients and in 2 (7.4%) was located near of the Broca's area. In 21 patients (77.8%), seizures were one of the first symptoms of the disease and as in 14 patients (51.9%) focal neurological symptoms occurred.

In 1 (3.7%) of the patient (left precentral gyrus EBATs) after surgery, a mild hemi paresis appeared that disappeared at the time of discharge. 24 patients (88.9%) were discharged with significant focal neurological improvement (comparison with the preoperative period). In 2 patients (Broca's area EBATs) in the postoperative period, transitory aphasic disorders were noted, which completely regressed by the time of discharge.
CONCLUSION:The use of modern methods of functional examination, navigation and intraoperative neuromonitoring allows us to safely perform surgery in EBATs, minimizing the risk of neurological deficits in the postoperative period.

FL-056

Special Topic: Functional
Concurrent Strayer procedure and peripheral neurectomy to the soleus muscle for spasticity – preliminary results with pre- and post- procedure gait analysis

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OBJECTIVE:Lengthening of the Achilles tendon is used to treat plantar-flexion contractures in the pediatric population and improve their gait. Lengthening of the entire Achilles tendon is often avoided given a risk of 'over-lengthening' and a detrimental impact on function. The Strayer procedure is a lengthening through the aponeurosis of the gastrocnemius, leaving the soleus muscle intact, but with continuing soleus spasticity the effectiveness may be limited.

The early results of a combined Strayer procedure and concurrent partial peripheral neurectomy of the soleus are presented. The procedural goal was to treat the spasticity with an immediate aponeurosis lengthening (Strayer), and utilize the peripheral neurectomy to prevent recurrent contracture across the joint and preserve function.
MATERIAL-METHODS:Five patients have undergone the procedure on one leg. The surgery is done as an outpatient, with post-operative short term cast immobilization. Gait analysis pre-procedure and at longer term follow up was used to objectively assess the results of the combined procedure. The clinical and gait analysis results will be presented on the follow up interval ranging from 8 to 21 months.
RESULTS:Early indications are that all patients have improved with effective treatment of the contracture and reduction of spasticity across the ankle. Performing the Strayer procedure first simplifies the technical aspects of the neurectomy, allowing a more limited popliteal dissection. Surprisingly, we have identified that antagonist dorsiflexor muscle function has been unmasked, allowing unanticipated functional dorsiflexion of the affected foot.
CONCLUSION:Combining the Strayer procedure with a peripheral neurectomy of the soleus muscle is technically straightforward; it allows the entire gastrocnemius-soleus complex to be effectively treated at one operation, without the risk of over-lengthening and residual functional issues; and it may diminish the need for longer term bracing.

FL-057

Special Topic: Functional

Safety and Efficacy of Continuous Intrathecal Baclofen in Children under 4 Years of Age

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OBJECTIVE:Intrathecal baclofen represents a safe and effective treatment option for patients with severe impairing spasticity. Yet, safety and efficacy has not been proven for children under 4 years of age.
MATERIAL-METHODS:We present a single center review from 2007 to 2017 of children under four years of age with Gross Motor Function Classification System level V and severe spasticity. After successful bolus trial we implanted an abdominal 20 ml pump device for continuous intrathecal baclofen administration. We analyzed age, sex, weight, etiology, effective baclofen dosage, catheter tip location, pump implantation site, concomitant presence of a gastral feeding tube, complications and adverse side effects as well as outcome.
RESULTS:Eight children under the age of four years, ranging from 11 to 47 months (mean 28 months) with a body weight from 7.7 to 14.9 kg (mean 12.5 kg) were treated with intrathecal baclofen. The effective dosage to lower the modified Ashworth scale by at least 2 points ranged from 180 to 2200 μg/day (mean 530, median 260 μg/day). Treatment was well tolerated and safe. Postoperative complications were intrathecal catheter dislocation in one case, and wound breakdown in the one and only case were the pump was subcutaneously implanted. Both cases needed revisionary surgery and may be prevented by optimized operative technique. All patients also had a gastral feeding tube, which was not interfering with abdominal pump implantation.
CONCLUSION:Continuous intrathecal baclofen through an abdominal subfascial implanted pump device represents a safe and effective treatment option also for children under 4 years of age with severe impairing spasticity.

FL-058

Special Topic: Functional

Neurosurgical management of spastic diplegia in pediatric patients with HIV Encephalopathy. Experience at Garrahan's Hospital

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OBJECTIVE:To analyze the effectiveness of Selective Dorsal Rhizotomy (SDR) for the treatment of spastic diplegia (SD) with intraoperative electromyography in pediatric patients with HIV Encephalopathy (HIVE).
MATERIAL-METHODS:We performed a retrospective and observational analysis of the surgical management of spastic

diplegia (SD) in pediatric patients with HIV Encephalopathy (HIVE), treated at our hospital between 2007 and 2016.

Age, sex, Gross Motor Function Classification System (GMFCS), Functional Mobility Scale (FMS), Gillette's Functional Assessment Questionnaire (FAQ), level of SDR, and socio-economic status (SES) have been considered.
RESULTS:A Selective Dorsal Rhizotomy has been performed in 14 patients (9 females; 5 males) with HIVE for the treatment of SD, presenting an average age of 11.4 years. Significant advantages in functional outcomes after SDR were observed.

Gait pattern, functional positioning, and the ability of the child to deal with her/his environment have been improved.
CONCLUSION:SDR with intraoperative electromyography is an effective microsurgical technique for treatment of SD in pediatric patients with HIVE.

FL-059

Special Topic: Functional

Deep brain stimulation of the subcallosal cingulate for treatment of intractable anorexia nervosa in a patient with extremely low body mass index - experience an short-term follow up: Case report

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OBJECTIVE:Anorexia nervosa has one of the highest mortality rates (5-15%) within psychiatric disease. The reports on safety of deep brain stimulation in patients with anorexia nervosa have documented clinical benefits of surgical therapy in a small series of patients. We have indicated deep brain stimulation of the subcallosal cingulate as a rescue therapy option in a patient with otherwise poor prognosis of life-time.
MATERIAL-METHODS:The treatment option of deep brain stimulation was offered to a patient with treatment refractory anorexia nervosa who refused parenteral nutrition as well as nasogastric feeding. Baseline body mass index was 9.8. The 20-year old patient was implanted with bilateral stimulation electrodes into the white matter of the subgenual cingulate gyrus under general anesthesia. A rechargeable impulse generator was implanted in an infraclavicular subcutaneous pocket. A period of eight weeks of postoperative hospital surveillance is available for a short-term follow-up.
RESULTS:No side effects, adverse events, or complications related to the surgical procedure occurred. Eight weeks after the operation the body mass index was stabilized at 12.1. Postoperative improvement in mood was reflected in a decrease in the Beck depression inventory scoring from 51 to 42.
CONCLUSION:Deep brain stimulation seems to be a safe treatment option. A larger number of cases and long-term follow-up needs to be established to validate the efficacy of the surgical treatment option for patients with anorexia nervosa.

FL-060

Special Topic: Functional

Operation of MDT for Spasticity in Huashan Hospital and Application of SL-SDR with 32 channels EMG monitoring in cerebral palsy patients

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OBJECTIVE:To discuss the new clinic model of the multiple discipline team (MDT) for spasticity management in Huashan Hospital. In the new technology era, to apply the minimal invasive and accurate SL-SDR surgery in spastic cerebral palsy patients and evaluate the effect.
MATERIAL-METHODS:To establish a MDT for spasticity management which including neurosurgeons, neurologists, orthopedists and rehabilitation physicians and to explore a new clinic model for spasticity management. For spastic cerebral palsy patients, to apply microscopic SL-SDR surgery to decrease spasticity with intraoperative 32 channels EMG monitoring, which would be more invasive and more accurate technology.
RESULTS:We have successfully established the first MDT for spasticity management in China and developed a cerebral palsy clinic and MDT special clinic in Huashan Hospital and provided a one-stop medical service for all spastic patients. Meanwhile, we have successfully applied SL-SDR for 35 cases in one year, which included patients with cerebral palsy, HSP, TBI, SCI and stroke. We have proposed a new model of surgery accelerating rehabilitation for spastic patients.
CONCLUSION:The MDT medical model is more effective for spasticity management and more acceptable for all

patients. The new characters for SL-SDR surgery would be more invasive and more accurate with 32 channels EMG monitoring during operation and with "Dura to Dura" microscopic surgical techniques.

FL-061

Special Topic: Other

Analyzing the common motion pattern and formulating rehabilitation program after SDR operation for children with spastic diplegia cerebral palsy

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OBJECTIVE:To observe the common motion pattern after SDR operation,take rehabilitation intervention,and formulate rehabilitation program,for children with spastic diplegia cerebral palsy by rehabilitation assessment.
MATERIAL-METHODS:18 children aged between 5 -8 years old who had spastic diplegia cerebral palsy with GMFCSII - III and were post-operation of SDR from center.were taken rehabilitation assessment and rehabilitation intervention in early post-operation and analyzed the common motion pattern. the assessments were completed by the same therapist. According to ICF frame, took intervention relative treatment; based on each phases after SDR operation, took corresponding rehabilitation program:0-1 month post-operation, took the training of strength,muscle stretch,seating balance and the use of orthoses and devices;1-2 months post-operation, took the training of stretch,muscle strength, standing, posture and the use of orthoses and devices;2-3 months post-operation, added posture adjustment and trunk core training;3-6 months post-operation, added proprioceptive input training and the use of orthoses;6-12 months post-operation, added the training of FTS gait and indoor and outdoor walking, and adjusted the key contents of rehabilitation training in different phases.
RESULTS:The muscle strength of quadriceps, tibial anterior, gluteus medius and musculi quadratus lumborumhad different degrees of insufficiency in 18 children who were early after operation of SDR;the proprioception and core stability were poor; and the original abnormal motion pattern disappeared. The muscle strength,core stability,proprioception,balance function and motion quality were significantly improved ($p<0.05$).
CONCLUSION:1.Because of the significant decrease in muscle tone,children with spastic diplegia cerebral palsy who post-operative of SDR had different degrees of insufficient muscle strength, poor balance function;2.Formulating standardized rehabilitation program and corresponding rehabilitation program based on different post-operative phases,could ameliorate abnormal motion pattern effectively in children with spastic diplegia cerebral palsy who post-operative of SDR;3.The combination of SDR operation and rehabilitation training could significantly enhance motor development trajectory and reconstruct motion pattern in children with spastic diplegia cerebral palsy.

Wednesday, 10 October 2018
14:40 – 15:30

Flash Parallel Presentations: Endoscopy/ Joint IFNE

FL-062

Special Topic: Hydrocephalus

Perspectives on repeat ETV: a survey study

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[7]Department of Pediatric Neurosurgery, Catholic University Medical School, Rome, Italy
[8]Department of Neurosurgery, University Medical Center Utrecht, Utrecht, the Netherlands
OBJECTIVE:The practice pattern regarding the follow-up of patients after ETV and, specifically, the role of repeat ETV (re-ETV) in cases of failure, is not sufficiently known. To inform this topic, we conducted a large, international survey of pediatric neurosurgeons.
MATERIAL-METHODS:An online survey was developed, pilot-tested, and then sent to 360 members of the International Society for Pediatric Neurosurgery asking about their practice in the use of re-ETV and patient follow-up after ETV.
RESULTS:There were a total of 143 respondents (39.7% response rate) from 34 countries with most having a large experience with ETV. A majority of respondents stated that their

decision to perform re-ETV was influenced by: patient age and etiology, time interval between ETV and failure, imaging findings at failure, and intra-operative findings at initial ETV. Most respondents (66.7%) did not use post-operative lumbar puncture and there was no consensus regarding optimal use of post-operative imaging. In asymptomatic patients with loss of a previously-present flow void, most respondents (79.1%) would not intervene if the ventricles were stable, while a majority (60.5%) would opt for re-ETV if the ventricles were increased.
CONCLUSION:Our survey describes the international practice pattern regarding ETV follow-up and use of re-ETV. While there is general agreement in some aspects of practice, in other areas, there is wide variation.

FL-064

Special Topic: Hydrocephalus

Endoscopic Ventricular Irrigation for the Treatment of Neonatal Posthemorrhagic Hydrocephalus with high grade Germinal Matrix intraventricular hemorrhage: A Single Center Study

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OBJECTIVE:Neonatal periventricular intraventricular hemorrhage causes mainly posthaemorrhagic hydrocephalus (PHH) and optimal therapeutic strategies remain unclear. PHH with especially high-grade Germinal Matrix (GM) intraventricular hemorrhage (III-IV) represents a challenge for pediatric neurosurgeon due to severe neurodevelopmental sequelae and high mortality rates. To assess the efficacy of endoscopic irrigation until placement of a permanent ventriculoperioneal shunt, retrospective analysis were performed.
MATERIAL-METHODS:Between January 2008 and December 2014, endoscopic irrigations were performed on 20 babies (9 male, 11 female) with PHH in a single institute. The data of these cases were retrospectively reviewed.
RESULTS:All infants included in this study were born prematurely at 27.41 weeks intrauterine pregnancy (± 2.90, range 23.57-34.71 weeks) and followed for 37.58 months (± 25.26, range 19-99 months). At the time of the first irrigation at our institute, the mean weight of the infants was 3.86 kg (± 1.20, range 2-5.91 kg). The average GM intraventricular hemorrhage grade was high with 3,75 (except three cases, all were with grade IV). The mean irrigation number performed for each infant was 3.75 (± 1.77, range 2-8). Two infants were expired due to other non-intracranial related problems. Shunt implantation could be performed on sixteen out of seventeen infants. As a complication, infection occurred in one case.
CONCLUSION:This retrospective, single center study demonstrated that the endoscopic ventricular irrigation may provide a feasible and safe treatment option for patients with PHH with severe intraventricular hemorrhage.

FL-065

Special Topic: Hydrocephalus

Endoscopic Management Of Infants With Hydranencephaly

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OBJECTIVE:Hydranencephaly is a congenital condition in which the brain's cerebral hemispheres are absent to varying degrees and the resulting empty cranial cavity is filled with cerebrospinal fluid. The prognosis of infants with Hydranencephaly is usually very poor. Despite treatment, there is no neurological improvement which creates ethical dilemmas on how to manage these patients. Ventriculoperitoneal shunt (VPS) placement has traditionally been used to control the increasing head size but this has been associated with considerable shunt complications. We present a single institution's experience of treating hydranencephaly endoscopically.
MATERIAL-METHODS:We retrospectively reviewed patients with hydranencephaly (n =80) who underwent surgery at CURE Children's Hospital Of Uganda. 19 patients received straight shunts. Of the 61 patients who received an endoscopic procedure, ETV/CPC was technically possible in 35 patients (57%). In 1 patient, only ETV was done. In 2 patients, the anatomy did not render an endoscopic procedure possible. Patients were considered successfully treated endoscopically if they did not eventually require shunting.
RESULTS:27 (44%) patients were successfully treated with ETV/CPC. 15 (25%) were treated with CPC alone. 8 patients treated with ETV/CPC and 8 patients treated with CPC alone later required VPS placement. Median follow up period was 4

months (Range 0-56 months). 19 (31%) patients failed the endoscopic procedure and required VPS placement.
CONCLUSION:Control of hydrocephalus in children with hydranencephaly can be achieved with ETV/CPC or CPC alone when it is technically impossible to do ETV.

FL-066

Special Topic: Hydrocephalus

Endoscopic Management of Hydrocephalus And Intracranial Cyst. A prospective study of 82 patients

Samuila Sanoussi, Aminath Kelani, Rabiou Maman Sani, Assoumane Ibrahim, Addo Guemou
Niamey University

OBJECTIVE:During the endoscopic management of intracranial cyst associated with hydrocephalus, evaluate the impact of cyst pressure and permeability of aqueduct on the surgical technics and clinical results.
MATERIAL-METHODS:It was a prospective study conducted from January 2015 to May 2017 at Niamey national hospital of Niger. The study included children from 0 to 5 years, admitted with hydrocephalus associated with supra or infratentorial cyst. The pre endoscopic evaluation was based on CT analyze. Fenestration of cyst was realized before ETV and the permeability of the aqueduct was always inspected. Patients were classified into 2 groups. The first group concerned patients with open aqueduct associated with obstructed foramen of V4. The second group concerned children with obstructed aqueduct. This second group is divided into two subgroups according to low and high cyst pressure. The follow up evaluation included reduction of cranium perimeter, reduction of Evans index and progression of development of Gezel index during 6months post operation.
RESULTS:The study concerned 82 patients. The mean age was 1.54 months ranged from 1to 60 months. 49 patients were included with the diagnosis of Dandy Walker malformation, 23 patients with the diagnosis of mega cisterna magna/ vallecular cyst, 7 patients with the diagnosis of Dandy Walker variant. Infratentorial cyst were classified as Dandy Walker complex in 52 cases (68.42%). The study included 3 patients with V3 cysts with infratentorial extension. 6 months post-surgery mean reduction of CP were 2.45cm, mean reduction of Evans index were 0.0735, mean progression of DQ were 8.79 points. Treatment was successful for 68% of patients. Open aqueduct with obstructed V4 foramen were associated with success. Obstructed aqueduct with high pressure cysts were associated with good results.
CONCLUSION:Endoscopic management of intracranial cysts associated with hydrocephalus is efficient. Intracystic high pressure is a predictive factor of success.

FL-067

Special Topic: Hydrocephalus

Management of complex hydrocephalus

Hector Velazquez Santana, Francisco Guerrero Jasso, Everardo Escamilla Gutiérrez, Miguel Angel Andrade Ramos, Adrian Santana Ramirez, Raul Guillermo Moran Martinez, Oscar Gutiérrez Avila, Luz Monserrat Almaguer Ascencio
Civil Hospital of Guadalajara "Dr. Juan I. Menchaca"

OBJECTIVE:To describe our experience in the treatment of complex hydrocephalus with the use of endoscopy and ultrasonographical guide.
MATERIAL-METHODS:We achieve diagnosis of complex hydrocephalus in thirty-one patients by TC and RM images techniques. It was included different etiological entities that conditioned this problem like tumors, arachnoid cyst, neuroinfection were the most common observed in our study. These patients were operated by different approaches: microsurgical and endoscopic approach, alone or in combination. In all of cases, we make a trans operative sonographic exploration, which allow real-time navigation to localize lesions, corroborate resection, identify vascular features of lesions, guide endoscopic exploration and guide ventricular devices. We performed postoperative ultrasonography to prove objectives preoperative. Which are corroborated by image techniques TC or RM.
RESULTS:Thirty-one patients were operated using sonographic guide, twenty-one patients with hydrocephalus diagnosis (67% of total cases), eleven with multiloculate hydrocephalus (35%), ten with hydrocephalus in which there is ventricular system segment isolate (32%). Seven patients with arachnoid cyst (22.5%), three brain tumors (9.6%)
CONCLUSION:We presented our experience in the treatment of unusual hydrocephalus in which microsurgery and endoscopic combination assisted by trans operative ultrasonography allow the possibility to solve CSF accumulation in complex cases.

Trans operative ultrasonography offers value information. It is reproducible, cheap and accessible to most of hospitals, becoming a value tool, mainly in developing countries.

FL-068

Special Topic: Hydrocephalus
Treatment strategies of asymptomatic Type II and III sylvian arachnoid cysts in pediatric patients

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OBJECTIVE:Sylvian arachnoid cysts (SACs) is a common-seen neurological disorder, especially in children. Most of them are asymptomatic. Nonetheless, the treatment strategy is still controversial. This study aims to elucidate the treatment strategies of asymptomatic Type II and Type III SACs in pediatric patients.
MATERIAL-METHODS:We retrospectively reviewed all electronic medical records of pediatric patients with a radiologically confirmed Type II and Type III SACs at Children's Hospital of Shanghai, North branch of Shanghai Ninth People's Hospital and Shanghai Renji Hospital between March 2010 and November 2016. We collected information about age at diagnosis/surgery, gender, follow-up time, Galassi Classification, and as well as a serial imaging study on particular SACs of those patients. We also observed the alternation of Galassi Classification and ratio between cysts and cranial cavity.
RESULTS:There are total of 80 cases with 80 SACs which match our criteria. 32 cases of SACs which didn't undergo surgery morphologically stayed stable. Among the 48 cases of SACs which underwent surgery, 2 patients underwent urgent surgery because of cyst rupture into hemorrhage. 31 cases of SACs had classification degrade to no more than type I, in which 7 patients were less than 2 years old. 7 cases of SACs didn't have classification degradation, five of which were less than 2 years old. 13 cases of SACs had complications after surgery and among them, 7 patients are younger than 2 years old.
CONCLUSION:Asymptomatic type II and III SACs may stay stable. However, it has possibilities to rupture into hemorrhage and needs urgent operation. The overall outcome of type II and type III SACs after surgery is good and the operation is valid. Considering the complications and surgical failure, it is better to have operation after the age of 2. More experiments are needed to take to confirm the current outcome.

FL-070

Special Topic: Other

Using a borescope as a method of training in neuroendoscopy in low income countries

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OBJECTIVE:Obtaining a neuroendoscope with a full setup for clinical use and or training is a developing country is a herculean task. In view of this challenge an attempt was made to produce a cheap alternative for training and possible clinical use.
MATERIAL-METHODS:The development of this product was inspired when the 1st author visited the states as an AANS international visiting fellow.

In view of the difficulty in getting a neuroendoscopy setup from most of the major companies and the availability of a 3-D printer in the innovation laboratory, a 3-D model of a sheath was design with the help of a biomedical engineer (SB) and a borescope was purchase by the laboratory.
RESULTS:The borescope is a cheap way of developing a training endoscopy model. The picture quality of the image was good but it has a fixed focal length and the images appear flipped. This can be used in training for Endoscopic third ventriculostomy, choroid plexus coagulation and transphenoidal surgeries. Also it can be used for endoscopic assisted surgeries. The sheath of the borescope is about 16cm long with an outer diameter of 1cm. It also has an opening for the borescope that was about 8cm in diameter and a 1.5mm opening for the working instruments. There are 2 other openings one for irrigation and the other for suctioning.
CONCLUSION:This is a cheap affordable training model and may have a place in the development of newer and cheaper scopes.

FL-071

Special Topic: Other

Development of a cost effective biodegradable Endoscopic Third Ventriculostomy (ETV) training model

Ramesh Teegala

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OBJECTIVE:Laboratory training models are essential for enhancing the surgical skills, especially for neuroendoscopy. The closer to live surgery the training model is, the greater the benefit to trainees. To create a cost effective training model for Endoscopic third ventriculostomy (ETV), which can mimic real surgery is the main objective. Author designed this innovative model to mimic the normal ETV surgery.
MATERIAL-METHODS:The training model contains a small container having a lid with 1.5cm central opening. The bottom of the container is filled with thermacol, cork or similar other materials. Gelfoam material cut in a tangential manner is glued to the above material. On the top of the gel foam two small, round biodegradable pellets to mimic the mammillary bodies are disposed and fixed with glue. A biological membrane to mimic the tuber cinereum is disposed over said biodegradable pellets. A basilar artery pulsating model was incorporated. This assembly is placed in a used green coconut and fixed with an adhesive. The coconut is then filled with clear water resembling the ventricular cavity.
RESULTS:Nearly 125 trainees have tested this model and their performance and satisfaction of ETV on the model was evaluated with different parameters. About 90-95% satisfaction rate was observed among the trainees and they found it was very useful model for basic endoscopic third ventriculostomy training
CONCLUSION:This model mimics the human anatomy of third ventricular floor. Floor of the third ventricle, working in water environment and feel of perforation of membrane simulated this model to real surgery. These kinds of cost effect models are very useful for training.

