IPSO 2022 Congress

Abstract Proceedings

MEETING DESTINATION VIENNA

NOW ◆ TOGETHER

International Pediatric Stroke Organization

Thank you to our sponsors

For 45 years, Balt has been leading the way collaborating with physicians and institutions to develop elegant neurovascular solutions. As the premier global platform focused on neurointerventional innovation, we always push the boundaries of what's possible in-patient care.

www.baltgroup.com

https://twitter.com/Balt_Group

https://www.linkedin.com/company/baltgroup/

Bayer is a Life Science company with a more than 150 year history and core competencies in the areas of health care and agriculture. With our innovative products, we are contributing to finding solutions to some of the major challenges of our time.

Advancing Life at Bayer | Bayer

Contents

Back to the top

Oral-1: *Cognitive Outcomes and Predictors in Young Children with Presumed vs. Acute Perinatal Stroke*

Christine Mrakotsky[1], Julie Swanson[1], Pooja Venugopal[1], Michael Rivkin[1]

[1]Boston Children's Hospital/Harvard Medical School

Introduction: Perinatal stroke is the most common type of childhood strokes. Long-term morbidities are high, including cognitive and behavioral deficits. Some studies suggest poorer cognitive function in presumed vs. acute perinatal stroke, yet ages range widely and samples are small. We aimed to assess cognitive outcomes in a larger homogenous sample regarding age, time since injury, and development. We previously reported diminished cognitive performance in preschoolers with presumed perinatal stroke. We here present updated data and potential predictors of outcomes. Hypothesis: Young children with presumed perinatal stroke (PPS) demonstrate poorer cognitive function than those with acute perinatal stroke (APS) and these differences are predicted not only by factors related to injury, but also intervention, and family environment. Methods: Children 4;0-5;11 years with perinatal stroke (n=69; APS=45, PPS=24) underwent comprehensive neuropsychological assessment as part of standard care. Parents/teachers completed ratings of executive and behavioral function. Data from initial evaluations were analyzed retrospectively comparing the whole sample to population means, and acute with presumed subgroups. Potential predictors of outcome were analyzed via regression. Results: Compared to population means the overall perinatal group demonstrated poorer processing speed, auditory memory, visual-spatial and visual-motor skills (pFDR<.01-.05), and increased problems with executive functions (pFDR<.01) and adaptive skills. APS patients had higher rates of neonatal seizures and early intervention whereas PPS patients had higher rates of hemiparesis, current OT/PT, older age, and lower maternal education. Compared to APS, the PPS group showed reduced verbal, visual-spatial, speed and pre-academic skills (ps<.01-.05). Stroke location, history of seizures, hemiparesis, maternal education, and home language environment were significant predictors. Rates of early intervention did not predict outcomes. Conclusions: Perinatal stroke causes widespread diminished cognitive and behavioral function in young children, with differences in presumed versus acute perinatal stroke, underscoring the importance of early diagnosis to improve long-term outcomes. In addition to injury factors, findings were predicted by maternal/socioeconomic factors, as an important target for intervention.

Oral-2: *TNF-blockade for primary stroke prevention in ADA2 deficiency*

Ariane Soldatos[1], Camilo Toro[2], Patrycja Hoffmann[2], Natalie Deuitch[2], Alessandra Brofferio[3], Ivona Aksentijevich[2], Daniel Kastner[2], Amanda Ombrello[2]

[1]National Institute of Neurological Disorders and Stroke, [2]National Human Genome Research Institute, [3]National Heart, Lung, and Blood Institute

ADA2 deficiency (DADA2) is a genetic neurologic and systemic vasculitis syndrome which can lead to recurrent strokes, typically lacunar. In the cohort of now 60 patients followed at NIH, no patient has had a stroke since starting tumor necrosis factor (TNF)-blockade. We present

a family with multiple affected children. The proband is a 20 year-old female who had a cryptogenic ischemic stroke at 8 years of age; she was placed on aspirin. At the age of 11 years, she experienced a second ischemic stroke; clopidogrel was added. A conventional angiogram was unremarkable. She made a full neurological recovery. Subsequently she developed livedo racemosa, and some raised nodular skin lesions suggestive of polyarteritis nodosa; biopsy was consistent with vasculitis. Glucocorticoids and rituximab were added. Initially only one mutated ADA2 allele was identified, although her ADA2 enzyme levels were in the deficiency range. Her antiplatelets were discontinued and she was started on etanercept. She has been neurologically stable for many years. The mutation of the second allele of ADA2 was found to be a loss-of-function variant in the upstream regulatory sequences. Her siblings were subsequently tested as the age of onset of symptoms in DADA2 varies so this practice has allowed us to identify presymptomatic siblings. Her genetically affected but neurologically asymptomatic older sister (history of complicated migraines with normal neuroimaging) elected to start TNF-blockade as per our clinical recommendation for primary stroke prevention. Her genetically affected but neurologically asymptomatic older adult brother initially declined this treatment but subsequently had a stroke at age 20 years and is now on etanercept. DADA2 testing should be considered for any child or young adult with cryptogenic ischemic stroke. Antiplatelets including low-dose aspirin are contraindicated due to the vascular friability and vasculitis in these patients leading to increased risk of hemorrhage. In addition, the single effective stroke prevention for these patients is immunomodulation specifically with TNF-blockade. The illustrative example of this multiply affected family with DADA2 supports the treatment recommendation of genetic testing in clinically asymptomatic siblings and starting TNF-blockade to prevent development of strokes.

Oral-3: ***Executive functioning, ADHD and resting state functional connectivity in children with perinatal stroke***

Suraya Meghji[1], Alicia Hilderley[1], Kara Murias[1], Brian Brooks[1], John Andersen[2], Darcy Fehlings[3], Nomazulu Dlamini[3], Adam Kirton[1], Helen Carlson[1]

[1]University of Calgary, [2]University of Alberta, [3]University of Toronto

Perinatal stroke describes a group of focal, vascular brain injuries that occur early in development, often resulting in lifelong disability. Two types of perinatal stroke predominate, arterial ischemic stroke (AIS) and periventricular venous infarction (PVI). Though perinatal stroke is typically considered a motor disorder, other comorbidities commonly exist including deficits of attention and executive function. Rates of attention deficit hyperactivity disorder (ADHD) are higher in children with perinatal stroke and executive dysfunction may also occur but underlying mechanisms are not known. To investigate associations between resting state brain networks, ADHD, and executive function, we measured resting state functional connectivity in children with perinatal stroke using previously established dorsal attention, frontoparietal, and default mode network seeds. Associations with parental ratings of executive function and ADHD symptoms were examined. A total of 120 participants aged 6-19 years [AIS N=31; PVI N=30; Controls N=59] were recruited. In comparison to typically developing peers, both the AIS and PVI groups showed lower intra- and inter-hemispheric functional connectivity values in the networks investigated. Group differences in between-network connectivity were also demonstrated showing weaker anticorrelations between task-positive (frontoparietal and

dorsal attention) and task-negative (default mode) networks in stroke groups compared to controls. Both within-network and between-network functional connectivity values were highly associated with parental reports of executive function and ADHD symptoms. These results suggest that differences in functional connectivity exist both within and between networks after perinatal stroke, the degree of which is associated with attention and executive function.

Oral-4: ***Fetal Intraparenchymal Hemorrhage: Imaging, Etiology, and Neurodevelopmental Outcomes***

Rachel Vassar[1], Dawn Gano[1], Andrew Mogga[2], Elizabeth George[1], Orit Glenn[1]

[1]University of California, San Francisco, [2]Albany Medical College

Introduction: Little is known about risk factors and outcomes of fetal intraparenchymal hemorrhage (IPH). This study aims to evaluate imaging patterns and etiology of fetal IPH and describe neurodevelopmental outcomes among live-born infants. Methods: This retrospective single-center cohort study included all cases of fetal IPH identified on fetal brain MRI between 1998-2021. Imaging findings were categorized based on radiology reports, with confirmatory review by two pediatric neuroradiologists. Pre- and postnatal clinical data were collected from electronic medical records. Results: A total of 53 fetuses with IPH were identified, including 40 singleton and 13 twin gestations. Median gestational age (GA) at fetal MRI was 24.4wks. IPH was supratentorial in 50/53 (94%), infratentorial in 10/53 (19%), including 7/53 (13%) with both. Unilateral ventriculomegaly (VM) was noted in 12/53 (23%), all with ipsilateral IPH, and bilateral VM was present in 23/53 (43%), including 7/53 (13%) with hydrocephalus. Etiology of IPH was known/suspected in 31/53 (58%) and included twin-twin transfusion syndrome in 11/13 (85%) twins, intrauterine blood transfusion (N=3), COL4A1/2 mutation (N=5), congenital infection (N=3), and other maternal and fetal comorbidities. 25/53 (47%) of fetuses survived to birth (median GA 38wks); 3 died prior to discharge. 16/53 (30%) underwent voluntary termination, 3/53 (6%) underwent reduction via radiofrequency ablation, 4/53 (8%) had spontaneous intrauterine demise, and 2/53 (4%) had stillbirth. Among 17/22 infants with follow-up data, 3 died in infancy, 2/14 (14%) required a ventriculoperitoneal shunt, 5/14 (36%) had epilepsy, 10/14 (71%) had developmental delay, and 8/14 (57%) had cerebral palsy. Conclusions: A suspected cause of fetal IPH was identified in more than half of cases in this cohort. A broad spectrum of outcomes was observed among surviving infants, with developmental delay and/or disability occurring in the majority. Additional research will further inform clinical management and counseling.

Oral-5: ***Long-term Trajectories of Cerebral Vasculopathy in Children with PHACE Syndrome***

Moran Hausman-Kedem[1], Elysa Widjaja[2], Ronan Neto[2], Elena Pope[3], Irene Lara-Corrales[2], Gabrielle Deveber[2], Nomazulu Dlamini[2], Daune MacGregor[2], Elizabeth Pulcine[2], Mahendranath Moharir[2]

[1]Tel Aviv Sourasky Medical Center, [2]The Hospital for Sick Children, [3]The Hospital for Sick Chidlren