FL-072

Special Topic: Neuro-Oncology

Third Ventricular Mass Lesions in Children: Role of Endonasal & Transventricular Endoscopy

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OBJECTIVE:The efficacy of endonasal endoscopy (EE) and transventricular endoscopy (TVE) is often debated for third ventricular lesions in children. This study was to evaluate the efficacy and safety of EE and TVE in pediatric third ventricular lesions.
MATERIAL-METHODS:Children with predominant third ventricular lesions who underwent EE or TVE endoscopic procedures were studied for their clinical features, degree of visual impairment, radiology, hormonal status, surgical procedure performed, extent of radiological resolution, need for additional surgery, adjuvant radiation and other complications. Predominantly suprasellar craniopharyngiomas were excluded.
RESULTS:Out of 21 children studied, there were 10 third ventricular craniopharyngiomas (upto 5 cm), 4 arachnoid cysts, 2 hypothalamic gliomas, 2 tectal gliomas, and 1 case each of pineal parenchymal tumor of intermediate differentiation, giant (6 cm) cavum velum interpositum colloid cyst and giant (6 cm) benign tectal cyst. Most common visual finding was bitemporal deficits. Hypocortisolism was noted in most craniopharyngiomas. All children with craniopharyngiomas underwent endonasal endoscopic surgery, resulting in 80% gross total resection, 90% improvement in vision, 80% DI and 10% CSF rhinorrhoea. Hypothalamic gliomas underwent EE partial resection and TVE biopsy in 1 each followed by chemo-radiation. All others underwent TVE. Radiological resolution could be achieved in colloid cyst and 75% of arachnoid cysts. Hydrocephalus in posterior third ventricular lesions resolved in all. Radiation was given to residual lesions except tectal glioma.
CONCLUSION:Endonasal endoscopy is effective in children even with large third ventricular craniopharyngiomas, while transventricular endoscopy is effective even for giant cystic third ventricular lesions and biopsy.

FL-073

Special Topic: Neuro-Oncology

Endonasal endoscopic excision of orbital lesions in pediatric population

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OBJECTIVE:To evaluate the feasibility and safety of endonasal endoscopic surgery for orbital lesions in pediatric patients.
MATERIAL-METHODS:The study was performed by retrospective review of the medical records of the pediatric patients

of orbital lesions operated in our department with endonasal endoscopic approach.
RESULTS:Six (Male 3, female 3) pediatric patients (age <18 years) of orbital lesions presented with unilateral progressive proptosis (n=6), restriction of eye movement and diplopia (n=5), visual deterioration (n=6) and unilateral blindness (n=5). MRI was suggestive of intraconal (n=5) and extraconal (n=1) lesions. The lesions were excised by pure endoscopic endonasal approach in all the cases. Histology was suggestive of pilocytic astrocytoma (n=3), cavernous hemangioma (n=1), meningioma (n=1) and mesenchymal tumor (n=1). The extent of excision was total (n=5) and subtotal (n=1). Post-operatively propotosis resolved and vision remained static in all the cases. following surgery, transient ophthalmoparesis occurred in 3 cases.
CONCLUSION:Endnasal endoscopic approaches to pediatric orbital lesions is feasible, safe, minimally invasive and bears excellent outcome.

FL-074

Special Topic: Neuro-Oncology

Outcomes Following Endoscopic Endonasal Resection of Sellar and Suprasellar Lesions and Associated Use of Endonasal Flaps in Pediatric Patients

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OBJECTIVE:OBJECTIVE: The endoscopic endonasal approach (EEA) is emerging as a credible surgical alternative for resection of sellar and suprasellar lesions such as pituitary adenomas, craniopharyngiomas, and Rathke cleft cysts. However, the application of this surgical approach to pediatric patients poses several unique challenges that have not yet been well evaluated. The authors evaluated the safety, efficacy, and outcomes associated with the use of the endoscopic endonasal approach for treatment of these pathologic entities in pediatrics patients. Additionally, we examined our use of the endonasal flap in our EEA cases.
MATERIAL-METHODS:Materials-METHODS: We performed a retrospective review of 30 pediatric patients who underwent EEA and recorded surgical endocrine and ophthalmological outcomes, as well as complications. We reviewed the use of 14 endonasal flap in 13 patients.
RESULTS:RESULTS: Of The 30 pediatric patients, 9 had pituitary adenomas, 12 had craniopharyngiomas, and 9 had Rathke cleft cysts. Twenty-three(77%) patients had gross-total resection determined by 3 month postoperative MRI and 22(73%) remain disease free to date. Eleven (37%) patients experienced improvements in their vision and 11 (37%) experienced improvements in anterior pituitary function. Complications included new endocrinopathy in 6 (20%) patients, new permanent diabetes insipidus in 5 (17%) patients, headaches in 5 (20%) patients, vasospasm/stroke in 3 (10%) patients, and CSF leak in one patient (3%) without and endonasal flap. The peri-operative mortality rate was 0% and the mean follow up period was 37 months. Of the 14 endonasal flaps used, no CSF leaks were found.
CONCLUSION:CONCLUSION: This study highlights the endoscopic endonasal approach as a safe, effective, and less morbid surgical alternative for the management of sellar and suprasellar pathologies in pediatric populations with excellent otucomes and minimal complications. When the endonasal flap is used, the risk of csf leak is greatly reduced.

FL-075

Special Topic: Hydrocephalus

Hydrocephalus prevalence and its perioperative treatment in pediatric brain tumor patients – a 6 years retrospective single center survey

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OBJECTIVE:The perioperative treatment of hydrocephalus in pediatric brain tumor patients remains heterogeneous due to different tumor entities, locations, growth patterns, patient age, and local policies. We analyzed our brain tumor patient database regarding the perioperative treatment modalities for hydrocephalic brain tumor patients in 2010 to 2016.
MATERIAL-METHODS:The brain tumor database was examined in regard to the prevalence of hydrocephalus in the different tumor entities and the perioperative treatment. 405 tumor operations were recorded in our department in 242 patients within 6 years (total/subtotal/partial removal/biopsy). The mean age at tumor-intervention was 7.6 ± 5.23 years of age (133 male patients (54.9%) and 109 female patients (45.1%)). Cerebrospinalfluid (CSF) diverting procedures such as external ventricular drainage (EVD), endoscopic third-ventriculo-cisternostomy (ETV) and ventriculo-peritoneal-shunting (VPS) in the period of 2010-2016 were documented.
RESULTS:122 (50.4%) patients of 242 patients needed a CSF diverting procedure. Prior to the targeted tumor surgery 86 (35.5%) patients received a hydrocephalus related intervention (23 (27%) ETV, 57 (66%) EVD and 16 (17%) VPS). At

admittance 12 (13.9%) patients were already treated with a CSF-shunting procedure. Postoperatively 29 (11.9%) patients were treated with an ETV (n=7; 17.2%) or VPS (n=22; 75,8%). Temporary CSF-diversion was indicated in 37.3% of the patient in pilocytic astrocytoma, 32.2% in anaplastic ependymoma, 33.4% in medulloblastoma and 39.2 % in ATRT. Permanent CSF-diversion was undertaken either by ETV (n=30) or VPS (n=36) in 66 patients total. The ratio to diagnosis for permanent CSF-diversion was as following: 14.6% pilocytic astrocytoma, 35.2% anaplastic ependymoma, 35.2% medulloblastoma an 34.1% ATRT.
CONCLUSION:We conclude therefore a rate of 50.4% for a CSF-diverting procedure in pediatric brain tumor patients at which 14.8% (n=36) of the patients depended on a VPS within the study period.

Wednesday, 10 October 2018
14:35 – 15:30

Parallel Session: Craniofacial

FL-077

Special Topic: Craniofacial

Cranial shape comparison for objective open craniosynostosis surgery planning

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OBJECTIVE:In craniosynostosis, one or more sutures within the new-born's skull are closed prematurely, causing deformed skull growth. During open cranial vault reconstruction, the surgeon divides the skull in osseous panels and remodels the skull. Currently, this is based on the interpretation and experience of the surgical team. We developed an algorithm that allows the comparison of the patient's cranial shape with a reference, as first step towards a fully automated objective pre-operative planning technique.
MATERIAL-METHODS:Skulls and objects were represented as mesh data. Shapes were matched by comparing curvature maps that represent the gaussian curvature distribution for an n-neighbourhood. We validated our algorithm on an artificial test object and tested the algorithm for recognising symmetrical shape on an average skull. We let the algorithm find the region on a trigonocephalic skull that maximally corresponded in shape with a reference shape, selected on the average skull at a normally-reconstructed site.
RESULTS:Our algorithm recognised the region on the artificial object, that corresponded in shape with the region selected on a rotated version of this object (Figure 1). Also, the algorithm was able to find the temple contralateral to the selected temple on the average skull (Figure 2). Finally, the algorithm selected a region on the parietal bone of the trigonocephaly skull as corresponding shape to the reference shape (Figure 3).
CONCLUSION:Our algorithm enables fully-objective comparison of cranial shapes. Further work should focus on surgical restrictions and implementing a cost function that creates a reconstruction plan that will establish a cranial shape that maximally corresponds in shape with a reference.

FL-078

Special Topic: Craniofacial

What is the real prevalence of positional plagiocephaly in children and adolescents?

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OBJECTIVE:Since 1992 there was documented increase in the incidence of Positional Posterior Plagiocephaly(PPP) following the American Academy of Pediatric(AAP) recommandations of "Back to Sleep". The natural history of PPP is still unclear. The aim of this study is to understand the actual prevalence and severity of PPP in unselected pediatric population.
MATERIAL-METHODS:A total of 165 patients were enrolled, ranging from 0 to 18 years, submitted to a head CT scan at Hopital Mère Enfant of Lyon after negative head trauma during the period September 2016-September 2017. Cranial Vault Asymmetry Index (CVAI) was calculated at the level of the superior orbital rim and 3,5 % was considered as threshold of asymmetry. The results were analysed according to different age: Group I: 1month to 12 months of age (37 patients), group II: 2 to 4 years (32), group III: 5 to 8 years (36), group IV: 9-12 (27), and group V: 13-18 years (33) and

severity of asymmetry: mild group (CVAI range: 3.5–7%), moderate group (CVAI range:7–12%) and severe group (CVAI>12%).
RESULTS:The total prevalence of PPP was of 25%. The prevalence in Group I was estimated to be 40,5%, 15,6% in Group II, 30,5% in Group III, 18,5% in Group IV and 12% Group V.

The degree of deformation varied from 3.5% and 15.09%, most children having a mild asymmetry. The degree of the asymmetry varied according to the age groups but moderate asymmetry could be found at all ages even in Group IV and V. One child (Group II) presented a severe asymmetry.
CONCLUSION:This study analysing PPP in an unselected unbiaised pediatric population, confirms that the prevalence of deformational plagiocephaly is more common than usually reported and that PPP persists at a late age.

FL-079

Special Topic: Craniofacial

Craniosynostosis with coronal suture involvement: anterior plagiocephaly, brachycephaly and multiple sutures synostosis

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OBJECTIVE:The coronal suture is the second most commonly involved in all cases of craniosynostosis. Unilateral involvement, that manifests as anterior plagiocephaly, is twice more frequent than bilateral, that manifests as brachycephaly. The aim is to review the surgical results in patients with coronal synostosis unilateral, bilateral or in association with other sutures.
MATERIAL-METHODS:From 334 patients who underwent surgery for craniosynostosis from 1996 to 2017 by the senior author (JWJB) 85 patients were studied (25%) with involvement of coronal suture. The surgical technique consisted of bilateral frontal craniotomy and unilateral orbital advancement for anterior plagiocephaly and bilateral fronto-orbital advancement for brachycephaly. Syndromic diagnosis was made on clinical basis with no molecular testing.
RESULTS:Boys were 41 and girls were 44 with an average age of 12 months (13 days to 6 years) and average weight of 9 kg (3 to 19 kg). Most cases, 65 (76%), were non-syndromic with 36 unilateral, 12 bilateral and 17 with multiple sutures involvement.

20 (24%) cases were syndromic with 2 unilateral coronal, 7 bilateral coronal and 11 multiple sutures. The identified syndromes were: Crouzon 13, Saethre –Chotzen 3, Apert 2, Carpenter 1 and 1 chromosomal anomaly. Overall, multiple suture involvement was found in 28/85 patients (33%) being 17/65 (26%) in non-syndromic cases and 11/20 (55%) in syndromic cases. Complications were seen in 11 patients (13%). 3 dural tears, 2 externalization of wires, 2csf leak, 1 sepsis, 1 subgaleal collection that needed drainage, 1 wound infection and 1 externalization of a resorbable plate. There was no mortality.
CONCLUSION:Coronal suture synostosis is associated with a high rate of multisutural involvement and syndromic cases increasing the challenge for the surgical team. The best surgical results for craniosynostosis, with no mortality and low morbidity can be achieved even in the most difficult cases with fronto-orbital advancement and multisutural involvement.

FL-080

Special Topic: Craniofacial

Treatment And Results In Anterior Plagiocephaly: The Respective Role Of Surgery And Genetic Pattern On Outcome

Marika Furlanetto[1], Veronica Saletti[1], Alessandra Erbetta[1], Mirella Seveso[1], Fabio Mazzoleni[2], Alberto Sommariva[1], Micol Babini[1], Laura Grazia Valentini[1]
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OBJECTIVE:Aim of craniofacial surgery is prevention or treatment of functional problems and gain of better craniofacial shape in terms of symmetry and proportion, without interfering with normal growth. Fronto-orbital cranioplasty, by reshaping and repositioning of cranial and orbital bone segments is the treatment of choice in growing patients, because autologous bone grafts provide lowest morbidity and don' t interfere with growth.
MATERIAL-METHODS:44 children (17 males and 27 females) affected by anterior plagiocephaly were treated in the cranio-facial department of FINCB. Age ranged between 5 - 26 months (average 9). All were treated with a cranioplasty, by a combined neurosurgical-maxillofacial team. Pre and post operative evaluation included clinical and ophtalmological examination, CT and pictures standardized in the same six

projection, magnification and landmarks. The genetic exam was performed in 32 cases, but the genes studied were different.
RESULTS:Longterm follow up showed: good reshaping in terms of orbital and facial symmetry by the combined approach, as documented by a parents' interview, in 85% of cases with a stabilization of good cosmetic results by rigid fixation. There were no lack of ossification or cranial vault deformities; ocular globe position and vision were adequate except in 15% with convergent strabismus requiring orthoptic surgery. 10 children had a positive genetic testing, while 22 were negative.
CONCLUSION:In favour of cranioplasty with fronto-orbital volet there is a more accurate bone remodelling, especially when a complex torsion is required; and a long-lasting stabilization after repositioning, preventing bone resorption. Accurate planning providing overcorrection of the defect in both remodelling and repositioning may partially compensate recurrence due to phenotype. No influence by the genetic pattern was observed, nor on the cognition, neither on the surgical results. Against there are need of blood transfusions and the double step surgery to remove metal plates.

FL-081

Special Topic: Craniofacial

Caregiver stress in children with craniosynostosis: A systematic literature review

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OBJECTIVE:Craniosynostosis occurs approximately 1 in 2500 births. As this is a diagnosis most common in infants and often requires surgical treatment, this is a significant and stressful ordeal for caregivers. Caregiver stress impacts various outcomes for the child, and little is understood and known about caregiver stress in the pediatric craniosynostosis population. We present an overview of the literature on caregiver stress in children with craniosynostosis and report common trends in the literature.
MATERIAL-METHODS:A literature search for all articles pertaining to craniosynostosis and parental/caregiver stress was conducted using PubMed, Embase, PsychINFO, and CINAHL databases.
RESULTS:Seven articles on caregiver stress in craniofacial abnormalities patients, 6 in craniosynostosis patients, and 3 articles craniosynostosis repair patients specifically were identified. Three articles on parental satisfaction after craniosynostosis repair were also identified and included in the review. Few published studies exist in the literature on caregiver stress in children with craniosynostosis and no clear trends were identified. It is evident that caregiver stress significantly affects the psychosocial outcomes of children with craniosynostosis. However, there are an equal number of studies reporting significant differences in caregiver stress in children with craniosynostosis as those reporting no significant differences.
CONCLUSION:There is evidence that caregiver stress affects psychosocial outcomes of children with craniosynostosis, but no clear trends of either increased or decreased levels of stress were identified in caregivers of children with craniosynostosis. Additional research is needed to identify risk factors related to caregiver stress.

FL-082

Special Topic: Craniofacial

A population-based numerical model for performance prediction in spring cranioplasty

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OBJECTIVE:Spring assisted cranioplasty (SAC) has proved to be a safe and effective method for the correction of scaphocephaly. However, this procedure's outcomes are still uncertain due to an incomplete understanding of the skull-distractor interaction. Recent works have shown that the distractor performance and cranial reshaping can be predicted numerically using finite element modelling: we aimed hereby to improve numerical predictions by means of population-specific biomechanical cranial properties.
MATERIAL-METHODS:Pre-SAC computed tomography (CT) images, spring models and spring force measurements on-table and at day 1 follow-up (F_M) were retrieved from 10 SAC patients (age = 5.5±1.2 months). 3D calvarial models were created using SCANIP®. Spring expansion was modelled using finite element modelling (ANSYS®) using a viscoelastic material. Data relative to bone biomechanical (elastic and viscoelastic) properties were initialized to literature values and reference spring force values (F_R) were retrieved in this configuration. Design of Experiment was used to assess the parametric correlation between simulated

expansion and input biomechanical properties: bone stiffness (Young's modulus) was varied between 25% and 140% of the reference literature value (421Mpa), while total viscous relaxation was varied between 83% and 99%. A final simulation was run to estimate the value of spring force after material optimization (F_OPT) and compared with the baseline values F_R and measurements F_M (average spring force was used for comparison).
RESULTS:The use of the population model improved the prediction of average distraction force at insertion (F_R = 10.7±2.3N, F_OPT=9.6±2.6N, F_M=9.3±3.0N) and at FU (F_R= 6.0±1.7N, F_OPT=4.7±1.4N, F_M=3.9±2.5N). The estimation error was reduced both at insertion (1.4±1.8N vs 0.3±1.5N, p=0.014) and at FU (2.1±1.4N vs 0.8±1.6N, p=0.002).
CONCLUSION:This work shows that performance prediction in SAC can be improved by means of population specific biomechanical properties: this will help create a personalised tool for surgical planning of scaphocephaly correction

FL-083

Special Topic: Craniofacial

Management options in non-syndromic sagittal craniosynostosis. how to choose? Our experience based on 104 patients using different techniques

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[4]Department of Neurosurgery, Universidad de Los Andes

OBJECTIVE:There are multiple surgical techniques described to treat non-syndromic sagittal synostoses. Currently there is no consensus about which surgery is best, or how to select techniques for specific patients. The objective of this paper is to find criteria to choose different surgical approaches, based on our serie of cases.
MATERIAL-METHODS:We reviewed clinical data and images from 104 patients operated for non-syndromic scaphocephaly between 2012 and 2018 in two neurosurgical centers. We obtained Information about: chosen surgical technique, age of intervention, follow-up time, and changes in the cranial index. In addition, aesthetic considerations of the outcome were recorded in those patients who could be followed.
RESULTS:From a total of 104 patients, 13 underwent open cranial remodeling, one had endoscopic suturectomy with subsequent helmet use, and the remaining 90 patients were treated with different types of Springs-asisted distraction. The mayor difference in cranial index was achieved in the open remodeling group as well as the best aesthetic result. In the group of patients distracted by Springs, the least impact on IC was in those patients operated after 6 months of age, even when they had more average time for distraction. The patient who underwent endoscopic suturectomy achieved a normal CI 5 months after surgery and an excellent cosmetic result.
CONCLUSION:The age when surgery is performed seems to be a significant factor for choosing a surgical technique. According to our experience, good age limits would be: 3 months for endoscopic suturectomy and 6 months for distraction with Springs. More cases are needed to compare the three techniques and their results. Based on this paper, it seems important that each center can offer a variety of surgical alternatives adjusted to each patient, it is also essential to do the diagnosis of non Syndromic Craniosynostosis is as early as possible for better surgicall results.

FL-084

Special Topic: Craniofacial

A statistical shape modelling framework to assess morphological outcomes in spring assisted cranioplasty

Pam Heutinck[1], Paul Knoops[1], Naiara Rodriguez Florez[2], Stéphane Couvreur[3], Benedetta Biffi[3], William Breakey[1], Maarten Koudstaal[4], Silvia Schievano[1], David Dunaway[1], Owase Jeelani[1], Alessandro Borghi[1]
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OBJECTIVE:Spring assisted cranioplasty (SAC) has been adopted at Great Ormond Street Hospital (GOSH) for the treatment of patients under 6 months affected by scaphocephaly. We hereby present a methodology for quantitatively assessing the effect of SAC based on Statistical Shape Modelling (SSM).
MATERIAL-METHODS:3D models retrieved from CT scans of GOSH patients affected by non-cranial related pathologies (NORMAL, n = 66) as well as 3D surface scans of SAC patients performed before the procedure (PRE, n = 53) and at the time of removal (REMOVAL, n = 23) were collected from the GOSH craniofacial database. Each 3D model was similarly pre-processed and registered. SSM (performed using Deformetrica, a non-parametric, non-landmark-based approach - www.deformetrica.org) and principal component analysis (PCA) were performed on a combined population including all the models. t-Distributed Stochastic Neighbour

Embedding (tSNE) plots were used to visually assess group clustering.
RESULTS:PCA showed that the first 11 shape modes of variations (which characterize the dominant contributors to 3D shape variability) represent 91% of the total shape variability within the combined population. The first shape mode (Mode 1) captured size, with REMOVAL scans associated with statistically larger values than NORMAL ($p<0.001$) as well as PRE ($p<0.001$). Mode 2 showed a strong correlation with cranial index ($r = -0.82$, $p<0.001$); REMOVAL values of mode 2 were statistically different from both PRE ($p<0.001$) and NORMAL ($p<0.001$), although quantitatively closer to the latter. tSNE plot showed distinct clustering among the three groups.
CONCLUSION:SSM is a useful tool to assess the effect of surgical correction of non-syndromic craniosynostosis: this work describes a quantitative method for assessing complex morphological outcomes and understanding the limitations of SAC. Future developments will address the comparison of different surgical techniques in view of maximizing aesthetic outcomes in the treatment of scaphocephaly.

FL-085

Special Topic: Craniofacial

Neurosurgeon Opinions Related to Surgery for Metopic Craniosynostosis

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OBJECTIVE:Based on the lack of definitive evidence for treatment of metopic craniosynostosis in the literature, we conducted an online survey to determine neurosurgeons' opinions regarding treatment.
MATERIAL-METHODS:Members of the International Society for Pediatric Neurosurgery were queried using Survey Monkey (n=212). The survey consisted of two clinical case studies of children with metopic craniosynostosis with five questions each. The first case study featured a one year old girl with a metopic ridge, normal development, and no signs of increased intracranial pressure (ICP). The second case study featured a one month old boy with metopic synostosis, trigonocephaly, normal exam, soft anterior fontanel, and no signs of increased intracranial pressure. Respondents were asked if surgery was recommended, the reason for surgery (if recommended), the likelihood of future problems with increased ICP, and predicted outcomes if no surgery was performed.
RESULTS:There were 75 responses with 41.4% having 20+ years in practice. For the first case, most (94.5%) did not recommend surgery and 67.6% were not concerned about future increased ICP. Of those who would not recommend surgery, 49.3% believed that in 10 years the ridge would remain unchanged and 46.5% believed it would improve. For the second case, 93% recommended surgery for the following reasons: appearance (60.6%), concern for developmental delay (15.2%), and increased ICP (10.6%). An open procedure was recommended by most neurosurgeons (71.2%) instead of the endoscopy assisted strip craniectomy (28.8%). Most rated the likelihood of increased ICP as <10% (37.1%), with the rest predicting: 10-24% (25.7%), 25-50% (15.7%), and 51-100% (4.3%).
CONCLUSION:The majority of surgeons agreed on the need for non-operative versus operative treatment in each case, but we observed a significant variation in opinions regarding long term prognosis and the risk of raised intracranial pressure.