Background: The trajectory of the cerebral vasculopathy and stroke risk in patients with PHACE syndrome (PHACES) is largely unknown. We aimed to characterize the cerebral vasculopathy, its long-term course, and stroke risk in patients with PHACES. Methods: Retrospective, consecutive cohort study of patients followed at the multidisciplinary PHACES clinic at the Hospital for Sick Children. Clinical and sequential neuroimaging data including brain Magnetic resonance imaging (MRI) and MR angiography (MRA) study were re-reviewed. Clinical and radiological rates of stroke, the characteristics of the vasculopathy, and its evolution with time were studied. Progression of vasculopathy was defined as worsening in pre-existing and/or appearance of new vascular findings. Results: Thirty-four PHACES patients were included [definite (N=32), possible (N=2); 85% females]. Median age at last follow-up was 8.5 years (2-18 years). Mean number of MRIs for each patient was 4 (range-1-14) over a mean follow-up of 7±4.7 years. Fifteen patients were classified as low/low intermediate risk, 6 intermediate-risk, and 13 high-risk vasculopathy. Half of all patients (n=17) were treated with aspirin. Transient ischemic attack (TIA) was reported in 3 (9%) and arterial ischemic stroke (AIS) in 1 patient. Intracranially, 85% had narrowed vessels, mainly in the anterior circulation. Of these, all had hypoplasia/diffuse narrowing and 8/34 (23%) had moderate-severe steno-occlusive arteriopathy. Extracranial narrowing occurred in 27/34 (79%), [hypoplasia/diffuse narrowing in 23/34 (68%), moderate-severe stenosis in 8/34 (23%)]. Arterial tortuosity was evident in most patients (91%) and was progressive in 5 (15%). Dolichoectasia was seen in 19 (56%), mainly intracranially (63%), and was progressive in 4 (9%). Three patients had an aneurysm, evident from the 1st year of life. Overall, 10 (29%) patients had radiological progression of vasculopathy at some point during the follow-up time with a cumulative 5-year progression-free survival of 73% and TIA/AIS-free survival of 87%. At the last follow-up, the vasculopathy stabilized in 4 patients and was still progressive in 6 (18%) patients. Conclusion: The cerebrovascular disease in patients with PHACES appears to be mostly non-progressive or slowly evolving and is associated with very low rates of AIS. Larger studies are needed to better characterize the vascular disease trajectory and long-term outcome.

Oral-6: ***Functional oscillatory activity underlying dystonia and cognitive outcomes following childhood arterial ischemic stroke***

Prisca Hsu, Cecilia Jobst[1], Nomazulu Dlamini[1], Douglas Cheyne[1]

[1]Hospital for Sick Children

20% of children who suffer an arterial ischemic stroke will develop dystonia, a painful and disabling motor sequelae. In addition, cognitive impairments related to reduced executive functions are more likely to develop in post-stroke children who develop dystonia than those without. An emerging hypothesis linking dystonia and cognitive impairments involves deficits in inhibitory control, an ability related to planning goal-directed behaviors and inhibiting habitual responses. In the study, we aim to examine functional oscillatory activity indicative of inhibitory control. Using functional MEG and structural MRI, we examined induced oscillatory activity associated with dystonia in an initial sample of 6 patients (3 with dystonia, 3 without) and 8 healthy children. All participants completed a go/no-go task, a behavioral paradigm extensively used to measure inhibitory control. Frontal theta (4-8 Hz) oscillatory activity was measured to examine neural mechanisms underlying executive functions. Motor beta (15-30 Hz) oscillatory activity was measured to examine motor preparation and execution. Dystonia

patients showed higher theta power and higher error rates for 'no-go' trials, suggesting more cognitive effort but less effective ability to withhold movement. Interestingly, non-dystonia patients did not show any behavioral differences across both hands, but theta power was greater in the hand associated with the lesioned hemisphere. Motor beta oscillatory activity is characterized by suppression and rebound around movement onset in healthy children and non-dystonia patients. However, this activity was dampened in dystonia patients. Induced theta and beta oscillatory patterns reflect behavioral deficits seen in post-stroke dystonia patients and suggest that reduced inhibitory mechanisms are related to poor outcomes following pediatric stroke. Recordings in these pediatric stroke patients are ongoing to confirm the replicability of these initial findings.

Oral-7: ***Health Inequity and Time from Stroke Onset to Arrival Trends: A Single-centre Experience***

Akshat Pai[1], Dan Nichol[1], Daune MacGregor[1], Ishvinder Bhathal[1], Mahendranath Moharir[1], Teresa To[1], Birgit Ertl-Wagner[1], Andrea Kassner[1], Gabrielle deVeber[1], Nomazulu Dlamini[1]

[1]Hospital for Sick Children

Background Clinical outcomes following childhood arterial ischaemic stroke (AIS) depend on age at the time of stroke, infarct size and location. However, other important variables including health inequity and stroke onset to arrival times remain inadequately addressed. This study reported trends in health inequity and stroke onset to arrival times along with proximity to a stroke centre in Ontario, Canada. Methods Childhood AIS patients (N=234) with stroke onset between 2004-2019 at a Level 2 (comprehensive) stroke centre were included. Measures of material deprivation included household income, education, proportion of single-parent families, and housing quality within a region located in Ontario. Patients were stratified into 3 cohorts (by date of stroke onset) and postal codes were categorized as least, moderate, or most deprived neighbourhoods by using validated mapping techniques. The time from stroke onset to arrival was stratified into < 6 hours, 6 to 24 hours, and > 24 hours. Results Over the 16-year period, an increasing number of patients arrived from the most deprived neighbourhoods. Although, there was no significant association between material deprivation and stroke onset to arrival time, an increasing number of patients presented within 6 hours of stroke onset ($\chi 2 = 13.8$, $p = 0.008$). Furthermore, most patients arrived at the comprehensive stroke centre from urban neighbourhoods within Ontario. Conclusions The faster stroke onset to arrival trend is encouraging, however, material deprivation trends are concerning. Thus, future studies exploring post-stroke outcomes should consider material deprivation, stroke onset to arrival times, and geographical proximity to the stroke centre.