FL-086

Special Topic: Craniofacial

Trigonocephaly: surgical treatment in 51 cases

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OBJECTIVE:The premature closure of metopic suture results in a skull deformity with a triangular head shape called trigonocephaly. Normally all the metopic sutures should be close with 9 months of age. There has been an increased incidence of this type of synostosis, recently. Surgery is indicated to restore the skull volume and correct the deformity. The aim is to review the surgical experience in the treatment of trigonocephaly.
MATERIAL-METHODS:51 patients operated between 1996 and 2017 were studied by the senior author (JWJB). Demographics, weight, blood loss and complications were

recorded. The surgical technique consisted in bilateral frontal craniotomy with remodeling and bilateral supraorbital advancement. Patients had the tracheal tube removed at the end of surgery and received a post-operative care in the pediatric intensive care unit.
RESULTS:Boys were 35 (69%) and girls were 16 (31%) with an average age of 10 months (5,7 mo to 2 years) and average weight of 9 kg (6 to 14 kg). Most cases, 50 (98%), were non-syndromic with only one case with Rethore syndrome(46 XX, del 9). Resorbable plates were used in 26 patients (51%) for bone fixation. Bone cement was used in 7 patients. Only one patient needed reintervention to correct irregularities in the forehead secondary to bone cement. Complications occurred in 5 patients (12%): 3 externalization of wires which needed to be removed, 1 case with excessive blood transfusion, 1 pulmonary infection/atelectasia and 1 case with bone cement irregularities. There was no surgical mortality. Aesthetic results were considered excellent in 45 cases (88%). Less satisfactory results were seen in 6 patients: 3 cases persisted with some depression in the temporal fossa and 3 cases persisted with some irregularities in the forehead.
CONCLUSION:Excellent surgical results for trigonocephaly, with no mortality and low morbidity can be achieved with an experienced surgical team.

FL-092

Special Topic: Craniofacial

Anterior Plagiocephaly Surgery and 3D Printing Technology

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OBJECTIVE:Report the anterior plagiocephaly preoperative planning using customized 3D printing models.
INTRODUCTION: Anterior plagiocephaly results from the premature fusion of a unilateral coronal suture, and surgery is the most suitable treatment for its definitive correction. Currently the anterior plagiocephaly preoperative planning consists in images analysis (computerized tomography and magnetic ressonance) which enables cephalometric measurements by three-dimensional reconstruction; however, mostly these images does not provide the appropriate condition for the spatial anatomy visualization by the surgeon. The customized 3D printing models (named biomodels) were developed as an alternative to solve these limitations. Biomodels are bones or organs replicas in real dimensions, which reproduce the individual anatomy of each patient, being possible to obtain accurate size and format of the target structure.
MATERIAL-METHODS:The present report describes two cases of anterior plagiocephaly whose surgical correction was planned using 3D printed models. One patient was submitted to a primary surgical approach and the other to a relapse correction.
RESULTS:The 3D models enabled a detailed multidisciplinary discussion of the aspects of the surgical approach and a better post-op follow up by the intensive care physicians. This study evidenced intra-operative time reduction, accurate osteotomies planning, prior osteosynthesis material contouring, hospital day length reduction and better family's understanding of the proposed surgical plan.
CONCLUSION:In anterior plagiocephaly surgery, 3D modeling may be a useful complimentary tool in surgical preoperative planning, which adds safety to the procedure and potentially contributes to a better outcome.

FL-093

Special Topic: Craniofacial

Metopic synostosis: pre and post-operative evaluation of craniofacial deformities

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OBJECTIVE:This study was designed to examine quantitatively, the preoperative main changes and postoperative corrections of the deformities of patients with trigonocephaly. Only patients that had undergone pre and postoperative CT scan measurements were included.
MATERIAL-METHODS:We report on 22 consecutive cases out of 148 children with metopic synostosis who underwent a fronto-orbital advancement associated with a bone graft at the fronto-temporal area to avoid bitemporal depressions. Quantitative assessment of the deformities was carried out on standard axial-sliced CT scan images. The following distances was obtained: the intercoronal; the lateral orbital wall, the intertemporal, and the anterior interorbital. The results were compared with age matched normal standards, and analysed by Student's t tests (significance = $p<0,05$) (Minitab 17 Software). An aesthetic appraisal of the fronto-orbital remodeling and advancement was based on family views
RESULTS:The mean age at surgery was 13,2 months (range 5 – 38 months). Gender distribution male/female was 13/9= 1.44. The preoperative assessment of the tomographic

measurements compared to the age matched control, showed: intercoronal 74% of the normal, the lateral orbital wall 85% of normal, the intertemporal 83% of normal, and the anterior interorbital 71% of normal. The post-operative measurement presented with improvement of all distances, and comparing to the normal age matched values: intercoronal was corrected to 105%, the intertemporal increased to 104%, the lateral orbital wall improved to 98%, and the anterior interorbital was significantly increased (P<0,05) but remained undercorrected at 94% of the normative data. In only two patients some degree of fronto-temporal depression was a concern.
CONCLUSION:The fronto orbital remodeling and advancement promotes a true corrections of the craniofacial deformities in the metopic synostosis. Bone grafting at the fronto-temporal corner may help to prevent the fronto-orbital depression

FL-094

Special Topic: Craniofacial

Fixation of cranial vault distractors with resorbable pins

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OBJECTIVE:Posterior cranial vault distraction (PCVD) is a popular technique widely used especially in patients with syndromic craniosynostosis, who need to have significant increase in intracranial volume. Traditionally the devices are fixed to the bone by titanium screws. This has several disadvantages, like a risk of dural tear by the sharp tip of the screw and prolonged device removal time with wide tissue exposure. We present our experience with application of resorbable sonic pins for distraction device fixation.
MATERIAL-METHODS:Since October 2015 in the Burdenko Neurosurgery Institute, Moscow, Russian Federation, resorbable sonic pins are used to fixate distraction devices during PCVD. We present here data on 7 consecutive cases where 2.0 mm pins were used and the patients were followed until device removal was performed in average 5 months after the primary operation. The PCVD was done in traditional way as described earlier. In each case two devices were fixed with 12 pins each, thus 6 pins were for each footplate.
RESULTS:The patients mean age at operation was 26 mo. Three patients had Apert, two had Crouzon and two had unknown syndromes. On control CT prior to device removal in two patients loosening of posterior footplates with relapse were noticed. Though in these cases achieved volume increases were smaller than planned, both patients benefited from the operation and there was no need for re-operation. There were no complications related to the usage of the pins. The detachment of devices from the bone after consolidation period was easier since there was no need to screws removal. Due to that removing of devices was faster and could be done from smaller incisions.
CONCLUSION:Resorbable sonic pins alone can be used for device fixation in PCVD procedures. Like in PCVD were titanium screws are used risk of device loosening with relapse should be bared in mind.

FL-095

Special Topic: Craniofacial

Cranioplasty for Macrocrania: Guided by Computer aided design & three dimensional printing technique

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OBJECTIVE:The Macrocrania disease is a rare condition, mostly caused by hydrocephalus. It will be happened if hydrocephalus wasn't treated at infant. There are few reports of vault reduction cranioplasty for macrocrania. Normally, many pieces of the skull of cutting and splicing is necessary during the operation. In recent years, the technique of computer aided design is used before the operation, but can't be used during the operation.
MATERIAL-METHODS:4 cases of macrocrania was treated. We optimized the "normal way": only 4 self-fitted pieces of skull is designed in the vault reduction cranioplasty. We invent a series of navigation boards to guide our skull cutting and rebuilding during the operation. All the navigation boards was made in 3D printer and sterilized in high pressure steam. A retrospective method was practiced for all patients: including surgery, hospitalization time, measurement of preoperative and postoperative complications, and evaluating.
RESULTS:All patients (2 male and 2 female) was an average age of 43.3 months. The average operation time was 6 hours, the estimated blood loss was 800 ml (including one cases of self-blood-transfusion). The average hospital stay was 26.7 days. All patients without helmet fixed, and the cost averaging was ¥35825.9. The mean reduced volume of skull was 755ml. The head circumference was reduced from 64cm to 59.5cm.

CONCLUSION:Macrocrania often occurred in the economic underdeveloped district of China. How to treat macrocrania in a low cost and good treatment way is important. Our technology can offer choice to the patients. This plan consists of a series of surgical techniques: precise preoperative surgical designing, nasal intubation, blood transfusion controlling, intraoperative accurate skull cutting and splicing. We can accurately know the degree of shrinkage skull before surgery, and without helmet fixed after operation.

Thursday, 11 October 2018
08:45 – 09:03

Flash Presentations: Neurotrauma

FL-096

Special Topic: Neurotrauma/Critical Care

North American Survey on the Post-Neuroimaging Management of Children with Mild Head Injuries

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OBJECTIVE:There remains uncertainty regarding the appropriate level of care and need for repeat neuroimaging among children with mild traumatic brain injury (mTBI) complicated by intracranial injury (ICI). This study's objective was to investigate physician preferences for and attitudes toward the management of these patients.
MATERIAL-METHODS:We surveyed residents, fellows, and attending physicians from the following pediatric specialties: emergency medicine; general surgery; neurosurgery; and critical care. Participants came from 10 institutions in the United States and an email list from the Canadian Neurosurgical Society. The survey asked respondents to indicate management preferences and influences for children with mTBI complicated by ICI, focusing on an exemplar clinical vignette of a 7-year-old female, Glasgow Coma Scale score 15, with a 5-mm subdural hematoma without midline shift after a fall down stairs.
RESULTS:The response rate was 52% (n=536). Overall, 326 (61%) respondents indicated they would recommend ICU admission for the child in the vignette; yet only 62 (12%) agreed/strongly agreed that this child was at high risk of neurological decline. Half of respondents (45%; n=243) indicated they would order repeat neuroimaging, including a follow-up CT (29%; n=155) and/or MRI scan (19%; n=102). However, only 63 (12%) agreed/strongly agreed that repeat neuroimaging would influence their management. While respondents endorsed a variety of influences on level-of-care decisions, 42% indicated they would admit all children with mTBI and ICI to the ICU. Most respondents (77%; n=411) supported involving family in their level of care decision, but 473 (88%) also endorsed one or more barriers to shared decision making.
CONCLUSION:Most physicians surveyed supported ICU admission and half endorsed repeat neuroimaging for the

child in this vignette, despite uncertainty regarding the clinical utility of those decisions. These results may help guide the development and implementation of evidence-based decision tools for managing children with mTBI complicated by ICI.

FL-097

Special Topic: Neurotrauma/Critical Care

Outcomes of severe TBI in children, the possibility of prognosis and monitoring

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OBJECTIVE:We aim to determine prognostic factors that can influence the outcome of severe TBI in children.
MATERIAL-METHODS:169 patients with severe TBI were included. Conciseness was evaluated using GCS. Severity of concomitant injuries was evaluated using ISS. CT-scanning was used on admission and later. Intracranial injuries were classified using Marshall CT scale. ICP monitoring took place in 80 cases. Serum samples of 65 patients were tested for S-100β protein, in 43 patients – for NSE. Outcomes were evaluated in 6 month after trauma using GOS. Statistical and mathematical analysis was conducted. The accuracy of our prognostic model was defined in another group of patients (N=118).
RESULTS:GCS, pupil size and photoreaction, ISS, hypotension, hypoxia are significant predictors of outcome of severe TBI in children. CT results significantly complement the forecast. The accuracy of surviving prognosis came to 76% (0.76) in case of S-100β protein level ≤0.25 mkg/l and NSE level <19 mkg/l. Mathematic model of outcome prognosis was based on discriminate function analysis. Model of prognosis was tested on control group. The accuracy of prognosis is 86%.

Prognostic value of ICP is discussed. We use the average daily value of ICP and its standard deviation. We introduced new indicator "energy ICP" (E^2), which describes the dynamics of the process. E^2 value in the group of survivors <500 $mmHg^2$, the probability of accurate forecasting is 91%. Sensitivity 0.9, specificity 0.94.
CONCLUSION:Personalized prognostic model makes it possible to predict the severe TBI outcome in children at first day after trauma. Indicator "energy ICP" (E^2) is accessible and easy to perform in case of intracranial pressure monitoring possibility. This method has high specificity in the prediction of severe TBI outcome and can be a reliable tool for ICP control.

FL-098

Special Topic: Neurotrauma/Critical Care

Infrascanner_ in the diagnosis of intracranial lesions in children with traumatic brain injuries

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OBJECTIVE:The number of traumatic injuries among children is increasing. However, so-called mild TBI might result in unfavourable outcomes. Early diagnosis of intracranial haematomas prior to development of serious complications may be a decisive factor for a favourable outcome. InfraScan company developed and brought to the market the Infrascanner_ model 1000, which is a portable detector of blood collections that operates in the near infrared (NIR) band.
OBJECTIVE: To estimate the efficiency of the Infrascanner_ model 1000 for detection of intracranial haematomas among children with mild TBI.
MATERIAL-METHODS:Ninety-five patients with mild TBI were examined. An indication for

cerebral CT after mild TBI was the presence of risk factors of intracranial lesions. The Infrascanner was used by a neurosurgeon during primary examination. CT was performed in 43 patients (45%), while 52 patients (55%) with a low risk of intracranial lesions were under observation.
RESULTS:The results of examination of patients using CT and infrared scanning coincided in 39 cases and intracranial haematomas were detected in eight patients. False-positive results were obtained in three cases. The sensitivity of the procedure used in this group of patients with a medium and high risk of development of intracranial haemorrhages was 1.00 (0.66; 1.00). The specificity was 0.91 (0.81; 1.00)—the proportions and a 95% CI. The false-positive risk is 0.27 (0.00; 0.58). During infrared scanning in patients with low risk of intracranial lesions, false-positive results were obtained in four cases and false-negative results were absent.
CONCLUSION:Infra-scanning might be viewed as a screening technique for intracranial haemorrhages in ambulances and outpatient trauma centres in order to decide on hospitalization, CT scanning and referral to a neurosurgeon. Infra-scanning combined with evaluation of risk factors of intracranial damage might reduce the number of unnecessary radiological examinations.

FL-099

Special Topic: Neurotrauma/Critical Care

Prognostic Models of Lethality in Children and Adolescents with Severe Traumatic Brain Injury: a systematic review

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OBJECTIVE:To identify prognostic models of lethality for children and adolescents victims of severe traumatic brain injury and to describe their characteristics and qualities.
MATERIAL-METHODS:Cohort or case-control studies (in English or Portuguese, published between 2006 and June 2017) which developed or validated prognostic models of lethality for children and adolescents victims of severe TBI (Glasgow Coma Scale score ≤ 8) were searched using PubMed platform; the analysis of the studies and the risk of bias was accomplished using CHARMS tool, which evaluates the origin of the data, participants, predicted outcomes, candidate predictors, sample size, missing data, model development, performance, evaluation and results.
RESULTS:Ten studies that presented fifteen models were included, two of which were external validation studies and eight were development studies, without validation. All models used some clinical prognostic factor as predictor; age and Glasgow Coma Scale score were the two most common prognostic factors among the models. Most of the studies did not present any performance data of the analyzed models. The assessment of risk of bias was varied, showing that the studies found had low to high risk of bias between the domains analyzed; moderate to high risk of bias was found in the data origin axes, candidate predictors, data loss, performance and model evaluation.
CONCLUSION:Few models have been validated externally, which compromises their generalization to other populations. Most of the studies did not use prognostic model publication guidelines, which also prevents not only a complete understanding of the model developed, but also the adequate comparison between the characteristics of each study and each model developed.

FL-100

Special Topic: Neurotrauma/Critical Care

New entity of skull lesions due to birth trauma: Kanat (wing) fractures

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OBJECTIVE:To discuss a special type of skull lesion detected after delivery. We reviewed our experience on scalp swelling in term neonates to further investigate the relationship between cranial injuries and labour process
MATERIAL-METHODS:55 newborns presented with scalp swelling were included in the study. Cases were analysed on the basis of route of delivery, labour length, maternal and neonatal information and radiologic images of newborns. Cephalhaematoma, subgaleal hematoma/caput succedaneum, and skull lesions were diagnosed clinically and by using the two views of skull X-ray (PA and lateral). scalp swellings were divided in two groups. Cephalhaematoma and subgaleal haematoma. A radiologist and a paediatric neurosurgeon reanalysed all X-ray images. Afterwards, the diagnostic differences were noted including, previous-current diagnostic difference and current diagnostic difference of the each, both specialists performed the reinterpretation together, and consensus was achieved for contradicting diagnosis.
RESULTS:A special type of skull fracture, called Kanat (wing) fracture was detected. The fractures appeared unique, were located in the midline parietal bone, and were difficult to detect by X-ray. Kanat fractures account for 12,7 % of 55 cases (n = 7). Patients without (group-1) and patients with (group-2) Kanat fractures were compared based on the head circumference of the newborns (p = 0,881), foetal birth weight (p = 0,20), maternal age (p = 0,04), duration of second stage of labour (p = 0,217), maternal body mass index (p = 0,278), total labour time (p = 0,922) and parity (p = 0,375). No statistically significant difference between two groups was determined for the compared parameters
CONCLUSION:The present study is the first research describing and discussing the possible effects of maternal, foetal and delivery characteristics on Kanat fractures. Designing clinical and experimental researches to enhance awareness and acknowledgement of skull injuries and labour process could improve clinical outcome of the newborns

Thursday, 11 October 2018
09:03-09:20

Flash Presentations: Neurotrauma

FL-101

Special Topic: Neurotrauma/Critical Care

Cranioplasties following craniectomies in children: a multicenter, retrospective cohort study

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OBJECTIVE:In children, complications following cranioplasty after craniectomy with either autologous bone flaps or allografts are reported to be common, especially bone flap resorption. However, there is only sparse and single institute data available regarding cranioplasty strategies, complications and outcome. Therefore, we report the first multicenter cohort study on auto- and allograft cranioplasties following craniectomies for a variety of indications.
MATERIAL-METHODS:Four academic hospitals with a dedicated pediatric neurosurgical service included all consecutive children (<18yrs) who underwent a craniectomy (period 2008-2014) and subsequent cranioplasty surgeries. Data was collected regarding initial diagnosis, age, time interval between craniectomy and cranioplasty, bone flap storage method, type of cranioplasty, re-do cranioplasties and postoperative outcome including surgical site infection, wound breakdowns, bone flap resorption, and inadequate fit/disfigurement. The follow up period after cranioplasty needed to be at least one year.
RESULTS:Sixty-seven patients (19F;48M/ mean age: 9.3 ±5.7years) were eligible for inclusion. The mean follow up period after craniectomy was 6.9±2.7 years.

Forty-three cranioplasties (64%) after craniectomy were autologous, mostly cryosterilized boneflap re-implants. Twenty-four cases (56%) showed resorption. On average, this occurred at 433 days (range 68-1827 days) after re-implant cranioplasty. In the autograft group, twenty-one re-do cranioplasties were done. In 6 cases, a second re-do cranioplasty was needed.

In twenty-four of the post-craniectomy cases (36%), a direct allograft was used (eleven different types of implants). Infection, loosening or disfigurement prompted an allograft re-do cranioplasty in 4 cases (17%).
CONCLUSION:This first multicenter cohort study, with a relatively long FU period, has shown that bone flap resorption in children remains a common and widespread problem after craniectomies. Also, cranioplasty strategies appeared to vary over time within and among centers. Allograft cranioplasties revealed low morbidity and low rates of re-do surgeries. Still, longer term and prospective multicenter cohort studies are needed to optimize cranioplasty strategies in children who underwent a craniectomy.

FL-103

Special Topic: Neurotrauma/Critical Care

Post-traumatic hydrocephalus in pediatric patients: Presentation, management and outcome — An apex trauma centre experience

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OBJECTIVE:To assess Paediatric post traumatic hydrocephalus (PTH) with respect to the patient population, management, complications & clinical outcome in traumatic brain injury (TBI) patients.
MATERIAL-METHODS:This is a retrospective study conducted in an Apex trauma centre of the paediatric patients (18 years or younger) presenting with PTH. Clinical and radiological profiles of the patients were studied at initial presentation with trauma, at the time of PTH presentation, discharge and outpatient follow-ups.
RESULTS:Total of 38 patients was treated for PTH during the study period. Sixty six percent (66%) were males, while 34% were females with a mean age of 9.8 years (2-18 years). Ten patients (26%) were 3 years old or younger. Initial injury in majority of cases was severe TBI (58%), followed by moderate and mild TBI (21.0% each). The commonest initial CT findings were contusions in 58%, followed by subdural haemorrhage (39%) and subarachnoid haemorrhage (27 %). Thirty two (84%) patients underwent decompressive craniectomy (DC) at initial admission, and ICP monitoring was done in 61% cases. Clinical and biochemical meningitis/ventriculitis was observed in 39% cases. PTH was developed after a median period of 33 days following initial trauma. Eighteen patients (47 %) underwent temporary CSF diversion prior to shunt. Most common presentation of PTH was bulging flap (76 %), vomiting (58%) and seizures (42%). All patients

underwent VP shunt. Median GCS at admission was 10, while on discharge improved to 12 (median). Shunt malfunction and infection was observed in 29% and 3% respectively, requiring further intervention. Following VP shunt, 92% patients showed clinical &/or radiological improvement, while total mortality was 8%.
CONCLUSION:PTH is not uncommon, and is a treatable long term sequelae of TBI. VP shunt provides acceptable outcomes in patients for this potentially life threatening condition. A strong suspicion of PTH in followup period is warranted.

FL-104

Special Topic: Neurotrauma/Critical Care

Decompressive craniectomy in children with severe traumatic brain injury: a multicentric retrospective study and literature review

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OBJECTIVE:Severe traumatic brain injury (TBI) is the first cause of handicap in children. Refractory raised ICP can be a therapeutic challenge. When medical management is not sufficient, decompressive craniectomy (DC) can be proposed but its place is not clearly defined in guidelines.
MATERIAL-METHODS:We performed a retrospective and multicentric study to analyse the long-term outcome of 150 children with severe TBI treated by DC and try to identify prognosis factors.
RESULTS:In this series, we find a satisfying neurological evolution (represented by a KOSCHI score >3) in 62% of children with a mean follow up of 3,5 years. Mortality rate was 17%. Prognosis factors associated with outcome were: age, initial GCS, presence of mydriasis, value of neuromonitoring (ICP >30) and radiological findings (Rotterdam score ≥4).
CONCLUSION:This study with a large population confirm that children with severe TBI treated by decompressive craniectomy can reach a good neurological outcome. Further studies are needed to precise the place of this surgery in the management of children with severe TBI.