Oral-8: ***Perinatal Arterial Ischemic Stroke (PAIS) in term neonates: A diagnostic clinical prediction modelling study***

Ratika Srivastava[1], Mary Dunbar[1], Michael Shevell, Maryam Oskoui[1], Anna Basu, Michael Rivkin, Eilon Shany, Linda de Vries, Deborah Dewey[1], Nicole Letourneau[1], Michael Hill[1], Adam Kirton[1]

[1]University of Calgary

Introduction: Perinatal arterial ischemic stroke (PAIS) is a focal brain injury in term neonates that is identified postnatally but presumed to occur around birth. Many pregnancy, delivery, and fetal/neonatal risk factors have been considered, but definitive understanding is lacking. There is currently no process in place to identify at-risk neonates; therefore, early detection and prevention are not possible. This study developed and validated a diagnostic risk prediction model from common clinical factors to predict a term neonate's probability of PAIS. Methods: PAIS data were collected from the Alberta Perinatal Stroke Project, the Canadian Cerebral Palsy registry, and the International Pediatric Stroke Study. Healthy control data were from the Alberta Pregnancy Outcomes and Nutrition study. Common data elements of clinical pregnancy, delivery, and neonatal risk factors were used to develop a diagnostic prediction model using multivariable logistic regression. Bootstrap resampling and cross-validation were used for internal validation. Sensitivity analysis was done using a single population. Results: The final model included 1924 participants and nine perinatal predictors - maternal age, tobacco exposure, recreational drug exposure, pre-eclampsia, chorioamnionitis, intrapartum maternal fever, emergency c-section, low 5-minute Apgar score, and male sex - to predict the risk of PAIS in a term neonate. This model demonstrated good discrimination between PAIS cases and controls (C-statistic 0.73) and model fit (Hosmer-Lemeshow p=0.20). Internal validation techniques yielded similar C-statistics (0.73 with bootstrap resampling, 0.72 with 10-fold cross-validation), as did the sensitivity analysis using only Alberta data (0.71). Conclusions: Clinical variables can be used to develop and internally validate a model to predict the risk of PAIS in term neonates with good predictive performance and strong internal validity. On a population level, this model could help identify at-risk neonates who could be screened for early diagnosis and intervention, potentially reducing the lifelong morbidity associated with PAIS among these individuals and their families.

Oral-9: ***Modifiable Risk Factors for Perioperative Stroke After Moyamoya Revascularization Surgery in a Pediatric Cohort***

John Gatti[1], Syed Ameen Ahmad[1], Matthew DiGiusto[1], Sarah Gardner Yelton[2], Dennis Leung[1], Lisa Sun[1]

[1]Johns Hopkins University School of Medicine, [2]Ann and Robert H. Lurie Children?s Hospital of Chicago

Introduction: Surgical revascularization is the mainstay of management in moyamoya arteriopathy (MMA). Surgery decreases the long-term risk of stroke but carries a relatively high risk of ischemic complications during the perioperative period. Hypothesis: Parameters associated with decreased cerebral perfusion pressure, such as relative dehydration, are associated with perioperative ischemic stroke. Methods: This was a single-center retrospective cohort study. Medical records of pediatric patients undergoing surgical revascularization for MMA at our center between 2003 and 2021 were reviewed with attention to preoperative medications, pre- and postoperative laboratory values, and intra- and postoperative medical management. The primary outcome was perioperative ischemic stroke ≤7 days after surgery. Secondary outcomes included intensive care unit (ICU) length of stay, hospital length of stay, and pediatric stroke outcome measure (PSOM) score at the most recent follow-up visit. Results: There were 53 surgical events, consisting of 39 individual patients undergoing surgical revascularization of 74 hemispheres. Perioperative ischemic stroke occurred in five instances

(9.4%). Occurrence of ischemic stroke was associated with increased ICU and hospital length of stay (both p<0.01) and less favorable PSOM scores at follow-up (coef. 2.04, p=0.03). Larger decrease in hematocrit between the pre- and postoperative periods (OR 0.59, p=0.01), decrease in blood urea nitrogen (BUN) (OR=0.55, p=0.01), and use of fentanyl for postoperative analgesia (OR 12.90, p=0.02) were associated with stroke. Decrease in hematocrit remained significantly associated with stroke after adjusting for sex and comorbid sickle cell disease (AOR 0.60, p=0.02). Conclusions: Decreases in both hematocrit and BUN between the preoperative and postoperative periods are associated with increased risk of perioperative stroke. Taken together, this suggests that hyperhydration in the perioperative period may cause a dilutional anemia, which may increase the risk for ischemic stroke. Further work to optimize the balance between mean arterial pressure and oxygen-carrying capacity in these patients, including consideration of alternative blood transfusion thresholds, is necessary.

Oral-10: ***Impact of Stroke Volume on Neurological Outcome after Arterial Ischemic Stroke of Childhood***

Tatia Aprasidze[1], Arsany Hakim[2], Nana Tatishvili[3], Leonie Steiner[4], Gabriela Osch-Nemeth[4], Maria Regenyi[4], Maria Iciar Sanchez-Albisua[4], Sebastian Grunt[4], Christina Marx[5], Maja Steinlin[4]

[1]M. Iashvili Children Central Hospital, D. Tvildiani Medical University, University Children's Hospit, [2]University of Bern, Inselspital, [3]M. Iashvili Children Central Hospital, D. Tvildiani Medical University, [4]University Children's Hospital, Inselspital,

Background: There is limited knowledge regarding stroke volume and outcome in childhood stroke. Aim: To evaluate infarct volume as a prediction of long-term neurological outcome in acute diffusion-weighted imaging (DWI) with three different methods: Modified Alberta Stroke Program Early CT Score (ModASPECTS), volumetry by segmentation, and ABC/2. The three methods were compared for their accuracy and their prognostic value. Methods: 169 patients from the Swiss NeuroPaediatric Stroke Registry (SNPSR) (prospective registration and retrospective analyses) and 29 patients from Georgia (retrospectively collected and analyzed) who had DWI in the acute phase entered the study. The patients had a standardized neurological examination with Paediatric Stroke Outcome Measure (PSOM) at two years after stroke (for those not available after two years, outcome after six months was taken, N=17). For the modASPECTS the DWI images were cross-checked with the apparent diffusion coefficient (ADC) maps, and scored a maximum of 36 points for supra and infratentorial lesions in both hemispheres; a 3D slicer volumetric software program was used for the segmentation. A calculated infarct volume divided by total brain volume, and a percentage of infarct volume (PIV) was defined, because of the variations of whole-brain volume depending on children's age. lesion volume according to ABC/2 method was measured by placing linear diameters in three perpendicular axes on the slice where the lesion on DWI appeared largest; these three measurements were then divided by 2; Results: There was a highly significant association between all three techniques for measuring lesion size (r=0.70-0.96, p<0.000). All of these three methods had a significant association with PSOM (ASPECTS r=0.597, p<0.000; ABC/2 r=0.458, p<0.000; Volumetry r=0.451, p<0.000). ModASPECTS had the highest correlation to outcome. Regression analysis is going to be performed. Conclusion: Technically difficult

methods of volumetry might be replaced by easy to assess methods such as modASPECTS and ABC/2. Infarct volume in acute imaging is a good predictor of neurological outcome.

Oral-11: ***Vertebral artery configuration as a risk factor for dissection in children***

Fiza Laheji[1], Michael Dowling[1], Bruno Braga[1]

[1]University of Texas Southwestern

Introduction: The pathogenesis of pediatric vertebral artery dissection (VAD) is poorly understood. We previously described two configurations of the vertebral artery(VA) at the V3 segment: type A and type B depending on the angle of curvature of V3. All patients with V3 dissection who were diagnosed with bow hunter syndrome were found to have the type B conformation.(1) Hypothesis: The aim of this study was to investigate these VA conformations in patients without dissection vs those with VAD. We hypothesized that the type B configuration was more prevalent in patients with VAD. Methods: We conducted a retrospective chart review from 2008-2022 at Children's Medical Center (UT Southwestern). We reviewed MRA or IR angiogram of 37 patients, 19 with VAD (nontraumatic) and 18 with no vertebral artery pathology. The V3 segment was classified into type A (presence of obtuse angle or no acute angulation) and type B (two consecutive acute angles, <110 degrees). Chi-square test was used for analysis. Results: In 19 patients with VAD, 15 were male, average age was 12.3 years. Configuration type B was present in 79% of total dissected vessels (19/24) and configuration type A in 20.83% (5/24). 17 of these patients had a rotational angiogram with 12/17 showing vertebral artery compression or occlusion diagnostic of bow hunter syndrome and underwent a C1C2 fusion. In the control group of 18 patients with no VAD, 8 were male, average age was 15 years, and thirty-three vertebral arteries were available for review. Configuration type B was present in 24.42 % (8/33) and configuration A in 75.7% (25/33). Type B conformation had a significantly higher prevalence in the V3 dissection group than controls (p= < 0.001). Conclusion: The type B (acute angle) configuration of V3 seems to be a risk factor for VAD and warrants further investigation with a dynamic angiogram in the right setting. References: 1) Braga BP, Sillero R, Pereira RM, Urgun K, Swift DM, Rollins NK, Hogge AJ, Dowling MM. Dynamic compression in vertebral artery dissection in children: apropos of a new protocol. Childs Nerv Syst. 2021 Apr;37(4):1285-1293. doi: 10.1007/s00381-020-04956-1. Epub 2020 Nov 6. PMID: 33155060.

P-A-1: [Print only] ***Toward Development of national Pediatric acute Stroke management guidelines: A modified Delphi study***

Sahar Hassanein[1], Ghada El-Din Amin[2], Hala Khedr[3], Maha Mohammed[2]

[1]Pediatrics, Faculty of Medicine, Ain Shams University, [2]Faculty of Medicine, Ain Shams University, [3]One day surgery Madinat Nasr hospital

Acute childhood stroke diagnosis and acute management guideline is needed to have a unified pediatric stroke approach in Egypt. This will allow for early diagnosis, proper management, and better outcome. Method This was a consensus-generating study. Two-round, modified Delphi technique. A focus-group discussion including 4 experts adapted and developed preliminary questionnaire materials. An online survey was prepared on REDCap (Research Electronic Data Capture) a secure web application. Thereafter, an internet-based 2-round modified Delphi-study answered by 26 pediatric neurologists with interests in childhood stroke. Consensus was predefined as ≥75% level of (dis)agreement. The first round consisted of 16 open-ended questions. In round 2, experts rated items from round 1 that did not reach consensus. Results Twenty-six pediatric stroke physicians completed the first Delphi round, and 25 completed the second Delphi round. The questions covering stroke presentation, diagnosis and treatment were answered. After two rounds, a consensus was reached on the following, the FAST tool is the commonest presenting symptom of stroke in pediatrics, the most common risk factors were thrombophilia, cardiac diseases followed by sickle cell disease and that MRI is the best neuroimaging to be ordered for a child with suspected stroke. In terms of treatment, the panel had agreement on supporting safety of anticoagulation use in AIS and on safety of aspirin use in prevention of stroke recurrence after exclusion of hemorrhagic stroke. Conclusion A modified Delphi consensus-based recommendations might help in early diagnosis and proper management of children with stroke. This will influence the development of an institutional followed by a national Egyptian stroke guideline.