FL-105

Special Topic: Neurotrauma/Critical Care

The importance of the skull impact site in children with minor mechanism head injury

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OBJECTIVE:most current guidelines for head injury management in children do not include location of injury as a risk factor. Our goal was to determine whether the site of impact in a minor mechanism pediatric head injury is associated with the need for neurosurgical intervention.
MATERIAL-METHODS:A retrospective cohort study of head injury patients seen in the years 2000-2015, in a large pediatric trauma center in Toronto. We included all children ages 0-18 years undergoing a neurosurgical intervention for head trauma. We excluded patients with non-accidental trauma, chronic relevant illness, or missing key data points such as GCS score, mechanism of injury or impact site.
RESULTS:503 patients met the inclusion criteria. 241 patients remained as the cohort group after exclusion. 192 (80%) patients experienced a major mechanism of injury and 49 (20%) a minor mechanism. None of the patients with a minor mechanism had a site of impact that was outside the temporoparietal region.
CONCLUSION:We studied one of the largest cohort of pediatric patients undergoing neurosurgical intervention for head injury.

In our cohort, none of the children who suffered an accidental head injury sustained through a minor mechanism had a clinical site of impact in the occipital or frontal bones regions. These data suggest that injury location should be considered in assessing the need for neuroimaging in minor mechanism head trauma patients.

Thursday, 11 October 2018
09:10 – 09:37

Flash Presentations: Spine

FL-106

Special Topic: Spine

Congenital Scoliosis of the Pediatric Cervical Spine

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OBJECTIVE:There exists a paucity of literature describing surgical outcomes in cervical congenital scoliosis. We sought to report surgical outcomes in this cohort and to identify risk factors associated with complications
MATERIAL-METHODS:Data were retrospectively collected from a single-center cohort of 17 consecutive patients receiving surgical deformity correction for congenital cervical scoliosis.
RESULTS:The present cohort represented 9 males and 8 females with a mean age at surgery of 7.07 ±3.38 years and average follow-up of 3.06 ± 1.78 years. There were 24 operations performed on 17 patients, and 4 complications (17%) were reported in the series (decubitus ulcer, asystole, vertebral artery injury and pseudarthrosis). Greater than 50% correction in both coronal and sagittal planes was significantly associated with the use of osteotomies ($p=0.034$), corpectomies ($p=0.011$), discectomies ($p<0.001$), and anterior fusion ($p=0.011$). Greater correction in the coronal plane only was associated with higher number of levels fused ($p=0.008$) and complications ($p<0.001$). The mean preop Cobb was 36.0 ±20.0° which improved to 23.6±14.2° ($p=0.02$). The mean operative time was 8.01 ± 2.01 hours with a mean EBL of 298 ± 690 ml. Halo gravity traction was used in 5 patients and 6 cases were staged. The 4 complications were vertebral artery injury, pseudarthrosis, ulcer, and asystole.
CONCLUSION:Congenital scoliosis of the cervical spine is a complex process. Intuitively, anterior release procedures and techniques were associated with greatest deformity correction but also a higher risk of complications. These patients may have very abnormal anatomy and further research is necessary to delineate the appropriate balance of correction and risk. Spinal deformity of this nature is frequently managed successfully with carefully-planned and executed surgical correction.

FL-108

Special Topic: Spine

Vertebral Artery variations In pediatric CVJ Anomalies And Its Surgical Implications

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OBJECTIVE:Understanding of vertebral artery course and its variations in relation with C1 - C2 joint has become a necessity for planning safe surgery of pediatric cranio-vertebral junction anomalies. The present academic work is to assess abnormal course and medialisation of vertebral artery in relation to C1 and C2 vertebrae using CT Angiography as an investigating tool in pediatric age group.
MATERIAL-METHODS:The authors prospectively analyzed the data of 26 consecutive pediatric patients of CV Junction anomalies who underwent CT angiography followed by posterior fixation surgery between January 2015 and April 2016. Post operatively CT angiography was also performed in patients with vertebral artery injury on follow up.
RESULTS:Vertebral artery medialization (38.4%) presented as statistically significant factor for vertebral artery injury intraoperatively. An increased predisposition to vertebral artery injury was present in vertebral artery going from congenital foramen formed by occiput and C1 fusion (5.5%) and persistent first intersegmental artery (22.2%). AAD with occipitalization of atlas was also associated with significant verterbal artery injury (18.7%). Out of 26 patients in this study, three (11.5%) of them suffered vertebral artery injuries intraoperatively during C1-C2 joint exposure and/ or manipulation with fixation, but successful repair was done without any immediate post op complications.
CONCLUSION:Preoperative CT angiography was very useful for planning in our patients and it identified the potential risk factors that may cause VA injury. Abnormally located verterbral arteries were dissected and secured to avoid its injury. Also injured vessels were repaired intraoperatively with complete establishment of vascular flow.

FL-109

Special Topic: Spine

Complex Combined Neurosurgical and Orthopedic Spinal Procedures in Pediatric Patients: a Case based Study

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OBJECTIVE:Correction of spinal deformity in pediatric patients with associated neurological abnormalities, often related to syndromic or genetic diseases, requires complex multidisciplinary treatments. Many patients undergo combined neurosurgical and orthopedic spinal surgeries either as a single-stage treatment or by interval staging of the deformity correction and the neurosurgical procedure. Our aim is to present our single-center experience in patients who underwent complex combined neurosurgical and orthopedic spinal procedures within the last 5 years.
MATERIAL-METHODS:A retrospective review of all pediatric patients (<18 years old) undergoing a surgical procedure involving a pediatric neurosurgeon and a orthopedic spine surgeon over a 5 year period was performed. Medical charts were searched for baseline characteristics, underlying disease or syndrome, pathology indicating surgery, surgical procedure, results of intraoperative spinal cord monitoring and postoperative complications.
RESULTS:Out of all neurosurgical patients treated between the year 2013 and the year 2017, we included 16 patients undergoing a total of 18 combined neurosurgical and orthopedic spinal procedures. 62.5% (n=10) were females and and 32.5% (n=6) males, with a mean age of 12.5 years. 2 patients suffered from a syndromic disease, 3 patients suffered a genetic disease (e.g. NF), 4 patients presented with spastic cerebral palsy, while in 7 patients no underlying disease was apparent. In 5 patients the reason for surgery was neoplastic. 9 patients underwent stabilization procedure due to scoliosis combined with a neurosurgical procedure (e.g. untethering, revision of a baclofen pump, spinal canal decompression, etc..). Intraoperative neuromonitoring was used in 88% (n=16) of the cases. Surgical morbidity rate was 11.1% and mortality rate was 0%.
CONCLUSION:In pediatric patients suffering from syndromic or genetic diseases the treatment can be often very challenging. Good collaboration between highly specialized pediatric neurosurgical and pediatric orthopedic spinal teams and correct timing of staged procedures is needed to achieve good outcome in these complex cases.

FL-110

Special Topic: Spine

Spinal Radiosurgery (SRS) for Pediatric spinal tumors

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OBJECTIVE:Spine Radiosurgery (SRS) is a modality for the treatment of spine tumors and was previously reported to be effective for both metastatic and primary spine tumors. To our knowledge, this is the first report of pediatric population treated by SRS for metastatic disease.
MATERIAL-METHODS:Pediatric patients suffering from spine tumors indicated for spine radiosurgery were treated by a single fraction of 14Gy, 16Gy or 18Gy dose in an ambulatory set-up by the authors in Sheba Medical center. A retrospective review of the cases was performed, examining the indications, method of treatment, side effects and response to treatment.
RESULTS:Seven patients were treated in nine sessions of SRS. Mean age was 10.8 (range 5-15). Most patients (88%) were treated with VMAT (Volumetric Arc Treatment) which allows for fast energy delivery. General anesthesia was required with only one patient while all others co-operated with the treatment teams. Mean number of treated levels was 1.67 (range:1-5), located in the thoracic(3), lumbar(4) and sacral(2) regions. A third of the cases were intradural metastatic spread, of which one was intramedullary. Pathologies consisted of Osteoid sarcoma(3), Ewing Sarcoma(2), ATRT(2), Meduloblastoma(1) and Hepatoblastoma(1). 56% of these patients were irradiated with fractionated radiotherapy prior to SRS. Mean treatment dose was 17.3G in a single session covering 88.4% of the contoured target. Complications included worsening pathological fracture in 2 cases, of which one had undergone kyphoplasty, and a case of transient nausea. Mean follow-up time was 220days (range: 60-720 days). Only one recurrence was diagnosed in a 13y/o Ewing sarcoma patient (89% local control rate).
CONCLUSION:SRS is an ambulatory non-invasive treatment of spinal tumors. The local control rate is high with low complication rate. Most patients were able to undergo the treatment without sedation or anesthesia. SRS should be considered routinely in the treatment of spine tumors in pediatric population.

FL-111

Special Topic: Dysraphism

Limited Dorsal Myeloschisis: reconsideration of its embryological origin

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OBJECTIVE:Limited dorsal myeloschisis (LDM) is a recently established clinical entity of spinal dysraphism. It is postulated to be a result of incomplete dysjunction in primary neurulation. However, clinical experience of LDM located below S1 - S2 vertebral level which is formed from secondary neurulation suggested that LDM may not be entirely explained as an error of primary neurulation. We aimed to elucidate the location and characteristics of LDM to find out the possible relation of its pathoembryogenesis to secondary neurulation.
MATERIAL-METHODS:Twenty-eight patients who were surgically treated for LDM from 2010 to 2015 were enrolled in the study. The clinical, radiological and surgical data were retrospectively reviewed. As the level of the interspinous defect where the LDM stalk penetrates the interspinous ligament is most clearly defined on the preoperative MRI and operative field, this level was assessed to find out whether the lesions can occur in the region of secondary neurulation.
RESULTS:Mean age was 5 months at the time of operation. Almost all patients were asymptomatic or only had minimal urodynamic study abnormality. Eleven patients (39%) with typical morphology of the stalk had interspinous defect levels which are lower than S1 - S2. These patients were not different in terms of level of conus, associated lesion, the presence of syrinx compared to the 17 patients with classic LDMs at the level above or same as S1-S2. This shows that other than the low level of the interspinous level, 11 patients had lesions that were sufficient as LDMs.
CONCLUSION:By elucidation of the location of LDM lesions, we propose that LDM may be caused by errors of secondary neurulation. The hypothesis seems more plausible as the supportive fact that the process of separation between cutaneous and neural ectoderm is present during the secondary neurulation is provided as the possible pathomechanism of the phenomenon.

FL-113

Special Topic: Dysraphism

Magnitude of risk factors that determine independence and intelligence at birth in neonates with meningomyelocele

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OBJECTIVE:To identify the magnitude of anthropometric and neuroanatomic factors implicated in predicting IQ there by estimating independence in neonate with meningomyelocele
MATERIAL-METHODS:The study was a cross sectional, hospital based study. Infants up to the age of 27 days were enrolled with the inclusion criteria being the presence of MMC and the exclusion criteria was patients who had concomitant congenital CNS infection, hypoxic brain insult, patients with hydraencephaly, and patients who had siblings diagnosed with L1 syndrome. The study period was from Jun. 1 to Oct.30. The calculated sample size was 140; during the study period 119 patients meeting the criteria were included. The research used structured format to collect data. The data was analyzed using SPSS 20, frequencies, averages; mean and standard deviation as well as correlations were done.
RESULTS:In this research we speculated the predicted intelligence of the neonates using the magnitude of independent predictors to be 85 and above in 56 % which would mean independency, and 9.2 %-44 % will be dependent with an estimated IQ of less than 80.This results are similar with the reported 55% having an IQ of greater than 85, hence independent.
CONCLUSION:Since the loss of IQ In MMC is already present at birth in 92 % of the cases, knowing the magnitude of anthropometric and neuroanatomic variables which are identified to be correlated and predictors of IQ, shades light in the expected outcome of this patients, with concomitant improvement of care. So we recommend the addition of these parameters in prediction of cognitive outcome on our day to day activity in dealing with these patients care.

Thursday, 11 October 2018
10:00 – 10:45

Flash Presentations: Neuro- Oncology

FL-115

Special Topic: Neuro-Oncology

Cerebellar low-grade gliomas in children and adolescents: a single institution experience

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OBJECTIVE:Cerebellar low-grade gliomas (LGG) in children have a favourable long-term prognosis. Resection remains the preferred treatment and is frequently curative.
MATERIAL-METHODS:The clinical data of 25 children with posterior fossa LGG treated between 2008-2018 were analysed retrospectively.
RESULTS:Median age at diagnosis was 6 years (range: 2-15). Histology was: Pilocytic Astrocytomas 17, Diffuse Astrocytomas 5 and Gangliogliomas 3. One patient had NF1. 18 (72 %) children underwent Gross Total Removal (GTR) and 7 Near Total Removal (NTR). Six patients experienced a relapse/progression event. Two patients relapsed after GTR whereas in 4 patients a progression of a small residue was observed. Three other children with a residue have not progressed so far. Six patients required second surgery. Two of these received adjuvant chemotherapy due to persistent residuum after second surgery and one of them, with infiltration of the brainstem, progressed further and had third surgery and radiotherapy. Median time to relapse/progression was: 2,5 years (range 1 month – 6 years). EFS and OS at 5 years were 85 % and 100 % respectively at a median follow-up of 3,2 years (range: 1 – 10 years). EFS at 5 years for patients with GTR and NTR was 93 % and 67 % respectively ($p = 0.049$). Histological grading didn't have any impact on EFS and OS ($p = 0.37$).
CONCLUSION:Cerebellar LGG remain a primarily surgical disease with excellent survival rates. Patients undergoing GTR have much better EFS than those undergoing incomplete resection. Chemotherapy and radiotherapy could be required in few selected cases.

FL-116

Special Topic: Neuro-Oncology

Spinal cord tumors management in children: our experience in lyon

Pierre Aurélien Beuriat[1], Didier Frappaz[2], Alexandre Vasiljevic[3], Cécile Faure Conter[2], Alexandru Szathmari[1], Federico Di Rocco[1], Carmine Mottolese[1]
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OBJECTIVE:Spinal cord tumors (SCT) are rare in children. We reviewed our series of spinal cord tumors operated in Lyon in the past 17 years
MATERIAL-METHODS:Twenty-three patients were studied. A retrospective study of medical, surgical, radiological, anatomopathological and oncological data was performed..The mean age at diagnosis was 9,6-year-old. The mean follow-up time was 4,9 years. Symptoms were back pain in 12 cases, lower limb motor deficit only in 9 cases and others in 6 (scoliosis, sacral malformation…). The main localization of the tumor was the thoraco-lumbar region. Surgery was performed between 4 to 12 weeks from the beginning of clinical onset. All patients had a laminotomy. One patient needed a spinal fusion.
RESULTS:Surgical resection was evaluated on a postoperative MRI realized within 48hours after the surgery: 4 cases of Near Total Removal, 13 cases of Total Removal and 6 cases of partial Removal.

One patient died within the first hours after the surgery because of an unexplicated complication and 1 patient had a severe motor worsening.

Histological diagnosis concluded: 4 myxopapillary ependymomas, 5 anaplastic ependymomas, 4 pilocytic astrocytomas, 4 metastasis of supra tentorial tumors, 1 neuroblastoma, 1 unclassified malignant tumor, 1 embryonary rhabdomyosarcoma, 2 PNET and 1 gangliocytoma.

Thirteen patients received no complementary treatment, 5 chemotherapy only, 3 radiation only and 2 chemotherapy and radiations. At last follow up, 12 patients were cured, 7 were in complete remission, 1 progressed and 3 died (2 because of disease progression). All patients are ambulatory.
CONCLUSION:Management of spinal tumors is complex and need a multi-disciplinary approach. Surgery remains the first line treatment. To obtain a complete removal is not

always possible but have to be the goal. Complementary treatments are useful in cases of partial removal and aggressive tumors.

FL-117

Special Topic: Neuro-Oncology

Surgical Treatment of Pediatric Brainstem Glial Tumors: A Single-Centre Ten Year Experience

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OBJECTIVE:To determine the extent of resection, immediate results and long-term outcomes after surgical treatment of pediatric brainstem tumors.
MATERIAL-METHODS:28 children with brainstem glial tumors operated in Regional Centre of Neurosurgery and Neurology from January, 2008 till December, 2017 were retrospectively analyzed. 16 (57.1%) patients were male, and 12 (42.9%) – female. Mean age of the patients was 9 years (from 2 to 16). In 15 cases (53.6%) tumor had exophytic growth pattern (11 - into fourth ventricle, 3 - into cerebello-pontine angle, 1 - into third ventricle) and in 13 patients (46.4%) the lesion was purely intrinsic (midbrain – 5, pons – 5, medulla oblongata – 3). Patients were examined neurologically on admission and on discharge. The extent of tumor resection was evaluated on early postoperative MRI (first 48 hours). Overall survival was assessed in patients with high-grade tumors. Children with low-grade tumors were examined on last follow-up according to KPS.
RESULTS:In 16 cases (57.1%) gross total resection was achieved, in 4 patients (14.3%) the resection was near-total, 4 children (14.3%) undergone subtotal resection, partial resection and CSF diversion only was performed in 2 cases each (7.1%). 8 patients (28.6%) deteriorated neurologically after surgery on discharge from the hospital, 19 patients (67.9%) improved or remained stable. One of the operated patients died (3.6%). The median overall survival in patients with high-grade gliomas (n=9, 32.1%) was 15.9 months. In group of patients with low-grade gliomas (n=19, 67.9%) mean follow-up is 43.9 months with a mean KPS of 88.1 (from 70 to 100).
CONCLUSION:Surgical treatment of pediatric brainstem glial tumors can be performed effectively (GTR + NTR in 71.4%) and relatively safe (short-term deterioration – 28.6%, postoperative mortality – 3.6%). Long-term outcome is excellent in patients with low-grade gliomas (mean KPS - 88.1, mortality - 0).

FL-152

Special Topic: Vascular

Management of Vein of Galen Aneurysmal Malformation - An Institutional Experience

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OBJECTIVE:Vein of Galen aneurysmal malformation (VGAM) is a rare, developmental intracranial vascular malformation. We intend to analyse the clinical presentations, imaging findings, angio-architecture, management options and outcome in our demographically heterogeneous set of VGAM patients.
MATERIAL-METHODS:We retrospectively analysed cases of VGAM from our Departmental archive, collected during 1988 to January, 2018. Demographic, clinical, therapeutic and follow up details were obtained for each patient from the available records.
RESULTS:We identified 41 patients of VGAM including 6 neonates, 19 infants, 11 children of 2-11 years, and 5 adults. Macrocrania was the commonest presenting feature. Type of fistulae was mural in 17 and choroidal in 20 patients while 4 had thrombosed sac at presentation. In five cases dilated venous sac had connection with the deep venous system. Bilateral jugular atresia and stenosis were seen in 10 and 6 patients respectively. Giant venous sac (>4 cm) was significantly correlated with mural type (P=0.0001). Dural arterial recruitment was seen in 4 including 3 adults. Among the 28 patients treated by endovascular means 18 had good outcome, 5 had poor outcome and 5 died. Significant correlation was noted between jugular atresia and poor outcome (P=0.003).
CONCLUSION:We encountered a wide range of demographic, clinical and angiographic features in VGAM. Mural type malformations were associated with giant venous sacs. Good outcome after embolization was seen in select neonates and in most of the infants, children and adults. Jugular atresia was significantly associated with poor outcome.

FL-118

Special Topic: Neuro-Oncology

Management of giant Supratentorial tumors in Children less than 3-years – A Sisyphean task?

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OBJECTIVE:Management of Giant supratentorial tumors (GST) in infants and toddlers (< 3 Years) is a herculean task. The complexity of the tumor including extreme vascularity, the physiology of the child and the need for intensive intraoperative hemodynamic monitoring poses extreme challenges. This coupled with fact that radiotherapy is often withheld in this group poses unique challenges. We examine our experiences with this rare and heterogenous group of tumors at our Institute, a tertiary referral center
MATERIAL-METHODS:All children less than 3 years operated for giant supratentorial tumors (> 5 cm at maximal diameter), from 2007-2017 at our Institute were included in this study. The records of these patients were retrieved and demographic features, clinical picture, radiological features, operative findings, pathology and postoperative events was evaluated. Follow-up data were obtained, either through direct clinical evaluation or mailed self-report questionnaire and telephone conversations.
RESULTS:There were a total of 31 patients (Males 18: females 13) included in the study. The average age was 1.9 years. The duration of surgery was 5 hrs. the average blood loss was 550 ml, (300-2100 ml). The post-operative morbidity was seen in 3 patients, the perioperative mortality in 2 patients. The intraoperative challenges will be discussed. The pathology included Choroid plexus tumors in 8 patients, anaplastic ependymoma in 6 patients and ATRT in 4 patients. The average follow-up was 1.2 years. None received radiotherapy while 22 patients received chemotherapy. The rest refused any postoperative chemotherapy. The average survival depended on the histology and is discussed.
CONCLUSION:Tumors in this age group pose significant intraoperative challenges and post-operative management dilemmas. The outcome is relatively poor and lots of challenges remain in the optimal management of these complex tumors.

FL-119

Special Topic: Neuro-Oncology

Role of DTI images in making the surgical corridors in brainstem safer

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OBJECTIVE:Brain stem lesions pose unique surgical challenge and are difficult to treat due to their location and proximity to vital structures. Safe surgical pathways are described before the advent of DTI. We analyzed the role of DTI in deciding management of diffuse and focal lesions
MATERIAL-METHODS:We retrospectively analysed 87 consecutive Brain stem lesion patients who were treated at our institute from Jan 2010 to Nov 2017.Primary radiotherapy was given for 18 cases. Surgical approach and coridors were used depending on location and extent for 69 cases.. Tractography was used to decide surgery versus primary radiotherapy in suspected diffuse pontin glioma. Analysis was done for surgically treated cases.
RESULTS:Age of the patients ranged from 2 yrs to 68 yrs in our series. Twentyfive of the pts were in the paediatric age group. 55% of the study population was Male (n=38). Recurrent lesions were noted in 7% (n=5). The most common location was Pons and medulla 78% (n=54), followed by Thalamopeduncular 20% (n=14), Cervicomedullary 2% (n=1). Majority of the lesions were Brain stem gliomas 57% followed by cavernoma 18 %,tuberculoma, cysticercosis,ependymoma was diagnosed in few cases. Sixty percent of the glioma were low grade. Adjuvant therapy was not given for them. Different surgical approaches were utilized to achieve maximal safe resection. Ten percent of the population had immediate worsening of defecits and perioperative mortality was 2%.
CONCLUSION:DTI helped in deciding the surgical corridors. Sixty percent of brainstem gliomas were low grade hence adjuvant therapy could be avoided. Surgery has acceptable morbidity and mortality.

FL-120

Special Topic: Neuro-Oncology

Intracranial tumors in infants under 1 year of age: a long-term follow-up study of a large clinical series from a single center

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OBJECTIVE:Infantile intracranial tumors are rare neoplasms, which constitute only 1-8% of all pediatric CNS tumors. Their diagnosis and management pose special challenges. The aim of study clinical-radiological features, histopathologic characteristics, treatment strategies and long-term follow-up results of intracranial tumors in infants operated at a single center.
MATERIAL-METHODS:A total of 81 infants under 1 year of age at presentation who underwent surgery for intracranial tumor in our institution between 1997-2017 were included in the study. Medical records of the patients were reviewed and data were collected retrospectively.
RESULTS:There were 46 males (57%) and 35 females (43%). Median age at presentation was 6.5 months (range 1 week to

12 months). Six patients (7%) had congenital tumors (presenting ≤4 weeks of age). Tumors were supratentorial in 65% of cases. The most common presenting symptoms are increased head circumference, vomiting, lethargy/agitation, and seizures. Median duration of symptoms was 1 month. Hydrocephalus was evident in 46%. Tumor size was above 4 cm in more than half of the patients (51%). Low-grade or benign neoplasms (56%) were slightly more frequent than high-grade or malignant tumors (44%). Most common histological types were astrocytomas (21%), embryonal tumors (20%), glioneuronal tumors (14%) and choroid plexus tumors (14%). Gross total resection was achieved in 48%. Surgical mortality and morbidity rates were 6% and 7%, respectively. After a median follow-up of 5 years (range 0.1 to 21 years), more than half of the patients (52%) had tumor control and favorable neurological outcomes, while 38% of the patients were dead.
CONCLUSION:Prompt diagnosis, maximally safe surgical resection, effective adjuvant chemotherapy and close follow-up yield satisfactory results in at least half of the infants with brain tumors.