P-A-2: ***Complex Migraine Mimicker: Idiopathic Wallenberg Syndrome in an Adolescent Female***

Barbra Giourgas[1], Jennifer Cashwell[1], Thomas Koch[1]

[1]Medical University of South Carolina

INTRODUCTION: Lateral medullary syndrome, or Wallenberg Syndrome, is a prevalent posterior circulation stroke syndrome in adults but rare in pediatric patients. It is typically caused by occlusion of the vertebral or posterior inferior cerebellar arteries, often secondary to arterial dissection in young adults, but there is no consensus to its etiology in children. Classic presentation includes vertigo, cranial nerve deficits, Horner's syndrome, and impaired pain and temperature sensation of the contralateral extremities. We present a case of an adolescent female with idiopathic right posterior lateral medullary syndrome. To our knowledge, there are less than 10 reported pediatric cases of Wallenberg syndrome, and even fewer of cryptogenic origin. CASE: A 16-year-old female with history of migraine with aura presented with headache, dizziness, and vomiting upon wakening. Physical exam revealed

right-sided facial weakness, ptosis, CN III palsy, dysarthria, decreased pinprick sensation to left hemibody, right upper extremity dysmetria, and ataxic gait (NIHSS 5). MRI showed an infarction involving the right inferior medial cerebellum and posterior lateral medulla, with occlusion of the right vertebral V3 segment on CTA Head and Neck. Subsequent MRA demonstrated multifocal irregularity and non-opacification of the proximal right vertebral artery attributed to artifact as flow was visualized distally. Our patient denied neck injury but participated in gymnastics, so cervical trauma was not ruled out. She was started on ASA 325 mg and symptoms overall resolved. DISCUSSION: Although Wallenberg Syndrome is common in adults, it is rarely reported in the pediatric literature and without a unanimous cause. This central ischemic syndrome can be subtle and mimic complicated migraine or peripheral vertigo. This case identifies the importance of early clinical recognition in children, as prompt diagnosis and intervention are crucial. Posterior circulation infarcts are likely under-recognized in this population, but timely preventative therapy is imperative given the high risk of reoccurrence.

P-A-3: ***Diversity in a UK Tertiary Paediatric Neurovascular Service Over a 5-Year Period***

Thomas Smith[1], Rebecca Keeping[1], Christopher Hilditch[2], Hannah Stockley[2], Daniel Holsgrove[2], Dimitrios Varthalitis[1], Ian Kamaly-Asl[1], Grace Vassallo[1], Dipak Ram[1]

[1]Royal Manchester Children's Hospital, [2]Salford Royal Hospital

Background and Aims: With an expanding evidence base and advancing therapies applicable to paediatric neurovascular disease, a growing number of patients are finding significant benefit from referral to tertiary neurovascular services. As such, a significant proportion of patients are also being diagnosed with diverse underlying genetic disorders which have strong associations with neurovascular disease. We sought to analyse the individual characteristics within our own patient cohort to ascertain the rates of such disorders within our own regional service. Methods: Analysis of individual patients referred to the service since its inception (2016), over a period of 5 years was carried out using the service's ongoing patient database. Data was collected concerning age, gender, diagnosis, rates of surgical intervention and sequelae of disease (including physical deficits, epilepsy, and developmental/psychological complications) Particular emphasis was placed on the rate of underlying genetic disorders predisposing to neurovascular diseases. Results: 117 patients were analysed across the 5 year period. The commonest active diagnoses consisted of cavernomas (n = 27, 23.1%), arteriovenous malformations (n= 22, 18.8%) and Moyamoya disease (n=18, 16.2%), all of which can have an identifiable genetic disease basis. 29 patients (24.8%) were identified as having an underlying genetic diagnosis, the commonest being neurofibromatosis type 1, trisomy 21 and CCM gene mutations. Conclusions: Approximately one quarter of our patient cohort were identified as having a genetic basis for their neurovascular disease, representing a significant proportion of the population. It is crucial that as advancements in the approach to paediatric neurovascular disease are made, that involvement of clinical genetics is sought in order to optimise the evaluation of neurovascular patients.

P-A-4: ***Pushing Boundaries: The Paediatric Neurovascular Service of Northwest England***

Dipak Ram[1]

[1]Royal Manchester Children's Hospital

Introduction: There is a strong need for more robust paediatric neurovascular services internationally. In the UK, the Royal College of Paediatrics and Child Health (RCPCH) published new paediatric stroke guidelines in 2017. Despite this, there is no single centre in the UK which is currently able to deliver solid 24/7 hyperacute stroke services for children. Methods: With the aim of setting up a more cohesive neurovascular service for children living in the North West of England, discussion took place between two large tertiary paediatric hospitals in Manchester and Liverpool. The idea of using pooled expertise across both sites was exchanged and agreed. Using strengths across both sites meant that service delivery across the North West was significantly enhanced. Results: After forming a core team in 2019, regular multidisciplinary team (MDT) meetings now occur on a monthly basis, involving paediatric neurologists, neurosurgeons, neuroradiologists and specialist nurses. Dedicated haematologists and geneticists are involved in the MDT as required. An MDT clinic has also been setup on a monthly basis and feedback from patients and families have been overwhelmingly positive, and this clinic now accepts quaternary referrals from across the country. Recent MDT discussions in 2021 have led to the establishment of a new pathway for thrombectomy services in the North West of England. Conclusion: The paediatric neurovascular service in Northwest England is currently a lot more robust and is able to deliver MDT-orientated care to patients in the region. However, there is still more work to be done nationally and internationally for paediatric stroke in terms of hyperacute management. Pooling resources nationally may be a way forward to achieve this next vision.