FL-121

Special Topic: Neuro-Oncology

Surgical treatment of intracranial tumors in infants under 12 months of age

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OBJECTIVE:Brain tumors are infrequent in neonatal patients under 12 months of age. They differ from intracranial tumors in older children. Lesions of this type can be surgically challenging even for experienced specialists. The aim of the study was to analyze patients with brain tumors treated at age under 12 months.
MATERIAL-METHODS:Retrospective study was conducted for surgically treated patients for intracranial mass lesions at the Department of Pediatric Neurosurgery in Katowice from 2002 to 2017. All 32 cases were diagnosed under 12 months of age. Dermatoid cysts and other skull-based lesions were excluded from the data base.
RESULTS:31 patients under 12 month of age underwent surgery and one patient was diagnosed at 3 months of age, but the procedure was delayed due to chemotherapy. Histopathological study showed variety of tumor pathologies: 6 cases of papilloma plexus choroidei (3 characterized as atypical), 4 cases of choroid plexus carcinoma, 4 cases of ependymoma, 2 of which were anaplastic, 4 cases of glioblastoma multiforme,4 cases of astrocytoma pilocyticum, 3 of which were malignum, 2 cases of atypical teratoid rhabdoid tumor, 2 cases of desmoplastic infantile ganglioglioma, 1 case of PNET, 1 case of DNET and 4 cases of different types of tumors Gross total resection was achieved in 12 cases (40 %). Other procedures ended with 16 cases (53 %) of partial resection and 2 cases (7 %) of biopsy.. One intraoperative death occurred. 30 patients were followed-up concerning their psychoneurological development and PFS and OS.
CONCLUSION:Surgery remains a primary choice of treatment fro congenital brain tumors. The prognosis depends on tumor pathology, its location and size. Despite of early diagnosis, developmental and neurological outcome remains poor.

FL-122

Special Topic: Neuro-Oncology

Intraoperative magnetic resonance in pediatric neurosurgery – initial experience of the use of this technology in a public Hospital in Brazil

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[2]Santa Casa de Barretos, Barretos, Brazil

OBJECTIVE:Pediatric CNS tumors are frequent neoplasm, being an important cause of death and morbidity. Intraoperative magnetic resonance imaging (iMRI) is a technology to assist the surgeon during the procedure aiming for "real-time visualization" of the surgery result, allowing broader and safer resections besides immediate complications identification. The aim of this study is to analyze data from the first surgeries for brain lesions in the pediatric population that included the iMRI techonology and that were performed this public Hospital.
MATERIAL-METHODS:All patients operated with the use of iMRI from February to October 2016 were included. Data retrospectively collected were lesion localization, grade of resection before iMRI, need for reoperation after iMRI, surgical complications, histological report.
RESULTS:Eighteen patients were included and a total of 23 procedures were performed. The patients were divided in groups. The first group, that included the sellar region lesions, had 6 patients (3 craniopharyngiomas, 2 adenomas and 1 germinoma). One craniopharyngiomas needed for reoperation for residual lesion. It was performed only biopsy in the germinoma case. The second group, the posterior fossa

lesions, had 7 patients (4 pylocitic astrocytomas and 3 medulloblastomas). One pylocitic astrocytoma had accessible residual lesion and the resection was continued, but in another one brainstem infiltration was identified. There were mixed supratentorial lesions in the third group (one cavernoma, one meningioma, one central neurocytoma, one ependymoma and one pinealoblastoma). A residual lesion was seen in the neurocytoma case and in the meningioma case and both could be completely removed during reoperation. A tumoral hematoma was identified in the case of pinealoblastoma case and was promptly removed. There were no complications related with the use of this technology.
CONCLUSION:The use of iMRI in pediatric neurosurgeries proved to be effective and safe in this study for these cases.

FL-123

Special Topic: Neuro-Oncology

Surgical management of CNS germ cell tumors in children: Experience in a cohort series in Taiwan

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OBJECTIVE:We review our experience of surgical management of CNS germ cell tumors in children in a cohort series in Taiwan.
MATERIAL-METHODS:We perform a retrospective review of 250 cases of CNS germ cell tumors for the surgical management of these tumors in the pineal, neurohypophyseal, basal ganglia, and ventricle regions. This series is retrieved from a collection of 1612 cases of primary brain tumors in children with age ≦ 18 years in three hospitals (Taipei VH, CHGH, TMUH) from 1971 to 2017.
RESULTS:In this series, tumor entities encounter were germinoma (59.2%), mature teratoma (4.0%), NGMGCT 35.2%, and unclassified GCT (1.6%). Histological confirmation of germinoma, mature teratoma, and NGMGCT was 58.1%, 100%, and 90.9% respectively. The location distribution in the 4 most common locations was pineal region 37%, neurohypophyseal alone and double midline tumor 37%, basal ganglia 19%, and ventricle 4%. A total of 186 (74.4%) patients received various extend of tumor resection including near total to total resection 46 (27%), partial to total resection 67 (36%), and open/endoscope biopsy 68 (36.6%). Operation for diagnostic biopsy or radical resection was performed in 76 (81.2%) of pineal tumors, 65 (69.9%) of neurophypophyseal anddouble midline tumors, 28 (60.9%) of basal ganglia tumor, and 10 (100%) of ventricular tumors. Radical resections were performed in 75% of teratoma and mixed germ cell tumors. Operation mortality occurred in 6 cases (3.2%). Hydrocephalus at diagnosis was 53.6%. Among them, VP shunt implantation and ETV were required in 58.2% and 23.9% respectively. A total of 78.1% ETV procedures were performed in pineal tumors and 21.9% in double midline tumors.
CONCLUSION:The surgical management of CNS germ cell tumors varies from diagnostic biopsy to radical resection. The decision relies on tumor entity, locations, and s/CSF tumor markers.

FL-124

Special Topic: Neuro-Oncology

Surgical Approaches to Sellar and Parasellar Pediatric Tumors

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OBJECTIVE:Pediatric sellar and parasellar lesions comprise a various group of tumors. Sellar/parasellar lesions are accessible via endoscopic and transcranial approaches. Sphenoid sinus pneumatization may play an important role in the selection of the surgical route Endoscopic approaches are mostly preferred in the last two decades. Lack of large pediatric sellar/parasellar case series in the literature encouraged us to present our case series.
MATERIAL-METHODS:The authors evaluated 43 patients that endoscopically and transcranially operated for sellar/parasellar pathologies between 2012-2017 years in a single institute.
RESULTS:Endoscopic endonasal procedure was performed on 23 patients and 20 patients underwent transcranial approaches. There were 25 males (58.1%) and 18 females (41.9%) in our case series review (mean age: 9.7 years). Indications for surgery included 16 craniopharyngiom (37.2%), 12 hypophysis adenoma (28%), 6 pilocytic astrocytoma (14%), 4 primitive neuroectodermal tumors (9.3%), 2 hypophysitis (4.6%), 1 dermoid cyst (2.3%), 1 neurocytoma (2.3%) and 1 hemangiopericytoma (2.3%).

CONCLUSION:Sellar/parasellar lesions are common in pediatric age group. Endoscopic or transcranial approaches are preferable for this region pathologies after evaluation of

patient anatomic and radiologic features. The frequency of endoscopic approaches is increasing due to technological developments.

FL-125

Special Topic: Neuro-Oncology

Neurosurgical treatment of infant brain tumors: Single Institutional Experience in China

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OBJECTIVE:The aim of this study is to delineate the prognosis results for patients going through surgery for pediatric brain tumors in the first 12 months of life.
MATERIAL-METHODS:A retrospective analysis was done in patients <12 months old who were operated on for primary brain tumor in Shanghai Xinhua Hospital since 2005 to 2015.
RESULTS:Eighty-seven infants, 56 males and 31 females, with the mean age of 6.10 months (0.5–12) were enrolled. There were 65 supratentorial and 22 infratentorial tumors. The presenting symptoms included increased head circumference (32); vomiting (30); developmental regression (15); sunset eye (11); seizure (8); loss of consciousness (3); irritability (4); nystagmus (3); visual loss (3); hemiparesis (2); torticollis (2). Gross total and subtotal resection were performed in 31 and 56 cases, respectively. Eleven patients needed external ventricular drainage in the perioperative period, from whom five infants required a ventriculoperitoneal shunt. Eighteen tumors were histologically low-grade glioma (WHO grade I–II), and 5 were high-grade glioma (WHO grade III–IV);ATRT(7), medulloblastomas (5), choroid plexus papilloma(13), ependymoma (7).The rate of 30-day mortality was 9.1%. Twenty patients are now well-controlled with or without adjuvant therapy, from whom 13 cases are tumor free (disease free survival; 41.9%), 3 cases have residual masses with fixed or decreased size (progression-free survival; 9.6%), and 2 cases are still on chemotherapy.

No patients were lost to follow-up. Five patients died in the postoperative period (30 days). Twenty-one patients died during the follow-up. Sixty-one patients are alive, with follow-up times from 2 to 14 years, median 7 years
CONCLUSION:Infants with brain tumors may clearly benefit from surgical resection. Optimal outcomes for infant brain tumors were achieved by strict evaluation and perioperative management as well as microsurgical skills.

FL-126

Special Topic: Neuro-Oncology

Hyponatremia in children after brain tumor surgery

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OBJECTIVE:To evaluate the incidence, clinical and biochemical signs of hyponatremia in children after sellar/III ventricle tumor resection and determine distinctive features between SIADH and CSWS.
MATERIAL-METHODS:Medical records of patients (age 0-17.9 years) after tumor resection 2008-2014 were analyzed. Prospective study included 37 hyponatremic children after craniopharyngioma (CP, n=18) or low grade glioma (LGG, n=19) resection, and 10 control group (10 patients without electrolyte disorders after surgery). Protocol included clinical and hormonal evaluation, diuresis and electrolyte management before and after surgery. While Na dropped <133 mM/l, clinical signs, blood parameters (osmolality, Na, K, creatinine, urea, urea acid, Ht, glucose, ACTH, fT3, fT4, cortisol, brain natriuretic peptide (BNP), copeptine) and urea osmolality were investigated.

Hyponatremic patients were divided in 3 groups: 1 – with fluid retention (SIADH, n=12), 2 – with profound polyuria (CSWS, n=17), 3 – with normal diuresis (n=9).
RESULTS:Hyponatremia (Na<130mM/l) developed in 123/1604 (7.7%) patients with sellar/III ventricular tumors. In prospective patients tumor location in hyponatremic patients involved hypothalamic region in 36/37 patients. 13/19 LGG had diencephalic cachexia, and 14/19 histologically pylomyxoid variant. Severity of hyponatremia significantly (r=-0,38, p<0,05) correlated with age. There was no correlation between hyponatremia incidence and thyroid/adrenal status. Urine osmolality was significantly ($p<0.05$) higher in SIADH group than in CSWS (820±221 vs 420±236mOsm/kg respectively). Copeptine blood level didn't differ between SIADH and CSWS groups, but BNP was significantly higher in CSWS patients, than in SIADH (80.2±75.7 and 12.4±10.7 pM/L respectively). The duration of hyponatremia was significantly longer in CSWS group, than in SIADH (8.3±3.8 vs 3.5 ±1.1 days respectively).
CONCLUSION:Hyponatremia predominantly occurs after resection of tumors with hypothalamic involvement, in patients with diencephalic cachexia, and pylomyxoid LGG. Urine osmolality and blood BNP level may be useful in distinguishing SIADH and CSWS.

FL-127

Special Topic: Neuro-Oncology

Unusual behavior of rosette-forming glioneuronal tumor in children

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OBJECTIVE:Rosette-forming glioneuronal tumor (RGNT) of the fourth ventricle has been established as a mixed glioneuronal neoplasm initially in 2007, later in 2016 World Health Organization WHO Classification of Central Nervous System Tumors. As a grade I pathology, this tumor is regarded as a slow-growing tumor specific to the fourth ventricle. This presentation is an overview of a single institution experience on RGNT emphasizing unexpected behavior in selected cases.
MATERIAL-METHODS:Eight cases of RGNT were diagnosed in a 5 year period with an age range from three to 14 years of age. All were admitted with symptoms and signs of increased intracranial pressure due to hydrocephalus. Four cases were typically confined to 4th ventricle, the remaining were periaquductal in two, pontine and posterior thalamic, consecutively.
RESULTS:At an average of 2,5 year follow-up, five cases remained stable both clinically and radiologically without additional treatment after surgery. Three cases demonstrated unusual behavior for a grade I tumor with fast regrowth requiring multiple reoperations with additional radiation therapy in one, regardless the localization and extent of surgery.
CONCLUSION:Since its description as an exclusively fourth ventricular tumor in 2007, in almost one third of the reported cases RGNT has been found at different anatomical locations including chiasm, hypothalamus, pineal region, cerebellar hemisphere and the spinal cord. has been described. Nevertheless, almost all described cases had favorable outcome regardless the localization. Unusual behavior of some cases in this series rises the suspicion that either RGNT has different subgroups yet not identified or the histopathology had a misdiagnosis in those.

Thursday, 11 October 2018
10:20 – 10:45

Flash Presentations: Vascular

FL-128

Special Topic: Vascular

Stress response and communication in surgeons undergoing training in endoscopic management of major vessel hemorrhage: a mixed methods study

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OBJECTIVE:Major vessel hemorrhage in endoscopic, endonasal skull-base surgery is a rare but potentially fatal event. Surgical simulation models have been developed to train surgeons in the techniques required to manage this complication. This mixed-methods study aims to quantify the stress responses the model induces, determine how realistic the experience is, and how it changes the confidence levels of surgeons in their ability to deal with major vascular injury in an endoscopic setting.
MATERIAL-METHODS:Forty consultant surgeons and surgeons in training underwent training on an endoscopic sheep model of jugular vein and carotid artery injury. Pre-course and post-course questionnaires providing demographics, experience level, confidence, and realism scores were taken, based on a 5-point Likert scale.Objective markers of stress response including blood pressure, heart rate, and salivary alpha-amylase levels were measured.
RESULTS:Mean "realism" score assessed post-training showed the model to be perceived as highly realistic by the participants (score 4.02). Difference in participant self-rated pre-course and post-course confidence levels was significant ($p < 0.0001$): mean pre-course confidence level 1.66 (95% confidence interval [CI], 1.43 to 1.90); mean post-course confidence level 3.42 (95% CI, 3.19 to 3.65). Differences in subjects' heart rates (HRs) and mean arterial blood pressures (MAPs)were significant between injury models ($p = 0.0008$, $p = 0.0387$, respectively). No statistically significant difference in salivary alpha-amylase levels pre-training and post-training was observed.
CONCLUSION:Results from this study indicate that this highly realistic simulation model provides surgeons with an increased level of confidence in their ability to deal with the rare but potentially catastrophic event of major vessel injury in endoscopic skull-base surgery.

FL-129

Special Topic: Vascular

Increased prevalence of developmental venous anomalies (DVAs) in neurofibromatosis type 1 patients

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OBJECTIVE:Developmental venous anomalies (DVAs) are benign congenital malformations that are incidentally found on brain MRI at a rate of 2.6% to 6.4% in the general population. In recent years, a study has shown that pediatric patients with brain tumors have an increased incidence of DVAs compared to the normal population. Our center demonstrated that children with constitutional mismatch repair deficiency (CMMRD) have 100% prevalence of multiple DVAs (unpublished data). There are some overlapping features between CMMRD and neurofibromatosis type 1 (NF1) phenotype. No previous reports of association between NF1 and DVAs have been published. Our aim is to assess the prevalence of different types of vascular phenomena in our large cohort of NF1 patients with correlation to NF1 related intracranial abnormalities.
MATERIAL-METHODS:The database of the Israeli Center for Neurofibromatosis and Other Phakomatoses was searched for patients with NF1 who have undergone brain MRI in the past 10 years. These images were read by an expert radiologist, and data was collected for presence of DVAs, vasculopathy, vascular malformations, focal areas of signal intensity on T2 (FASI), optic gliomas, sphenoid hypoplasia, and head and neck plexiform neurofibromas.
RESULTS:Out of 300 children in the database, 145 had a brain MRI in the last 10 years. In our preliminary results, we found that 20.9% of the patients had a DVA, 3.8% had vasculopathy, none had vascular malformations, 100% had multiple FASI, 34.3% had optic gliomas, 14.9% had sphenoid bone hypoplasia, and 16.4% had head and neck plexiform neurofibromas.
CONCLUSION:Our preliminary results suggest an increased prevalence of DVAs in NF1 patients compared to the general population, a finding which has not been reported previously. This work will investigate the correlation between the presence of DVAs to the presence of tumors to understand if DVAs can be regarded as marker for associated tendency for tumor formation.

FL-130

Special Topic: Vascular

Intracranial Aneurysms in Children under One Year of Age: an Update

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OBJECTIVE:To describe the clinical, morphological, and radiological features of infants (< 1 year of age) harboring intracranial aneurysms (IA), and to identify risk factors associated with hemorrhagic presentation and unfavorable outcome (Glasgow Outcome Scale (GOS) ≤ 3).
MATERIAL-METHODS:The US National Library of Medicine NIH database and EMBASE were searched for papers describing IA in infants. Papers describing angiographically, surgically, or pathologically confirmed IA in infants were included. The retrieved data were supplemented by data of previously unpublished patients treated in Amsterdam, Helsinki, Nijmegen, and Rotterdam. Patients were stratified according to type of presentation (hemorrhagic vs. non-hemorrhagic) and according to GOS scores of ≤ 3 or >3. Univariable and multivariable logistic regression analyses were performed to identify risk factors for hemorrhagic presentation and unfavorable outcome (GOS 3). Missing values were accounted for by using multiple imputation with chained

equations, and a sensitivity analysis using a subgroup consisting of complete cases only was also performed.
RESULTS:We found 195 unique papers describing 217 patients. Six patients treated by the authors were added. The mean age at presentation was 4.6 months (SD 0.23), with a hemorrhagic presentation in 175 cases (78.5%). In multivariate analysis, younger age (OR 0.84, 95% CI 0.75-0.95) and middle cerebral artery (MCA) aneurysms (OR 4.15, 95% CI 1.27-13.53) were significantly associated with hemorrhagic presentation. In addition, rebleed (OR 20.03, 95% CI 3.98-100.75) and hydrocephalus (OR 3.65, 95% CI 1.22-10.93) were significantly associated with unfavorable outcome at follow-up (GOS ≤ 3)
CONCLUSION:Hemorrhagic presentation in infants with IAs is significantly associated with younger age and MCA aneurysms, whereas rebleed and hydrocephalus are significantly associated with unfavorable outcome.

FL-131

Special Topic: Vascular

Neurovascular findings in Loeys-Dietz Syndrome: evaluation of cerebrovascular screening guidelines

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OBJECTIVE:Loeyz-Dietz syndrome (LDS) is an autosomal dominant connective tissue disease with mutations in the transforming growth factor beta pathway. Clinical manifestations involve craniofacial and skeletal anomalies in conjunction with neurovascular pathologies. Given the nearly universal incidence of neurovascular pathologies among LDS patients, screening angiograms of the head are recommended for LDS care. We aimed to retrospectively review our institution's large pediatric LDS series to examine the role and findings of neuroimaging in this patient population.
MATERIAL-METHODS:Retrospective review was done of LDS cases at our institution's specialized cardiogenetics clinic, which follows screening recommendations for yearly brain/neck imaging for LDS patients. Demographics, clinical history, comorbidities, and imaging findings were collected. Follow-up examinations and reports were evaluated for disease progression. Data were analyzed using descriptive statistics.
RESULTS:35 patients aged <18 years with genetically-confirmed LDS seen in cardiogenetics clinic had screening neurovascular imaging. Males (n=19) and females (n=16) represented 54.3% and 45.7% of this cohort, respectively, with a mean age of 11.8 years (age range 3-27 years). Genetic testing implicated TGFBR1, TGFBR2, and TGFB2 mutations in 21.2%, 51.5%, and 27.3% of cases, respectively. 85.3% of patients had cerebrovascular tortuosity on magnetic resonance angiography (MRA) and one patient had a dissecting (13 x 9 x 8 mm) aneurysm in the cervical internal carotid artery and concurrent small (2 x 1 mm) basilar artery aneurysm near the origin of the anterior inferior cerebellar artery. One patient experienced posterior reversible encephalopathy syndrome following cardiac transplant.
CONCLUSION:LDS is a rare genetic disease with multisystem involvement, including the vascular system. Guidelines recommend yearly surveillance for monitoring of cerebrovascular disease in LDS. Our series suggests less frequent imaging in the pediatric LDS population may be reasonable due to lack of clinically actionable vascular findings. Further study and follow up is warranted, as well as correlation with cardiothoracic disease severity.

FL-133

Perioperative Risk of Revascularization Surgery for Pediatric Moyamoya – A local case series and literature review

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OBJECTIVE:Moyamoya disease (MMD) is a cerebrovascular disease with steno-occlusive changes at the terminal portion of internal carotid artery (ICA) and resultant neo-angiogenesis of fragile vascular network. Direct and indirect revascularization surgeries have shown to effectively reduce stroke risks. This study aims to identify perioperative complication risk factors for these patients locally and in literature.
MATERIAL-METHODS:We reviewed retrospectively case records of four pediatric MMD patients who underwent revascularization surgeries between January 2014 and January 2018 under Division of Neurosurgery at the National University Hospital of Singapore. We also searched the literature to identify perioperative complication risk factors of revascularization surgery and recommended measures to mitigate these risks.
RESULTS:Of the four patients, three were females aged 10 months, 12 years and 15 years old and one male aged 13 years old. Two patients had bilateral ICAs involvement and the other two unilateral. Varying and combined techniques of encephalo-duro-arterio-synangiosis (EDAS),

encephalo-myo-arterio-synangiosis (EMAS), pial synangiosis and multiple burr holes were employed. One patient developed left parietal stroke and right tonic-clonic seizures two days post-surgery. All other patients recovered uneventfully. Median time to discharge was 6.5 days. Common post-operative complications for direct and indirect revascularization surgeries include post-operative stroke (1.9%-16.9%), transient ischaemic attacks (11.6%- 28.5%), hyper-perfusion syndrome (5.9%-20%) and subdural hematoma (1.8%). Mitigating measures include pre-operative aggressive intravenous hydration, maintaining peri-operative cerebral perfusion pressure at or above baseline and hematocrit between 30% and 42%. Normothermia is maintained to prevent hypothermia-induced shivering or increased cerebral metabolic rate due to hyperthermia. Normocarbia is essential to avoid cerebral vasoconstriction in hypocapnia and potential intracerebral steal effect secondary to hypercapnia.
CONCLUSION:This study identifies the perioperative complication risks factors of revascularization surgery for Moyamoya disease. Perioperative management protocol of patients undergoing revascularization surgery has been identified to be effective in reducing the perioperative complication rates.

Thursday, 11 October 2018
12:06 – 13:00

Flash Presentations - General Interest

FL-135

Special Topic: Neuro-Oncology

Incidental brain tumors in children: An international neurosurgical, oncological survey

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OBJECTIVE:Incidental pediatric brain tumors (IPBT) are increasingly being diagnosed. Currently, there is no consensus regarding the need and timing of their treatment. In the current study, we identify trends among pediatric neurosurgeons and oncologists with regard to IPBT management, and approval of growth-hormone replacement therapy (GHRT).
MATERIAL-METHODS:A questionnaire presenting 6 different cases of IPBT was emailed to all members of several leading societies in pediatric neurosurgery and oncology. Collected data included basic information concerning the responders (profession, experience, continent of practice), as well as responses to multiple questions regarding treatment of the lesion, permission to supply GHRT, and free text for comments.
RESULTS:143 responses were eligible for analysis (92 neurosurgeons, 51 oncologists, from a total of 6 continents). Initial recommendations for each case were heterogeneous. However, a few consistent trends were identified:

- Lesions that were stable over time lead to a common shift in treatment recommendation to a more conservative one
- Growing lesions were commonly treated more aggressively
- Neither profession nor experience had a consistent impact on recommendations

CONCLUSION:Management recommendations for IPBT varied amongst the responders and seem to be influenced by many factors. However, stable lesions lead to a shift in management towards a "watch and wait" approach, while in growing lesions responders tended towards a "biopsy" or "resection" approach. This highlights the need for better understanding of the natural course of incidental brain tumors in children, as well as evaluating the potential risk for malignant transformation.

FL-136

Special Topic: Other

Pediatric Neurosurgery Malpractice Claims in Germany

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OBJECTIVE:Limited data on malpractice claims is available for pediatric neurosurgery. Aim of this study was to analyze malpractice claims faced by pediatric neurosurgeons in a large German Medical Council coverage area, representing 60,000 physicians and 10 million inhabitants.

MATERIAL-METHODS:We analyzed malpractice claims in neurosurgical patients aged 18 years and younger that were completed by the arbitration board of the North Rhine Medical Council from 2011 to 2015, in relation to overall number of neurosurgical procedures. Claims were categorized into cranial, spinal and neuro-interventional. Arbitration decisions were categorized into treatment-associated damage with medical error, treatment-associated damage without error or disease-related outcome. Severity was graded from negligible (grade 1) to death (grade 6).
RESULTS:From a total of 8,381 malpractice claims, seven concerned pediatric neurosurgery. Median age was 12 years (range 1-17). Claims were related to cranial (N = 5), spinal (N = 1) and neuro-interventional (N = 1) procedures. Surgical cases comprised three ventriculoperitoneal shunt (VPS) operations, two cranioplasties and one spinal fusion after trauma. During the study period, 4,500 VPS operations, 1,484 cranioplasties and 84 spinal fusion operations were performed in children in the coverage area, accounting for malpractice claim rates of 0.07%, 0.13% and 1.19%, respectively. Damage was treatment-associated with medical error in one and treatment-associated without error in six cases; thus all claims occurred in cases with complications. Severity was grade 2 (transient minor) in three, grade 3 (transient major) in one, and grade 5 (permanent major) in three cases.
CONCLUSION:Median malpractice claim rate was 0.13% of pediatric neurosurgery cases. While treatment-associated damage was confirmed in all cases, erroneous treatment was found in only one. The most common scenario leading to a malpractice claim was a CSF diversion procedure with complicated course, likely reflecting the high volume of hydrocephalus in pediatric neurosurgery.

FL-137

Special Topic: Other

Multimaterial 3D Printing Preoperative Planning for Frontoethmoidal Meningoencephalocele Surgery

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OBJECTIVE:Surgical correction of frontoethmoidal meningoencephalocele, although rare, is still challenging to neurosurgeons and plastic reconstructive surgeons. It is fundamental to establish reliable and safe surgical techniques. The 21st century has brought great advances in medical technology and the 3D models can mimic the correct tridimensional anatomical relation of a tissue organ or body part. They allow both tactile and spatial understanding of the lesion and organ involved. The 3D printing technology allows the preparation for specific surgery ahead of time, planning the surgical approach and developing plans to deal with uncommon and high-risk intraoperative scenarios.

MATERIAL-METHODS:The Patient is a 19-month-old girl from Luanda (Angola) presented with frontoethmoidal encephalocele (nasofrontal subtype) diagnosis. Computerized tomography and cranial magnetic resonance imaging were acquired, which demonstrated a frontoethmoidal encephalocele (nasofrontal subtype) with the straight gyrus as the content of the herniated sac.Digital 3D models were created from Cranial Magnetic Resonance Image (MRI) fused with Computerized Tomography (CT) dataset by using the Mimics software (Materialise, Leuven, Belgium). A Neurosurgeon participated in the planning sessions; CT data were segmented to develop a model of the skull and MRI data were used to obtain the soft tissues.
RESULTS:The present report describes a case of frontoethmoidal encephalocele, (nasofrontal subtype) of a 19-month-old girl, whose surgical correction was planned using three-dimensional printing modeling.
CONCLUSION:The 3D model allowed a detailed discussion of the aspects of the surgical approach by having tissues of different consistencies and resistances, and also predicting with millimetric precision the bilateral orbitotomy measurements. Moreover, it was a fundamental and valuable factor in the multidisciplinary preoperative discussion. This approach allowed reducing the time of surgery, accurately planning the location of the osteotomies and precontouring the osteosynthesis material. Three-dimensional models can be very helpful tools in planning complex craniofacial operative procedures.

FL-138

Special Topic: Other

3D-Virtual Reality for resident education in pediatric neurosurgery

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OBJECTIVE:Brain surgery requires a strong three-dimensional (3D) knowledge of the surrounding anatomical structures. Learning through observation and 2D mediums such as teaching books and neuroimaging has been a cornerstone of neurosurgical education for over a hundred years. The

use of neurosurgical rehearsal platforms has been shown to reduce operative time and improve efficacy in neurosurgical procedures. Here we explore the advantages of full immersion virtual 3D for education in pediatric neurosurgery. Despite being a new technology, with a high potential for the future of neurosurgery, clear scientific data is still lacking to confirm the effectiveness in term of resident teaching and surgical planning for neurosurgeons.
MATERIAL-METHODS:We use a novel high performance software, developed at the Department of Biomedical Engineering at the University Basel, that allows seamless 3D visualization of patient specific imaging with high resolution surface rendering. Integrating the software with HTC-Vive (Valve HTC headset), the system allows for a full immersion patient specific 3D-Virutal Reality (3D-VR), with the possibility to observe and interact with the patient's specific neuroanatomy. With the use of this technology we will investigate the effectiveness of 3D-VR for resident teaching of neuroanatomy prior to surgery. Especially, to analyse if the use of 3D-VR increases the recognition of real intraoperative situation based on previous imaging study with 3D-VR HTC-Vive.
RESULTS:Integrating 3D-VR in daily pre-surgical teaching is feasible and effective. Using this software surgical cases can be prepared without complex segmentation or other manipulations. Preliminary data indicate that residents acquire a deep understanding of surgical neuroanatomy faster than using traditional teaching methods.
CONCLUSION:We believe that structured and case specific resident teaching can be improved using novel technologies. Further improvements are needed to integrate interactive tools in the 3D-VR surgical software packages.

FL-139

Special Topic: Other

Surgical treatment of cervicomedullar compression in children with achondroplasia

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OBJECTIVE:Objective was to identify indication and evaluate an efficacy of the operation technique chosen.
MATERIAL-METHODS:17 patients with achondroplasia we examined. The diagnosis was confirmed for all children with help of molecular genetic testing. We used MRI standart mode and VRI. Polysomnography and neurological examination. On 8 cases (47%) parents complained about apnoe; 7 patients (41%) developed intracranial hypertension symptoms; 7 patients (41%) developed central apnoe disorders to polysomnography results. Hydrocephalus was diagnosed 7 (41%) separate occasions, 3(17%) children developed tetraparesis.

The degree of cervicomedullar compression was evaluated in accordance to the MRI results on T1 and T2 sagittal slices. The Y.Yamada method was used: brainstem and spinal cord diameter ratio on the foramen magnum level, on the pontomedullar junction level and C3 level.

10 patients developed signs of severe compression. On 4 cases there was detected myelopathy zone with its extensions to caudal zone of medulla. What is more, one child didn't complain about apnoe and there were no any signs of hypertension.

10 children had surgical treatment. Resection of part of squama occipitalis, C1-arch without duraplasty were used.
RESULTS:Catamnesis made from 6 to 24 month. There was indicate reduction in apnoe frequency both clinically and in accordance to the polysomnography results. On 7 separate occasions the reduction in hydrocephaly degree were indicated. On 3 separate occasions the level of paresis decrased. Till now vp-shunt hasn't been in practice yet.
CONCLUSION:There is a surgical indications in the presences of 2 symptoms out of 3, such as: central apnoe, severe cervicomedullar compression and elements of intracaranial hypertension. Cervicomedullar decompression without opening dura is effective.

FL-140

Special Topic: Neuro-Oncology

Intraoperative neurophysiological monitoring in posterior fossa surgery

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OBJECTIVE:Intraoperative Neurophysiological Monitoring (IOM) is considered a useful tool in posterior fossa surgery that enable a good surgical and neurological outcome. Aim of this study is to review our series of posterior fossa lesions collected in the last 3 years, to correlate the neurophysiological data with clinical outcomes, and to assess the impact of the neurophysiological techniques on surgical strategies.

MATERIAL-METHODS:From 2015 to 2017 89 posterior fossa IOM assisted surgeries were performed by using transcranial motor evoked potentials (tcMEP), somatosensory evoked potentials (SSEPs), continuous electromyography (EMG) and brainstem acoustic evoked potentials (BAEPs). By using electrical stimulation, triggered EMG for direct mapping of the structures involving in the surgery was performed. Before and after at least 3 months from surgery, clinical and radiological data were collected and related to IOM data modifications.
RESULTS:Our data showed a total/near-total in 72 % and subtotal resection in 22% of cases; in remaining 6 % biopsy was planned. 9/89 patients presented facial/oculo-motor deficit after surgery. Spontaneous EMG activation was correlated to procedures on tumours arising from brainstem, ponto-cerebellar angle and IV ventricle. Not significant alterations of BAEPs, was observed during our procedures. MEP and SEP alterations were observed during sitting position procedures, without significant correlation with post-operative sensory-motor deficits.
CONCLUSION:Our experience confirms the relevance of IOM in posterior fossa surgery, related to a high resection degree and to a low number of cranial nerve deficit in the clinical follow up. IOM is useful for the collection of functional data related to the lesion topography and can directly influence the surgical strategy.

FL-141

Special Topic: Neuro-Oncology

Do Post-operative CSF Diversion Procedures Cause Preventable Delay in Adjuvant Treatment of Posterior Fossa Medulloblastoma and Ependymoma? Single Center Retrospective Study

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OBJECTIVE:A third of children with malignant posterior fossa (PF) tumors such as medulloblastoma and ependymoma will have hydrocephalus after tumor resection. Debate exists as to necessity of pre-emptive CSF diversion as opposed to a "wait and see" approach post resection as not all children will have this complication. Post-operative management of CSF diversion may cause unnecessary delay in initiation of adjuvant treatment (AT) (radiation and/or chemotherapy), thus affecting prognosis. We aimed to see if post-operative CSF diversion procedures (CDP) caused preventable delay in initiation of AT (>30 days post op) and effect on OS/PFS.
MATERIAL-METHODS:Single center, retrospective analysis of pediatric patients with medulloblastoma/ependymoma of the PF, requiring AT. Canadian hydrocephalus prediction value (CHPV) and actual CDP were assessed. Primary outcome was defined as starting AT >30 days post op due to CDP.
RESULTS:From 2007-2018 ninety-one patients underwent resection of a PF medulloblastoma or ependymoma. Information regarding AT was available for 71. Treatment of 38 patients was delayed, of whom 19 (50%) due to CDP. Average CHPV of these 19 patients was 4.52 while score for 19 patients not receiving CDP was 3.52, p=0.018. Additionally, the rate of CDP in the delayed AT group was 50% compared to the non-delayed AT group 30% p>0.05 (Chi-square). Overall survival of ependymoma stratified according to grade, was slightly better in the non-delayed AT group but was not statistically significant due to small sample size. for 16/57 medulloblastoma patients molecular subgroup was known, and rate of CDP was higher in delayed patients across all 4 subgroups. OS is unclear because of subgroup sample size. follow up is ongoing.
CONCLUSION:In pediatric medulloblastoma/ependymoma patients who need post op AT, a CHPV ≥4 should alert the surgeon to considering peri-operative CDP (ETV/shunt) in order to prevent post op delay in AT which may adversely affect long term prognosis.

FL-143

Special Topic: Neuro-Oncology

Factors Analysis for Delayed diagnosis in children with suprasellar germ cell tumor

Muh Lii Liang[1], Wan Chi Chiang[1], Yi Yen Lee[1], Hsin Hung Chen[1], Shih Chieh Lin[3], Feng Chi Chang[4], Yi Wei Chen[2], Tai Tong Wong[5]
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[5]Department of Neurosurgery, Taipei Medical University Hospital

OBJECTIVE:A significant proportion of children with GCTs experience a delayed in time to diagnosis, and the delay may

increase the risk of tumor progression and deteriorate neurological outcome.
MATERIAL-METHODS:This retrospective study examined 96 suprasellar GCTs who received treatment at Taipei Veterans General Hospital from Jan 1, 1990 to December 31, 2016. The association between clinical variables and confirmed diagnosis was evaluated. The delay diagnosis is defined as an interval of more or equal to 6 months between recorded symptoms and diagnostic images.
RESULTS:Sixty-four (67%) out of 96 suprasellar GCTs have pathological diagnosis, which consisted of 50 pure germinoma (PG) and 14 non-germinomatous mixed GCTs. Two PG cases recurred and then malignant transformation to mixed GCTs with yolk sac tumor (YST) components. 68 (71%) cases located solely on pituitary fossa, thickened pituitary stalk, infundibulum and/or third ventricle of sellar and suprasellar region, and other 28 cases present multiple locations. Mean age at diagnosis is 12.4-years-old. Male to female ratio is 1.58 (57 male to 36 female). The presenting symptoms include diabetes incipidus in 70 (73%), headache in 32 (33%), blurred vision in 27 (28%), growth delay in 16 (17%), and precocious puberty in 8 (8%) patients. Medium duration of symptoms to diagnosis is 8 months (range 1 to 60 months). Up to 60% patients had a delay diagnosis. Mean follow-up period is 7.7 years. Medium age for patients with duration of symptoms within 6 months, 6-11 months, 12-24 months and more than 24 months were 19, 13, 17 and 12-year-old. The main factors affecting a delay diagnosis include symptoms of polyuria/polydipsia/nocturia, precocious puberty, and younger age.
CONCLUSION:The risk of delay in diagnosis cannot be oversighted in children with suspicious symptoms. Non-irradiated image study is advised for children with the suspected neoplasms in the locations.

FL-144

Special Topic: Hydrocephalus

Anterior transcallosal approach for microsurgical ventriculostomy and removal of pineal region tumor: experience with 19 patients

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OBJECTIVE:Surgical resection of pineal region tumors with transcallosal approach does not always resolve obstruction of cerebrospinal fluid pathways, and an additional ventricular shunting is required. To prevent postoperative obstructive hydrocephalus, we combine tumor removal and microsurgical ventriculostomy in 1 stage.
MATERIAL-METHODS:Between 2016 and 2017, 19 patients (4 girls and 15 boys, 2 to 11-year-old) with pineal region tumor (terotoma, mixed germ cell tumor, and pineocytoma, pineoblastoma) underwent 19 tumor resections with intraoperative direct third ventriculostomy. After performing tumor resection through the anterior transcallosal approach, premamillar and Liliequist's membranes were identified and fenestrated - intraoperative direct third ventriculostomy or microsurgical ventriculostomy.
RESULTS:Microsurgical ventriculostomy of the third ventricle was performed in 19 patients simultaneously with tumor resection. Gross total tumor removal was achieved in 86% of patients in this series. There were no most notable complication (e.g diabetes insipidus) related to the surgery and no increase in surgical time and bleeding. Follow-up data were collected in 19 patients (100%) and ranged from 2 to 23months (median 11 months). None of the patients but one required an additional shunt. The Kaplan-Meier survival analysis demonstrated that at 12 months the microsurgical ventriculostomy success rates were 95%. In contrast, 7 patients with same tumor underwent tumor resection without microsurgical ventriculostomy required additional shunting because of ongoing hydrocephalus from 1 week to 3 months (median 1.3 months) postoperatively.
CONCLUSION:Under direct visual control, intraoperative direct third ventriculostomy with anterior transcallosal approach were found to be reliable methods of hydrocephalus control in patients with pineal region tumors.

FL-145

Special Topic: Neuro-Oncology

Craniopharyngiomas: Evaluating the wide fronto temporal basal craniotomy to achieve radical excision. A Personal series of 144 cases from 1998 to 2018

Aadil Shaukat Chagla
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OBJECTIVE:Craniopharyngiomas arise from ectoblastic remnants of Rathke's duct and therefore may be located suprasellar, sellar or intra third ventricular along the path of the Rathke;'s pouch. These tumors due to their location cause visual, hypothalamic and hormonal abnormalities as well as obstruction to the cerebrospinal fluid pathways. Their location also makes them difficult to excise totally; and therefore tend to re grow in spite of all treatment options. The aim of this study is to evaluate the versatility and safety of the Fronto-temporal basal approach to achieve radical excision.

MATERIAL-METHODS:144 consecutive cases of pediatric craniopharygiomas were treated surgically from 1998 to 2018. 83 were males and 61 were females. All cases underwent enhanced computerized tomography, Magnetic Resonance Imaging or both. The symptoms were headache/vomiting in 126 patients, 6 were totally blind, and 124 had impaired visual acuity and 117 cases also had field defects; 109 cases had endocrinological manifestations, 16 suffered generalized tonic-clonic seizures; 3 cases were comatose on admission. Over 50% of tumors were greater than 5 centimeters in dimension.

Operation: All except three patients underwent a wide Fronto-Temporal craniotomy with a basal surgical approach to the tumor. 3 had transsphenoidal excision.
RESULTS:28 patients underwent total excision (One mortality), 84 near-total excisions (eight mortalities) and 25 sub-total excisions (three mortality) and 7 partial excisions (no mortality). 46 patients suffered from temporary diabetes insipidus, and 9 cases are on long term vasopressin. 38 received post-operative radiotherapy. 84 near totally excised tumours were observed. 14 recurrences were seen till date three of which were cases of those partially excised. No patient underwent any post-operative ventricular drainage.
CONCLUSION:The frontal temporal basal approach provides a wide exposure to achieve a safe radical excision. Radicality of excision provides the best results.

(A short video demonstrating the surgical technique is presented)

FL-146

Special Topic: Other

Protocol-driven prevention of perioperative hypothermia in the pediatric neurosurgical population

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OBJECTIVE:It is well established that mild perioperative hypothermia (PH) leads to increased surgical blood loss, infections and length of stay. PH is a preventable, pathologic, and usually iatrogenic state. Maintenance of perioperative normothermia is hampered by ergonomic preference for "cold" ambient temperature and non-standardized normothermia protocols. This study aimed to assess the efficacy and tolerability of a perioperative normothermia protocol in pediatric neurosurgery patients.

MATERIAL-METHODS:A non-randomized prospective study of 120 pediatric neurosurgery patients at Norton Children's Hospital. 38 experimental patients (EP) were managed perioperatively with a standardized warming protocol and compliance was recorded. 82 control patients (CP) received no special perioperative thermal care. Experimental subjects received Bair Huggers ("BH" - 3M Corporation) pre- and intra-operatively. Patients entered a room at 75°F, received radiant heat from a carefully positioned sun lamp during preparation time, and the BH was started as soon as possible after being covered with warm blankets. Post-operatively, the patients were kept warm with a SL and warm blankets. Temperature was measured pre- and post-operatively by tympanic thermometer, intraoperatively by rectal or esophageal. 36°C was the lower cut off for normothermia.
RESULTS:Operative minimum temperature in EP versus CP were 36.28°C versus 35. All differences in hypothermic burden occurred within 15 to 30 minutes of arrival in the OR, suggesting that pre-operative warming measures are unnecessary.
CONCLUSION:Intraoperative measures aimed at preventing PH were very effective and did not cause undue discomfort to the OR staff.

FL-147

Special Topic: Other

Emerging mathematical skills and the role of cerebellum in children treated for pilocytic astrocytoma

Valentina Baro[1], Sivia Benavides Varela[2], Riccardina Lorusso[3], Daniela Lucangeli[2], Nancy Estévez Pérez[4], Luca Denaro[1], Domenico D'avella[1], Carlo Semenza[3]
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OBJECTIVE:The cerebellum is known for its involvement in motor functions, but it has been recently implicated also in a wide range of high-level cognitive functions including mathematics among healthy adults. The cognitive role of the cerebellum during development, however, is much less understood. This study investigates the neuropsychological sequelae following cerebellar resection of pilocytic astrocytoma in children, as a means to explore the functional role of the cerebellum in emerging mathematical skills and the post-surgical plasticity of the cognitive functions associated to it.

MATERIAL-METHODS:Twenty children (mean age= 10.9 +/- 2.0) including ten healthy children and ten children who underwent surgical resection of a pilocytic astrocytoma were evaluated with mathematical tests along with a neuropsychological battery. The groups were compared using the Kruskal-Wallis's test, single-case analyses (Crawford's t) and non-parametric correlations.
RESULTS:There were no significant differences between patients and healthy controls in any of the neuropsychological or mathematical tests. Crucially, while verbal working memory appeared associated with counting and magnitude comparison both in patients and controls, skills associated with visuo-spatial perception and memory, and visual-motor integration appeared associated with the completion of basic numerical tasks in patients only.
CONCLUSION:The results evidence a functional reestablishment of mathematical skills despite cerebellar tumor resection in pediatric populations. Correlation data further suggests that, for achieving scores comparable to their peers, patients rely more on visuo-spatial abilities. This suggests in turn a modest trait of developmental delay in patients with respect to healthy children, whose visuo-motor integration abilities are generally associated with mathematical tasks at younger ages.

FL-148

Special Topic: Hydrocephalus

Factors affecting quality of life (QOL) among children who underwent ventriculo-peritoneal shunt

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OBJECTIVE:Ventriculo-pertoneal (VP) shunting is a common modality of management for children with hydrocephalus (HCP). Various problems faced by the children on VP shunt may affect their quality of life (QOL). Objective of the study are to assess the QOL of children with hydrocephalous on VP shunt and its associated factors.
MATERIAL-METHODS:A cross-sectional exploratory design was used to conduct a study in Neurosurgery units of a tertiary care center in North India. Total 31 children on VP shunt were selected through consecutive sampling technique. Hydrocephalus outcome questionnaire (HOQ) which is a standardized tool was used to collect the data.
RESULTS:Findings showed that mean age of patients was 11.51±4.26 years. Headache and generalized pain were the common problem experienced by them (42%). They were followed by fatigue in all four limbs, blurred/decreased vision, diplopia, fever and impaired speech. Very few have experienced seizure, difficulty in walking, vision loss, infection at shunt site, increased head circumference and gait ataxia. Mean score of QOL was 0.67±0.21 out of 1 which shows that QOL was diminished in children on VP shunt. Among all four domains, cognitive domain was mostly affected among patients with VP shunt. Factors influencing QOL included long duration of treatment ($p<0.001$) and multiple surgeries ($p=0.02$).
CONCLUSION:Patients who had undergone VP shunt for hydrocephalous face various health related problems in different domains and low QOL. Cognitive domain was the most affected. Long duration of treatment and multiple surgeries had significant impact on QOL.Hence appropriate interventions and holistic management are essential to improve QOL.