P-A-5: ***Cryptogenic bithalamic infarction in a child with Artery of Percheron Variant: Delayed diagnosis due to clinical and radiographic overlap with inflammatory demyelinating disease***

Varun Kannan[1], Viola Caretti[1], Ajay Thomas[1], Jill Hunter[1], Daniel Davila-Williams[1]

[1]Baylor College of Medicine at Texas Children?s Hospital

Introduction Infarction of the artery of Percheron (AOP), a common anatomic variant, leads to a characteristic imaging pattern of bilateral thalamic and midbrain ischemia associated with variable neurological manifestations. Here, we describe a child initially diagnosed with fulminant CNS demyelinating disease who failed to respond to empiric anti-inflammatory treatment, and was later confirmed to have AOP variant and associated stroke upon repeat imaging. Case A previously healthy 14-year-old girl presented to a community hospital with acute onset of confusion, dysarthria, expressive aphasia, and right facial droop. MRI was obtained upon admission and showed bilateral acute and subacute diffusion restricting lesions of the paramedian thalami (Figure 1), which were initially thought to be due to ADEM or acute necrotizing encephalopathy (ANE) of childhood. She subsequently was treated with pulse steroids and therapeutic plasma exchange, with minimal clinical improvement. She was transferred to our tertiary care center for further management. Repeat MRI showed evolution of the previous lesions, suggestive of bithalamic infarction as seen typically with AOP-

associated stroke. She subsequently underwent diagnostic cerebral angiography, which confirmed the presence of a single perforating branch of the left PCA supplying bilateral thalami consistent with AOP variant (Figure 2). There were, however, no flow-limiting stenosis or other evidence of vasculopathy to explain the infarction. Extensive serum and CSF laboratory workup for infectious, autoimmune, and genetic stroke risk factors were inconclusive. The stroke was categorized as cryptogenic, and she was enrolled in intensive physical and cognitive rehabilitation. Despite early improvement, she continues to exhibit mild-moderate neuropsychological deficits at 1 year follow up. Discussion Though exceedingly rare in this age group, AOP stroke can occur in children without known preceding vascular risk factors. Radiographic similarities with more common pediatric disorders, such as demyelinating and genetic/metabolic diseases, can impede timely diagnosis and delay appropriate intervention. In cases of diagnostic uncertainty, angiography may be helpful to confirm the vascular anatomy and avoid unnecessary treatments. Our case contributes to the growing understanding and recognition of pediatric AOP stroke.

P-A-6: [Print only] ***"REDCap for Red Alerts" Using REDCap to Capture Acute Stroke Team Activations***

Patricia Plumb[1], Wilmot Bonnet[1], Michael Dowling[1]

[1]U Texas Southwestern

Abstract: "REDCap for Red Alerts" Using REDCap to Capture Acute Stroke Team Activations. Patricia A. Plumb, RN, MSN, Wilmot Bonnet M.D., Michael M. Dowling M.D., PhD. Departments of Pediatrics and Neurology University of Texas Southwestern Medical Center, Dallas, Texas, USA Introduction: Our pediatric stroke team activation statistics were increasingly difficult to manage given new attending physicians, and rotating stroke fellows. We sought to streamline acquisition of data for our acute stroke team calls. We utilize the data for assessing strokes and mimics, timing, and assisting with institutional QI/QA. The data are used to facilitate our pediatric stroke guidelines and be a storehouse for potential research opportunities. Purpose: to use REDCap technology to streamline data collection and decrease missing data. Methods: The REDCap mobile application lets the attending physicians and fellows directly place real-time data into REDCap, replacing third person data entry. The mobile application is bookmarked onto team member phone or tablet for easy accessibility. Data collected: Medical record numbers, presenting symptoms, Time of data entry, last seen well, onset of symptoms, presenting symptoms, diagnosis listing options for stroke or stroke mimics, referral location. Results: Each entry placed into the REDCap acute stroke team call template takes 30-40 seconds. Within REDCap, we use very little free text to make future statistical analysis easy, but a field is available for helpful comments. The physicians no longer need to use outdated means of collecting data, i.e., pen/paper or emailing themselves or staff to fill in a spreadsheet and to ensure capture of all stroke mimics. Between 11/23/2021 and 2/24/2022 we captured data on 31 stroke team activations with 26% acute ischemic strokes, 74% mimics, including TIA, migraine, Covid-19 encephalopathy, Methotrexate toxicity, CSVT, seizures, Bell's Palsy, joint infection. Conclusions: Utilizing mobile REDCap, our stroke team has increased data collection efficiency. Physicians and fellows can place real time data at the time of stroke call activation. By the stroke team placing their own data, we have decreased missing data and entry errors by eliminating third party data entry.