FL-149

Special Topic: Hydrocephalus

Programmable versus non-programmable valves: which do better?

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[5]Asklepios Klinik, Neurosurgical Department, St. Augustin, Germany

OBJECTIVE:There are numerous shunt systems with different types of valves available for the treatment of paediatric hydrocephalus. Programmable valves (PV) are preferred over non-programmable valves (NPV), however there have been a few studies that have calculated valve survival time for PV and NPV. The objective of this retrospective study was to calculate and compare survival time of different types of valves and the factors influencing it.
MATERIAL-METHODS:It is a retrospective study of patients who underwent primary shunt insertion for hydrocephalus in our institution, from January 1, 2002, to December 31, 2014. All the patients were under a routine post-operative follow up and valve survival time was calculated from the time of insertion to change or removal of valve.

Statistical analyses were done using Pearson's Chi square / Fischer exact tests, Mann Whitney U / Student 't' test, Kaplan Meier survival analysis with log rank test and hazard ratio with Cox proportional hazard test.

RESULTS:252 patients underwent primary shunt surgery, of which 46 (18.2%) patients had NPV and 206 (81.7%) had PV. Revision surgery was done for 170 (67.5%) and only 36 (21.6%) were valve associated. Age at first surgery ranged from 0 to 7949 days with a median of 94 days. Mean age of first surgery was significantly less in patients undergoing a revision ($p<0.001$) for both the groups. Kaplan Meier survival analysis, estimates of time to revision did not differ ($p=0.715$) between patients with NPV and PV.
CONCLUSION:Younger the age of patient at primary surgery earlier is the revision, but however type of valve used, has no influence on valve survival or revision rate.

FL-151

Special Topic: Dysraphism

Pediatric Encephalocoeles: An institutional experience

Rohan Prafulla Shah, Shashank Ravindra Ramdurg
MR Medical College, Kalaburagi

OBJECTIVE:Encephalocele is the protrusion of the cranial contents beyond the normal confines of the skull through a defect in the calvarium and is far less common than spinal dysraphism. The exact worldwide frequency is not known. The study was conducted with an objective to determine the epidemiological features, patterns of encephalocele and its postsurgical results.
MATERIAL-METHODS:This was a prospective observational study, carried from year 2012 to 2017. Patients with encephalocoele were evaluated for epidemiological characteristics, clinical features, imaging characteristics and surgical results. Data was collected from OPD files, IPD files, surgical notes and discharge summaries.
RESULTS:22 encephalocoeles were treated during the study period. Out of these 13 (59%) were male and 9 (41%) female. Age range was 1 day to 7 years. Most common type of encephalocele was occipital 14 (63%), occipito- cervical 4 (18%), Parietal 2(9%), Fronto- nasal 1(4.5%), fronto-naso-ethmoidal 1(4.5%). One patient had a double encephalocoele (one atretic and other was occipital) with dermal sinus tract and limited dermal myelocschsis.Other associations: Chiari 3 malformation (2), meningomyeloceles (4), syrinx (4). 3 patients presented with rupture two of whom who succumbed to meningitis and shock. 17 patients treated surgically did well with no immediate surgical mortality (except a case of chiari 3 malformation who succumbed 6 months postsurgery to unrelated causes). Shunt was performed in 4 cases.
CONCLUSION:Most common type of encephalocele is occipital in our set up. Early surgical management of encephalocoele is not only for cosmetic reasons but also to prevent tethering, rupture and future neurological deficits.

NURSING SYMPOSIUM

Monday, 8 October 2018
10:00-14:30

NS-001

Staff Stress in paediatric neurosurgery

Lindy May
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OBJECTIVE:Neurosurgery can be a stressful working environment and stress can potentially lead to professional burnout, negative patient care and errors in care and management. An audit was undertaken across all staff groups in a tertiary paediatric neurosurgical unit in London, with the objective of identifying potential causative factors of stress and to compare these with the results of a previous audit undertaken in 2009.
MATERIAL-METHODS:Standardised questionnaires from the Health and Safety Executive were handed out to mixed group of health workers (Consultant neurosurgeons, registrars, junior doctors, ANP, ward nurses, HCA) over a period of one month. They were returned in sealed envelopes to maintain anonymity. The results were analysed and compared to a similar audit undertaken in 2009.
RESULTS:The audit is ongoing and results will be provided in the presentation. Although we are awaiting conclusive results, initial findings show that stress still occurs, not just through the demands of surgery, but also through demands of the environment, lack of bed availability, perceived lack of control over tasks, lack of support, lack of peer support and difficulties in relationships. However, coping strategies and problem solving was being used effectively in many situations, particularly among the nursing profession.
CONCLUSION:By raising awareness of stress and the potential causative factors among specific staff groups, early intervention and support can be instigated. Constructive and positive feedback and support is required from within and across all staff groups, but also from the management team.

NS-002

Challenges of caring for neurosurgical paediatric patients at a tertiary hospital with basic training in nursing

Lydia Vero N Ssenyonga
CURE Childrens' Hospital of Uganda, Busitema University Faculty of Health Sciences

OBJECTIVE:Pediatric Neurosurgery Nursing is a very specialized discipline in nursing practice. Nurses preparedness

and competency at the completion of their basic diploma training is inadequate to look after the pediatric neurosurgical patients. In order improve the ability of the new nurses to work in this environment, an orientation program with associated continuous nursing education was developed to help bridge the gap between knowledge deficit and patient care.
MATERIAL-METHODS:The orientation and continuing nursing education programs created access to ongoing support to meet individual learning needs. Training needs were evaluated by looking at the inefficiencies and anxiety of the nurses when looking after the paediatric Neurosurgical patients. Training plans were then developed and implemented. The focus was introducing them to critical thinking and management of pediatric neurosurgical conditions. Progress was assessed at 3, 6 and 12 months.
RESULTS:Orientation and continuing nursing education emerged as a cross-cutting issue for all the nurses working at the institution. They all expressed concern that the formal education they received at school did not adequately prepare them for real-world nursing environments, most especially the specialized settings. Nurses reported reduced anxiety in the workplace which improved their ability to learn and look after the patients
CONCLUSION:The training was shown to be effective in helping nurses with limited exposure to pediatric neurosurgical patients during their college training by providing adequate care in a specialized pediatric neurosurgical unit. This might be a useful model to adopt in areas that lack formalized specialized nursing.
Keywords: Orientation, basic nursing training,

NS-003

Nursing aspects of emergent and elective humanitarian pediatric neurosurgical care provided to Syrian refugees in Israel. Galilee Medical Center experience

Yehuda Suissa, Sergey Abeshaus
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OBJECTIVE:Since the civilian war in Syria began 5 years ago, thousands of seriously injured trauma patients from Syria were brought to Israel for emergency operations and postoperative intensive care. The aim of this study was to show the point of view at the experience of nursing care for refugee children, to raise distress in caring for and treat these children as any other child like Israeli citizen.

This experience comes from the practice in the pediatric surgery department, the Galilee Medical Center.
MATERIAL-METHODS:Since 2013 24 patients below age of 16 received neurosurgical care at GMC. 20% were due to military collisions and 80% of patients received elective or emergent neurosurgical care for tumors, hydrocephalus, craniosynostosis and other disorders.

The children who come from an enemy country to Israel, children who arrive without parents or relatives, the emotional and physical distance makes it difficult to provide the comprehensive treatment.
RESULTS:The findings indicate that the nurses in the department matched their belief and child care approach to allow positive health experiences. Qualitative analysis revealed internal psychological developments, contextual factors, and relational processes affecting the other's humanity in the relationship. This study sheds light on the specific ethical and humanitarian requirements that are required of the nurses in these difficult situations.
CONCLUSION:Even in conditions of war, it is possible to respond both medically and in terms of nursing care. Although in the present age there are places in the world where children are at physical and emotional risk due to war or lack of means, there are countries and medical personnel that provide treatment at a very high level and without compromises.

NS-004

Invasive Telemetry Monitoring and patients' with behaviour problems and developmental delays. Exploring procedural risks and compliance within this patient cohort

Orla Hayes
Great Ormond Street for Children, NHS foundation Trust, london

OBJECTIVE:The aims of this study is are;

- To investigate any incidences of increased risk of complications and suboptimal data collection within this patient group.
- Suggest methods by which this patient group can be supported throughout admission.

MATERIAL-METHODS:A mixed method approach was adopted involving a qualitative questionnaire distributed to nurses who have care for these patients and families who have experienced the Invasive Telemetry Monitoring (ITM) pathway. In conjunction, a retrospective analysis of any incident reports was undertaken. Patient characteristics from pre surgical evaluations and any complications or insufficient data collection during admission were extracted and analysed from patient's clinical records.
RESULTS:The results from this study are ongoing and will be explored during the presentation. Preliminary results indicate the nursing management of ITM within this patient group can be challenging and cause frustrations amongst the nurses caring for them, concurrently these viewpoints were echoed by patient families. There is shown to be an emphasised risk to patient safety and exposure to complications, potentially affecting

patient morbidity. A number of patients had early discharges, which resulted inadequate data collection.
CONCLUSION:Early identification and greater staff awareness of at risk patients groups could aid patient's compliance during ITM. Individualised care plans, available to nursing staff, of at risk patient groups can aid compliance during inpatient ITM, reducing possibility of complications and ensuring greater success of capturing optimal data.

NS-005

Pre-empting potential risk factors associated with subdural empyema and tailoring nursing care to combat these

Jacinta Leonard
Department of Neurosurgery, Great Ormond Street

OBJECTIVE:To increase the understanding of subdural empyema

To pre-empt potential/expected risk factors associated with subdural empyema

To prevent risk factors becoming actual complications

MATERIAL-METHODS:1. A literature review outlining known risk factors associated with subdural empyema

2. Survey completed by nursing staff from a neurosurgical unit outlining issues they have treated associated with subdural empyema

3. Parental survey focusing on expectations and the recovery process post subdural empyema diagnosis
RESULTS:As the study is ongoing the results will be discussed in the presentation. Preliminary results show that subdural empyema patients can present with a range of symptoms and severity leading to different focuses of care. More junior staff found benefits from discussing expected risks with senior nursing staff and on doctor's ward round. Understanding the condition and location of the empyema lead to a more individual based approach but still fell within the remit of pre-empting risk factors.
CONCLUSION:The presentation concludes with suggested nursing care and interventions initiated on diagnosis of subdural empyema.

NS-006

The necessity for unique training program to pediatric nurses for treating non-oncological terminally ill children

Anat Gauzman, Leali Yongi Halfon, Polina Blank
Department of Pediatric Neurosurgery, Dan Children's Hospital, Tel Aviv, Israel

OBJECTIVE:The trigger for this pilot study was N.V., a 6-month-old baby who was hospitalized with multiple brain cysts in the Ward of Pediatric Neurosurgery, Dana Children's Hospital (DCH), Tel Aviv, Israel. In our ward palliative patients are rare, as a result, the nursing staff was not specially trained to provide such a challenging care. The necessity for unique training program for treating non-oncological pediatric patients was raised. The purpose of this pilot study: to examine whether there is difference between pediatric oncological nurses and the nurses from other pediatric wards in their skills and knowledge regarding supportive care for terminally ill children. Pilot hypotheses: Relationship exists between the type of pediatric ward where a nurse works at and…

- …whether she/he feels that has received sufficient training in the subject
- …the need for professional guidance when dealing with a terminally ill child
- …the need for training in end-of-life care

MATERIAL-METHODS:The pilot questionnaire was answered by 58 nurses from our institution. Nineteen were from the pediatric oncology ward and 39 from other pediatric wards. Participants filled out a closed self-administered questionnaire.
RESULTS:The results of the study reveal: 1) 94.8% of the respondents believe that each nurse should undergo a special training program for terminally ill children; 2) 96.6% of all nurses emphasize the importance of special training on the subject of a terminally ill patients; 3) 47.4% of the oncology nurses suppose that they are sufficiently instructed to treat terminally ill children and their families as opposed to 25.6% of the other wards.
CONCLUSION:our pilot study shows an urgent necessity for unique training program for non-oncological nurses that will provide guidelines on supportive care for terminally ill children in DCH.

NS-007

Nursing Management of External ventricular drainage in children with hydrocephalus secondary to posterior fossa tumor

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[2]Pediatric Critical Care Unit, Rambam Medical Center, Haifa, Israel
[3]Department of Pediatric Hemato-Oncology, Rambam Medical Center, Haifa, Israel

OBJECTIVE:Hydrocephalus secondary to posterior fossa tumor resection is common in children. According to the English literature, nearly 60% of these children underwent ventriculo-peritoneal shunt insertion and another 10% had ETV. Due to the short and long term shunt complications, any effort should be made in order to avoid shunt implantation. The goal of this study was to provide a review of the

nursing role in implanting a management protocol in order to prevent the CSF diversion procedure
MATERIAL-METHODS:We retrospectively reviewed the medical charts of all children who underwent posterior fossa surgery for brain tumor in our institution during a 1-year period. Demographic and Clinical data was collected before and after surgery to identify risk factors to develop long standing hydrocephalus
RESULTS:Fifteen children underwent posterior fossa surgery for brain tumor. Mean follow up was 1-12 months, the mean age was 10 years (ranged 2-19). Patients who presented with hydrocephalus, and the tumor occupied the 4th ventricle underwent EVD insertion prior to tumor resection (5 children). Post-operatively while in PICU the level of the EVD was increased 5 cm daily, and 5 days after the surgery it was closed to monitoring. In another 5 patients the tumor was located in the cerebellar hemisphere and did not penetrated the fourth ventricle. Although these children suffered hydrocephalus, no CSF diversion procedure was performed. Another 4 children had no hydrocephalus, before or after the surgery. Out of the 15 children, one needed VP shunt insertion and one had ETV. Another 2 children have asymptomatic pseudo-meningocele
CONCLUSION:We emphasize the nursing role in following the patients with hydrocephalus and in the decision making process of EVD withdrawal strategy. We show that meticulous observation and patience can significantly help in reducing the incidence of VP shunt insertion in children following posterior fossa tumor resection

NS-008

Pediatric endoscopic third ventriculostomy from a nursing perspective (initial single-center experience)

Victoria Danko, Taras Havryliv
Regional Clinical Center of Neurosurgery and Neurology, Uzhhorod, Ukraine

OBJECTIVE:Operating department nursing has been under much scrutiny recently, with financial restrictions on health service spending and developments in the nursing role. This distinct specialty evolved largely in response to medical advancements and developments in neurosurgical technology. Hydrocephalus affect 0.9 to 1.5 per 1000 births which increases to 1.3 to 2.9 per 1000 birth when congenital abnormalities are considered. Endoscopic third ventriculostomy (ETV) is technique that has gained greater acceptance in recent years with the advent of new endoscopic technology and has now become an accepted mode of hydrocephalus treatment in children. An understanding from a nursing perspective of the special needs of the patient undergoing the procedure is essential to optimum care.
MATERIAL-METHODS:A retrospective analysis of initial 7 consecutive ETV procedures because of obstructive hydrocephalus at the Uzhhorod Regional Clinical Center of Neurosurgery and Neurology. The female-to-male ratio was - 2.5:1. The mean age was 11 (from 4 to 16 years old). A special algorithm was used before and during the procedure by the operating nurse with special attention to endoscopic equipment integrity and its sterility, intraoperative monitoring of intraventricular fluid irrigation to prevent related complications.
RESULTS:According to the data, there were no cases of equipment failure, hypothalamus disorders or infection complications among the operated patients. All the patients were assessed according to Karnofsky scale: more than 60 points - 7 (100%) patients. The median follow-up time - 15 months.
CONCLUSION:Good nursing care is essential to the successful execution of the procedure because of its strong role in relation to medical assistance and technical preparation. Nurses must remain updated on new technical developments as their use and availability will ultimately impact the care and outcome of the patients.

NS-009

Low Pressure Hydrocephalus in Children: Nursing Implications

Julie Miller
Division of Pediatric Neurosurgery, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio

OBJECTIVE:Low pressure hydrocephalus (LPH) is a rare and complex clinical entity associated with significant morbidity and mortality. The disorder is characterized by signs and symptoms of elevated intracranial pressure (ICP), ventriculomegaly on radiographic imaging, and normal to low ICP. The objective of the presentation is to provide an overview of low pressure hydrocephalus in children including the pathophysiology, risk factors, clinical presentation, medical management, and nursing implications.
MATERIAL-METHODS:A case report of 6-year old female with a history of a pineoblastoma and shunted hydrocephalus who developed LPH will be presented with a literature review.
RESULTS:LPH may develop due to subarachnoid hemorrhage, brain tumors, congenital hydrocephalus, or intracranial infections. A recent study suggests treatment with radiation and/or chemotherapy in young children with metastatic brain tumors and shunted hydrocephalus may contribute to development of LPH. Although the exact pathophysiology is unknown, it is hypothesized to be due to altered brain compliance resulting in persistent ventriculomegaly with low ICP. Presenting symptoms in children with LPH are similar to children in shunt malfunction and include lethargy, headache, nausea/vomiting, bradycardia, and agitation. Clinical signs

suggestive of LPH include ventriculomegaly on imaging, shunts that refill promptly when pumped, and shunts in which cerebral spinal fluid (CSF) is easily aspirated. The management includes CSF drainage by externalization of the shunt or placement of an external ventricular drain (EVD) with subzero drainage until brain compliance has normalized at which time the shunt is replaced with same valve or a fixed low pressure or programmable valve.
CONCLUSION:LPH is a complex and rare condition in children. As children with LPH may require prolonged external CSF drainage, an understanding of the pathophysiology, signs and symptoms, and management is required to provide optimal nursing care.

NS-010

Topic: Nursing aspects of the IIHS study (International Infant Hydrocephalus Study)

Orna Friedman
Orna Friedman

OBJECTIVE:The IIHS is a prospective randomised International study that was recently concluded in 26 centers around the world. The study compares surgical and neurodevelopmental outcome of infants with aqueductal stenosis who underwent either an endoscopic Third Ventriculostomy (ETV) or a VP Shunt. The IIHS is one of the only few large randomised studies in pediatric neurosurgery where one has to choose between two surgical techniques. As such, it introduces specific challenges mainly upon the recruitment stage and the interaction vis-a-vis the family.
MATERIAL-METHODS:Nursing assistance in this randomisation process is essential. The parents, for a proper informed consent, need to fully understand the pros and cons of each procedure and then to decide between being randomised or joining the “parental preference” arm
RESULTS:26 centers data will be given
CONCLUSION:This paper will discuss those challenges and how nursing serve as an integral part in this study and in academic clinical research in Pediatric
neurosurgery

NS-011

Neurosurgeon Opinions Related to Surgery for Metopic Craniosynostosis

Cathy Cartwright[1], Usiakimi Igbaseimokumo[2], Kavelin Rumalla[3], Paul Steinbok[4]
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[2]Texas Tech University Health Sciences Center - Lubbock - United States
[3]School of Medicine - University of Missouri Kansas City - United States
[4]Division of Neurosurgery - Vancouver - Canada

OBJECTIVE:Based on the lack of definitive evidence for treatment of metopic craniosynostosis in the literature, we conducted an online survey to determine neurosurgeons’ opinions regarding treatment.
MATERIAL-METHODS:Members of the International Society for Pediatric Neurosurgery were queried using Survey Monkey (n=212). The survey consisted of two clinical case studies of children with metopic craniosynostosis with five questions each. The first case study featured a one year old girl with a metopic ridge, normal development, and no signs of increased intracranial pressure (ICP). The second case study featured a one month old boy with metopic synostosis, trigonocephaly, normal exam, soft anterior fontanel, and no signs of increased ICP. Respondents were asked if surgery was recommended, the reason for surgery (if recommended), the likelihood of future problems with increased ICP, and predicted outcomes if no surgery was performed.
RESULTS:There were 75 responses with 41.4% having 20+ years in practice. For the first case, most (94.5%) did not recommend surgery and 67.6% were not concerned about future increased ICP. Of those who would not recommend surgery, 49.3% believed that in 10 years the ridge would remain unchanged and 46.5% believed it would improve. For the second case, 93% recommended surgery for the following reasons: appearance (60.6%), concern for developmental delay (15.2%), and increased ICP (10.6%). An open procedure was recommended by most neurosurgeons (71.2%) instead of the endoscopy assisted strip craniectomy (28.8%). Most rated the likelihood of increased ICP as <10% (37.1%), with the rest predicting: 10-24% (25.7%), 25-50% (15.7%), and 51-100% (4.3%).
CONCLUSION:There were significant variations in opinions for surgery, surgical indications, and prognosis. Neurosurgery nurses need to be familiar with treatment options and outcomes for patients with craniosynostosis so they can discuss parent concerns and prognosis.

NS-012

Case study: Nursing implication of Craniotomy for elevation of split thickness calvarian bone graft to repair a posterior fossa defect

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OBJECTIVE:To share the knowledge and experience of the operating room neurosurgical nurses in taking care of a patient

undergoing a craniotomy for elevation of split thickness calvarian bone graft to repair a posterior fossa defect.

To discuss the best practice for patient safety in prone positioning during surgery for posterior fossa exposure.

To describe how the split thickness calvarian bone graft for cranioplasty is performed by a neurosurgeon by taking bone flap from the patient's skull that is the same size as the cranial defect, the bone flap is then split into inner and outer tables. The inner table is then used to cover the donor site and the outer table to cover the defect.

MATERIAL-METHODS:Case study of a five year old patient with congenital midline posterior fossa defect for split calvarian bone graft cranioplasty.

The presentation features the importance of positioning the patient prone for maximum operative site exposure and patient safety for posterior fossa defect repair.

RESULTS:Prone position of patient under anesthesia requires coordination by the entire surgical team to ensure patient safety and prevention of injuries during surgery.

CONCLUSION:The knowledge and experience of the nursing team in intraoperative positioning and calvarian bone graft will ensure a good outcome for the patient.

NS-013

Case Report and Review of Aneurysmal Bone Cyst of the Cervical Spine in an Adolescent

Julie Miller
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OBJECTIVE:Aneurysmal bone cyst (ABC) is a benign primary osseous tumor representing 1.4% of all primary bony tumors and involves the spinal column 3% to 20% of the time. Although benign, ABCs in the cervical spine can be locally aggressive due to the vascularity of the tumor. As treatment can consist of a number of different procedures over a prolonged period of time, it is important for nurses and nurse practitioners to have an understanding of the clinical presentation and management to ensure optimal patient outcomes. The objective of the presentation is to provide a clinical overview of ABC of the cervical spine including the clinical presentation and treatment.

MATERIAL-METHODS:A case report of 18-year old female with an aggressive cervical spine ABC who underwent several staged procedures including embolization, resection, and sclerotherapy will be presented to illustrate the clinical presentation, treatment, and nursing management.

RESULTS:ABCs most commonly occur in children and adolescents and affect females slightly more than males. Clinical presentation includes localized pain, swelling, pathologic fracture, spinal instability, and neurologic symptoms. Magnetic resonance imaging demonstrates an expansile, multi-loculated lesion with fluid-fluid levels. Current treatment therapies include resection, embolization, intralesional curettage, and sclerotherapy.

CONCLUSION:ABCs of the cervical spine are rare and tend to be aggressive with a recurrence rates ranging from 12% to 71%. As ABCs of the cervical spine generally require a number of different procedures, nursing care is often complex. The presentation will review the different surgical procedures, pre and postoperative care, patient education, and the importance of care coordination.

NS-014

Posterior Fossa Bony Defect of Unknown Etiology, Management and Correction

Kamilah A. Dowling, DNP
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Objective: Case presentation of a 9-year-old female, with a large posterior fossa defect of unknown etiology.

Methods: Review of the patient's medical record, including CT scan images, intra-operative photos and post- operative photos. Information will be presented on the presentation, management, surgical correction and post-op care of this child.

Results: Imaging revealed a posterior fossa arachnoid cyst with pressure erosion of the bone measuring 10 x 7 cm. The cyst extends to the extracranial superficial soft tissues over the occiput. Splaying of the cerebellum which is displaced by the cyst was also noted. Post-operative diagnosis - large meningoencephalocele.

Conclusion: Patient underwent a bilateral craniotomy, with cranioplasty for split thickness bone grafts for repair of a bilateral large meningoencephalocele.

List of posters presented at 46th ISPN Annual Meeting

Poster Session I: Monday, 8 October 2018

Publication Number	Title	Presenter	Country
PP-001	Therapeutic strategies and problems for radiation-induced intracranial tumors after irradiation for pediatric cancers	Naoki Kagawa	Japan
PP-002	Immunotherapy for malignant glioma in children: WT1 peptide vaccination and future direction	Naoki Kagawa	Japan
PP-004	Children with malignant posterior fossa tumors - how do they perform at quality of life and cognition functional parameters after therapy ?	Arivazhagan Arimappamagan	India
PP-005	Management strategy for Large Arachnoid Cyst. Where do we stand today?	Asheesh Tandon	India
PP-006	Keyhole endoscopic surgery for ventricular tumors in pediatric population	Awadhesh Kumar Jaiswal	India
PP-007	Chiasmato hypotalamic gliomas in children: is there still a place for an extended surgery for their treatment?	Carmine Mottolese	France
PP-011	Longitudinal assessment of ataxia in children following surgical resection of posterior fossa tumours	Conor Mallucci	United Kingdom
PP-012	A Dedicated Neuro-Oncology Clinic for Teenagers and Young Adults	Conor Mallucci	United Kingdom
PP-013	Uncommon squamous cell carcinoma of the scalp with intracerebral spreading in a 12 years old girl with Aplasia cutis congenita	Cordula Scherer	Switzerland
PP-014	Indications for shunting in pediatric tumoral hydrocephalus. Our experience	Davron Baxtiyarovich Kadyrov	Uzbekistan
PP-015	Low Grade Glioma types in Pediatric Patients Outcomes	Dilnoza Sheralievna Ruzieva	Uzbekistan
PP-017	Tumor Resection and Neuroplasticity	Eduardo Varjão	Brazil
PP-018	Heterogenity of diffuse intrinsic brainstem tumors	Elena Anatolievna Khukhlaeva	Russia
PP-021	Review of the role of biomarkers in the management of Intracranial Germ Cell Tumors	John Nute Jabang	Israel
PP-022	Massive Pediatric Intramedullary Spinal Cord Tumor in an NF1 Patient; Stability over 10 years	John Nute Jabang	Israel
PP-023	Genetic predisposition to central nervous system tumors in children	Jon Foss Skiftesvik	Denmark
PP-024	The role of screening spinal MRI in children with solitary posterior fossa low-grade glial tumors	Jonathan Roth	Israel
PP-026	Combined transcranial-orbital approach for resection of unilateral intraorbital optic nerve glioma (ONG) in children: surgical technique and results	Jorge W. J. Bizzi	Brazil
PP-028	Pediatric cranial intraosseous hemangiomas: case report and review	Lakshmi Prasad Govindaraju	India
PP-029	Hemorrhagic presentation of intracranial pilocytic astrocytomas: Comparison between adult and pediatric age groups	Lakshmi Prasad Govindaraju	India
PP-032	Epidemiology of brain tumors in infants	Luca Massimi	Italy
PP-034	Crescent durotomy for midline posterior fossa lesions	Manas Panigrahi	India
PP-035	Choroid plexus tumor in children: surgical results	Marcelo Zimerman Bizzi	Brazil
PP-036	Electromagnetic navigation-guided neuroendoscopic removal of radiation-induced intraforniceal cavernoma as a late complication of medulloblastoma treatment	Michal Tichy	Czech Republic
PP-038	Pediatric Age Gbm; Treatment Of 13 Cases	Nazli Çakici Başak	Türkiye
PP-039	Clinical Manifestation of Supratentorial Brain Tumors in Pediatric Patients	Nilufar Erkinovna Turaeva	Uzbekistan
PP-041	Intraoperative recording of laryngeal adduction reflex (LAR) in IV ventricle tumor removal: case report	Paola Peretta	Italy
PP-042	Intraventricular Microcystic meningioma in a child: Case report	Pinar Karabagli	Türkiye
PP-044	Unilateral interhemispheric approach to perichiashmatic craniopharyngioma, an analysis of 14 cases	Rabi Narayan Sahu	India
PP-045	Supratentorial ependymomas in a 9 year child	Ranjan Kumar Jena	India
PP-048	Purely cystic and intrinsic brainstem epidermoid - a rare case with its surgical management	Saraj Kumar Singh	India

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PP-050	Children with Craniopharyngioma: can we get them to grow up into normal adults?	Shibu Vasudevan Pillai	India
PP-051	A novel detection method of metastatic cells in the cerebrospinal fluid of pediatric population with medulloblastoma using fluorescence lifetime imaging microscopy	Sivan Gershanov	Israel
PP-052	A case series on Thalamic Gliomas	Suchanda Bhattacharjee	India
PP-053	Risk of and intra-tumoural haemorrhage with pre-resection CSF diversion in intraventricular tumours	Suhas Udayakumaran	India
PP-054	Pediatric pilocytic astrocytomas: comprehensive treatment approach	Taras Havryliv	Ukraine
PP-055	Glioblastoma in the first year of life – features, management and outcome	Thomas Beez	Germany
PP-056	Transsphenoidal microsurgery in children – pearls and pitfalls	Thomas Beez	Germany
PP-057	Temporal evolution of MRI abnormalities of the inferior olivary and dentate nuclei in postoperative cerebellar mutism syndrome	Thomas Beez	Germany
PP-059	Craniopharingiomas in children: is complete surgical removal an important factor to control the late evolution of this chronic disease?	Federico Di Rocco	Italy
PP-060	Giant craniopharyngiomas in children: short- and long-term implications	Yosef Laviv	Israel
PP-061	Lhermitte-Duclos Disease in a Six-Year Old Child: A Rare Presentation	Yusuf Izci	Türkiye
PP-062	Very huge posterior fossa and long segment cervical cord tumor with different histopathology: Report of a rare case	Zenebe Gedlie Damtie	Ethiopia
PP-063	Surgery for tethered cord syndrome in older children and young adults	Ai Muroi	Japan
PP-064	A thoracic neural tube defect in Jarcho-Levin syndrome with life-threatening spondylocostal dysostotic anomaly	Shunsuke Ichi	Japan
PP-065	Outcomes of Neural Tube Defect Surgery in an Ethiopian Hospital	Abenezer Tirsit Aklilu	Ethiopia
PP-066	Early and Late Treatment in Spinal Dysraphism	Alvaro Francisco Sacalxot Ordoñez	Guatemala
PP-067	New Low-risk\High risk classification of lumbosacral lipomas: single centre review	Benedetta Pettorini	United Kingdom
PP-068	ventriculoperitoneal shunt anal extrusion in a case of Chiari 2 malformation	Brighton Valentine Nyamapfene	Zimbabwe
PP-069	Parasitic twin—a supernumerary limb associated with spinal malformations. A case report	Brook Mesfin Minass	Ethiopia
PP-070	Modification of Skin closure in Myelomeningoceles, limiting wound dehiscence and cerebral spinal fluid fistula	Emmanuel Wegoye	Kenya
PP-072	Myelomeningocele, Hydrocephalus and Prematurity: case report	Marcia Cristina da Silva	Brazil
PP-073	Surgical rehearsal for fetoscopic myelomeningocele repair: preparation for prime time	Mari L Groves	United States
PP-074	AlloDerm graft for temporary repair of large lumbosacral MMC in a preterm infant	Mickey Gideon	Israel
PP-075	Transverse Skin Incision in Spinal Dysraphism: Case Reports and Technical Note	Nelci Zanon	Brazil
PP-076	A Histopathological Study of the Filum Terminale in Cases undergoing Filar Resection for the Tethered Cord Syndrome:	Santosh Mohan Rao Kanangi	India
PP-077	Multiple Neural Tube defects in the Same Patient- A review of 4 cases:	Santosh Mohan Rao Kanangi	India
PP-078	Dizygotic unliked-sexed twins with surgically repaired concordant myelomeningocele conceived by in-vitro fertilization using intracytoplasmic sperm injection: A case report and review of the literature	Sarah Stricker	Switzerland
PP-079	Rare case of spondylocostal dysostosis with split cord malformation type I and Sprengel disease	Simbarashe Samakande	Zimbabwe
PP-080	Complex split cord malformations (SCMs) - A series of 4 cases:	Sundarakrishnan Dharanipathy	India
PP-082	Dorsal bony septum in split cord malformations	Yusuf Izci	Türkiye
PP-083	Type 1 and Type 2 split cord malformation: Experience of a single instution	Yusuf Izci	Türkiye
PP-084	Removal of adhered ventricular catheter by electrocoagulation with monopolar coagulator.	Shunsuke Ichi	Japan
PP-085	ETV in the management of hydrocephalus in adolescents with Spina Bifida	Adrian Caceres	Costa Rica
PP-086	Intracranial membrane resection in premature infants with posthemorrhagic hydrocephalus and complex cyst formation – a robot-assisted neuroendoscopic approach	Andrea Spyrantis	Germany
PP-087	Endoscopic treatment for ventricular atrium cysts	Benicio Oton De Lima	Brazil
PP-090	Acceptability of mobile applications for patients with hydrocephalus	Conor Mallucci	United Kingdom
PP-091	Successful Tailored Treatment of Basilar Artery Perforation During Endoscopic Third Ventriculostomy	Danil A. Kozyrev	Israel
PP-093	Parents' concerns and needs of children with hydrocephalus		Germany

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		Friederike Knerlich Lukoschus	
PP-094	Tactics of treatment of hydrocephalia in children with extremely low body mass/	Gennadiy Egorovich Chmutin	Russia
PP-097	Using a metallic rod and a feeding tube to make a Shunt passer	Gyang Markus Bot	Nigeria
PP-101	A method to replace manual segmentation as a gold standard when measuring from medical images. Presenting a Hydrocephalus case	J. Gordon McComb	United States
PP-102	The added value of MRI cisternography and ventriculography as a diagnostic aid in pediatric hydrocephalus	Jonathan Roth	Israel
PP-103	Use of EOS® low-dose biplanar X-ray for shunt series in children with hydrocephalus: a preliminary study	Jonathan Roth	Israel
PP-104	Endoscopic third ventriculostomy, surgical endoscopic success findings in a third level Hospital en Mexico	Jose Ascencion Arenas Ruiz	Mexico
PP-105	External ventricular drain. Experience from a Pediatric Cuban Hospital	Julio S. Brossard Alejo	Cuba
PP-106	{De Novo} Mutations in Genes Regulating Neural Stem Cell Fate in Human Congenital Hydrocephalus	Kristopher T. Kahle	United States
PP-107	Posterior reversible encephalopathy syndrome (PRES) following cystosubarachnoid shunt for cervicodorsal intramedullary cyst	Manoj Phalak	India
PP-108	Automated robust volumetry of CSF spaces in pediatric hydrocephalus - Technique and first results	Martin U Schuhmann	Germany
PP-109	Ventriculo-subgaleal drainage for post-hemorrhagic hydrocephalus in newborns: surgical and clinical outcome	Matthieu Vinchon	France
PP-110	Surgical management features of obstructive hydrocephalus after Endoscopic third ventriculostomy in pediatric patients	Mikle Talabaev	Belarus
PP-111	First experience in endoscopy treatment of hydrocephalus and brain cyst in children	Mykhailo Lovha	Ukraine
PP-115	The experience of implementing the early neuroendoscopic correction liquorodynamic pathways in premature and mature newborn infants with occlusive hydrocephalus of different etiology	Olim Akramov	Russia
PP-116	Fourth years assessement of endoscopic third ventriculostomy for hydrocephalus in Cote d'Ivoire	Pape Aicha Ginette	Cote d'Ivoire
PP-119	Trans aqueductal, third ventricle – Cervical subarachnoid stenting: An adjuvant cerebro spinal fluid diversion procedure in midline posterior fossa tumors with hydrocephalus: The technical note and case series	Ramesh Teegala	India
PP-120	Survival time of ventricular diversion procedures in hydrocephalus secondary to pediatric posterior fossa tumors	Reneé María Taveras Serpa	Dominican Republic
PP-122	Severe macrocrania and cranial vault defect in children with neglected hydrocephalus	Sergei Kim	Russia
PP-123	Postoperative outcomes at one year of follow up of children undergoing hydrocephalus surgery at Queen Elizabeth Central Hospital, Malawi	Sithembile Chimaliro	Malawi
PP-124	Efficacy of repeated lumbar punctures after endoscopic third ventriculostomy - A Randomized Controlled Trial	Sivashanmugam Dhandapani	India
PP-125	Flexible neuroendoscopy /Video neuroendoscopy in management of hydrocephalus - augmenting the intraventricular neuroendoscopy indications	Subodh Raju	India
PP-126	To determine the utility of early postoperative imaging in predicting potential ETV failure	Suhas Udayakumaran	India
PP-127	Changes of Third Ventricle Diameter (TVD) mirror changes of lateral ventricular indices in pediatric hydrocephalus	Susanne Regina Kerscher	Germany
PP-128	Third Ventricle Diameter (TVD): Comparison of US and MRI determination in pediatric patients	Susanne Regina Kerscher	Germany
PP-129	Endoscopic Third Ventriculostomy as first line treatment for obstructive hydrocephalus, time to rethink? A tale of 2 cases	Teddy Totimeh	Ghana
PP-131	Accidental modifications in programmable valve settings and magnetic toys: what is the safety distance?	Federico Di Rocco	Italy
PP-133	Child hydrocephephalus in a central african country (Chad)	Yannick Canton Kessely	Chad
PP-134	Retinoic Acid Embryopathy with Multiple Malformations	Yusuf Izci	Türkiye
PP-135	A Newborn with Encephalocele and Dandy-Walker variant	Yusuf Izci	Türkiye
PP-136	Limitation on surgical outcome of strip craniectomy for sagittal synostosis and advantageous effect on a modified surgical technique for strip craniectomy	Jun Kurihara	Japan
PP-137	Multi-directional Cranial Distraction Osteogenesis (MCDO) procedure for craniosynostosis cases	Masahiro Kameda	Japan
PP-138	Seizure outcome and complications after corpus callosotomy for pediatric intractable epilepsy	Kenichi Usami	Japan
PP-139	Suppression of Generalized Onset Motor Seizure in a Rat Model by Focal Brain Cooling	Sadahiro Nomura	Japan

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PP-140	Minimal removal of subdural hematoma in term neonates with perinatal intracranial hemorrhage	Goichiro Tamura	Japan
PP-141	Some Considerations of Decompressive Craniectomy for Severe Traumatic Brain Injury of Infants	Tae Kyun Kim	Japan
PP-142	Giant I C A bifurcation aneurysm in 11 year old girl with Sub arachnoid hemorrhage: A case where clipping definitely scores over coiling	Aadil Shaukat Chagla	India
PP-144	Frontal revascularization in pediatric moyamoya: clinical and [15O]H2O-PET results	Annick Kronenburg	Netherlands
PP-146	The use of flow diverters in the treatment of intracranial aneurysms in children with tuberous sclerosis complex (TSC)	Eveline Teresa Hidalgo	United States
PP-147	Microsurgical anastomosis a comparative analysis of techniques, operative time, vascular flow and risk of anastomotic leak	Gyang Markus Bot	Nigeria
PP-148	Long-Segment Stenosis of the Internal Carotid Artery Following A Direct Carotid-Cavernous Fistula: Delayed Arterial Dissection or Part of Natural History?	Kevin Paul Baylon Ferraris	Philippines
PP-149	The role of circulation endothelial progenitor cell after indirect revascularization: A rat animal model	Meng-Fai Kuoa	Taiwan
PP-150	The role of surgery in optic pathway gliomas in children. burdenko neurosurgical institution experiense.	Andge Valiakhmetova	Russia

Poster Session II: Wednesday, 10 October 2018

Publication Number	Title	Presenter	Country
PP-152	Familial Brain Periventricular Pseudocysts in the Fetus	Liat Ben Sira	Israel
PP-153	A 0-2 year-old normative 3D head model using statistical shape modelling as a tool for pediatric craniofacial surgery	Pam Heutinck	United Kingdom
PP-154	Cranioplasty of Skull defects in Children	Airat Timershin	Russia
PP-155	Shape memory alloys for the correction of scaphocephaly: design and virtual assessment on a sagittal craniosynostosis population	Alessandro Borghi	United Kingdom
PP-156	Using cranial orthosis for the non-surgical correction of deformities of the skull with cranio-synostosis in children	Alexander Sakharov	Russia
PP-157	Evolution of the Bony Orbit and Its Legacy for Predation: Part 1, Neural Crest	Alexandra Kunz	United States
PP-158	Evolution of the Bony Orbit and Its Legacy for Predation: Part 2, Post-orbital Bar	Alexandra Kunz	United States
PP-159	Evolution of the Bony Orbit and Its Legacy for Predation: Part 3, Supraorbital Torus	Alexandra Kunz	United States
PP-160	Craniosynostosis: Plagiocephaly, case report	Alvaro Francisco Sacalxot Ordoñez	Guatemala
PP-161	Trigonocephaly: implementation of simplified method for operative correction of isolated nonsyndromic metopic craniosynostosis in 46 cases	Assen Bussarsky	Bulgaria
PP-162	Application of ultrasonic pin fixation and biodegradable materials in the operative treatment of infants with craniosynostosis	Assen Bussarsky	Bulgaria
PP-163	Preoperative Planning for Craniosynostosis Correction using 3D Printed Models	Bianca Mendes Zacarias	Brazil
PP-164	Structural Fat Grafting in Craniosynostosis Patients	David Leshem	Israel
PP-165	Reconstruction Technique for Growing Skull Fracture Complicated by Progressive Congenital Cerebral Cyst	Dewa Putu Wisnu Wardhana	Indonesia
PP-166	Management of Pancraniosynostosis	Dhaval Shukla	India
PP-167	A simple variant in the surgical correction of trigonocephaly aimed at reducing the related hemorrhagic risk	Federico Di Rocco	France
PP-168	Early Experience in Management of Craniosynostosis	Francisco Guerrero Jazo	Mexico
PP-169	Single suture craniosynostosis: preoperative and postoperative evaluation of neurocognitive development	Gianpiero Tamburrini	Italy
PP-170	The 3D evolution of the normal cranium during the first 2 years of life	Guido De Jong	Netherlands
PP-171	10 years of experience in 123 craniosynostosis cases: Surgical treatment for Craniosynostosis	Hakan Karabagli	Türkiye
PP-172	Unusual large occipital meningoencephalocele and its surgical corrective procedure	Inthira Khampalikit	Thailand
PP-173	Can Operative Technique Decrease Blood Transfusions in Craniosynostosis?	Jose Aloysio Costa Val	Brazil
PP-174	Scaphocephaly surgical treatment “Peau d´ours” technique. Single Center experience	Jose Ascencion Arenas Ruiz	Mexico
PP-175	Cranial Vault Reconstruction for Bilateral Coronal Synostosis	Kevin Paul Baylon Ferraris	Philippines
PP-176	synthetic hydroxyapatite cranioplasty in children: our experience in lyon	Laura Nanna Lohkamp	France
PP-177	Happiness with the Surgical Outcome in Patients with Nonsyndromic Sagittal and Metopic Suture Synostosis	Matthias Millesi	Austria
PP-178	Randomized features in patients with single suture craniosynostosis	Mikle Talabaev	Belarus
PP-179	Neurosurgical treatment of pediatric intraosseal dermoid cysts with dural penetration	Miroslav Gjurasin	Croatia
PP-180	The Nautilus technique: Spiral osteotomy for cranial reconstruction	Nelci Zanon	Brazil
PP-181	Treatment of craniosynostosis in infants using endoscope-assisted craniotomy	Olim Akramov	Russia
PP-182	Craniosynostosis: A report of 3 cases in Dakar and a review of the literature	Rel Gerald Boukaka Kala	Senegal
PP-184	Application of 3D printing technique for the resection and reconstruction of craniofacial fibrous dysplasia	Sheng Che Chou	Taiwan
PP-185	A new technique for sagittal synostosis:A plurality of small incisions minimally invasive technique used on infants and young	Shuo Gu	China
PP-186	Primary non syndromic craniosynostosis- choice of surgery	Subodh Raju	India
PP-187	Isolated Calvarial Melerheostosis	Suchanda Bhattacharjee	India

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PP-188	Why metopic synostoses have an angulation at the suture and its possible treatment implications: proof of concept in a case of spring cranioplasty for trigonocephaly	Suhas Udayakumaran	India
PP-189	Surgical treatment for "old" scaphocephalic children: Frontal widening and Remodeling skull	Syril James	France
PP-190	Variant of Fronto-orbital advancement before Hypertelorism correction	Syril James	France
PP-192	Preoperative planning using 3D-printing in craniofacial surgery	Vadim Ivanov	Russia
PP-193	Near-Infrared cerebral oximetry in children with craniosynostosis	Vadim Ivanov	Russia
PP-194	Recent advances in the surgical procedures of syndromic craniosynostosis	Wei Min	China
PP-195	Spontaneous Rhinorrhea and Hydrocephalus	Yusuf Izci	Türkiye
PP-196	Accuracy in Robot assisted Surgery comparing CT-based Referencing methods vs Radiation reduced MR-data based Referencing	Andrea Spyrantis	Germany
PP-197	Intraoperative magnetic resonance imaging guided paediatric epilepsy surgery performed at The Royal Children's Hospital: a surgical outcome analysis	Cameron Englman	Australia
PP-198	Seizure Outcome and Quality of Life in Early Vagal Nerve Stimulator Implantation in Children	Jehuda Soleman	Switzerland
PP-199	Seizure outcome following surgery for supratentorial extratemporal low-grade gliomas in children	Jonathan Roth	Israel
PP-200	Visualizing Ictal Networks with Granger Causality: Use with Stereotactic Electroencephalography (sEEG) to Enhance Intraoperative Decision-Making	Joseph R Madsen	United States
PP-202	Electrophysiological EEG patterns under temporal epilepsis in children	Konstantin Borisovich Abramov	Russia
PP-203	Predictors of outcome of epilepsy surgery in children with focal cortical dysplasia	Manas Panigrahi	India
PP-204	Role of pre-surgical “non-invasive” multi-modality evaluation in children with focal cortical dysplasia undergoing epilepsy surgery: results of long-term seizure outcome	Manas Panigrahi	India
PP-205	Disconnection Surgery for Refractory Epilepsy in Childhood	Milind Sankhe	India
PP-206	Temporal lobe surgery for intractable epilepsy in children: What to do with the hippocampus?	Mony Benifla	Israel
PP-207	Role of exercise in management of psychosocial problem in epilepsy in school children	Pardeep Kumar	India
PP-210	Seizure control and clinical outcome after peri-insular hemispherotomy for refractory epilepsy in childhood and adolescence	Valentina Baro	Italy
PP-212	Correlation among radiological findings, histological diagnosis and survival of pediatric intrinsic brainstem lesions	Barbara Albuquerque Morais	Brazil
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