P-A-7: [Print only] ***Transcranial Doppler Sonography in Children with Congenital Heart Disease Undergoing Cardiac Catheterization***

Sahar Hassanein[1], Abeer Abdel Hameed[2], Yomna Abdel Sattar[3], Marwa Nasef[2]

[1]Professor of Pediatrics, Faculty of Medicine, Ain Shams University, [2]Faculty of Medicine, Ain Shams University, [3]Madinat Nasr Insurance hospital, Cairo, Egypt

Background: Children with congenital heart disease (CHD) remain at high risk for long-term neurodevelopmental disabilities. Acute neurologic complications, such as seizures, transient ischemic attack, intracranial hemorrhage, and ischemic stroke might occur in the setting of cardiac surgery and cardiac catheterization. Cardiac catheterization is important in the diagnosis and assessment of hemodynamic function in children with congenital heart disease. The incidence of neurologic complication (occurring within 48 hours) in interventional cardiac catheterization is significantly higher than diagnostic. Objective: The Aim of this study was to evaluate the effect of cardiac catheterization on transcranial Doppler sonography in children with congenital heart disease. Methods: This is a prospective study 40 children were enrolled; at Children's hospital, Ain Shams University over 6 months. TCD parameters, clinical data, neurologic examination were done before and after cardiac catheterization. Results: In the present study, 33 patients (82.5%) had interventional catheter and 7 (17.5%) had diagnostic catheter. A history of previous cardiac catheterization were found in 11 (27.5%) of 40 patients; 4 (36.4%) had previous failed catheterization, 3 (27.3%) had previous diagnostic catheterization. Middle cerebral artery TCD parameters of the patients in the diagnostic group showed statistically significant lower Peak systolic velocity (PS) and time average mean of the maximal velocities (TAMX), before catheterization and statistically significant lower PS, end diastolic velocity (ED) and TAMX post catheterization. All patients showed significant lower TAMX post-catheterization. Conclusion: Transcranial Doppler sonography is a noninvasive physiologic monitor of cerebral hemodynamics that can be performed at the bedside in the PICU. In our experience derangements in cerebral hemodynamics were recorded. However, the practical implications of these findings remain uncertain.

P-A-8: [Print only] ***Pediatric Stroke Neuroimaging pathway: A single-center experience***

Sahar Hassanein[1], Sahar Hassanein[1], Mahmoud Shaarawy[2], Shrouk Awadallah[1]

[1]Faculty of Medicine, Ain Shams University, [2]Radiodiagnosis, Faculty of Medicine, Ain Shams University

Introduction: Pediatric Stroke is an acute neurologic emergency causes significant morbidity and mortality in children worldwide. Prevention of handicap depends on the early diagnosis, and proper management. Hypothesis: Whether setting up neuroradiology pathway for practitioners will shorten time from last seen well till diagnosis in children with suspected stroke? Patients and Methods: A cross sectional study, children with radiologically proven stroke, using one or more of the following modalities (CT, MRI or DSA), were included. The picture archive and communication system (PACS, Synapse 5.7. 002. Fujifilm Medical System) was reviewed for all children imaged for suspected stroke from January 2017 till May 2021, at Ain Shams University hospitals. Data were collected and analyzed. High field MRI,1.5 Tesla,

dedicated phased array brain coil, closed type machine (Achieva Phillips Healthcare) was used. Abbreviated MRI protocols was used to reduce time. Results: Eleven out of 17 cases (64.6%), which had been diagnosed clinically and radiologically as pediatric stroke, started neuro-imaging studies with CT brain and six cases (35.3%) started with MRI stroke protocol with MRV sequence. Diagnosis of stroke was missed in (36.4%) of cases which started with CT brain. Conclusion: The diagnosis of acute stroke in children is delayed when CT scanning is the first neuroimaging. MRI should be the initial imaging modality in any suspected case of acute childhood stroke. Setting up neuroradiology pathway for practitioners will shorten time from last seen well till diagnosis in children with suspected stroke A neuroimaging algorithm is proposed and will be evaluated in an institutional level to be generalized. The use of abbreviated MRI stroke protocol should be generalized.

Risk Factors and Prevention

P-B-9: [Print only] ***The Impact of Sleep Restriction on Endothelial Function in Healthy Adolescents***

Amy Chan[1], Yeasmin Begum[1], Amanda Robertson[1], Kirstin Walker[1], Robyn Westmacott[1], Manohar Shroff[1], Indra Narang[1], Nomazulu Dlamini[1]

[1]Hospital for Sick Children

Background: Despite clinical recommendations of 8 to 10 hours of sleep each night, 60% of adolescents report 7 hours or less of sleep each night. Sleep restriction (SR) adversely impacts attention, executive function, memory and learning that lead to poor academic performance. Additionally, studies in adults found that SR increases sympathetic activity, oxidative stress and pro-inflammatory markers leading to vascular endothelial dysfunction (VED). VED is a modifiable risk factor for disease and can be improved with a healthy lifestyle of adequate sleep, exercise and diet. Novel non-invasive measures of BOLD cerebrovascular reactivity (CVR), provide an imaging biomarker of endothelial function and has been shown to predict cognitive outcome and stroke risk in adults. The purpose of this study was to investigate whether experimental SR, relative to ideal sleep (IS), is associated with VED, as measured by CVR in healthy adolescents. Methods: This randomized crossover study recruited healthy 15- to 18- year old neurotypical adolescents from the community whom underwent a 2-week at-home sleep manipulation protocol that included 5-nights of IS (9 hours in bed), and 5-nights of SR (6 hours in bed). Validated accelerometer was used to objectively record sleep duration across multiple nights. At the end of each sleep manipulation condition, participants underwent a BOLD MRI with controlled CO2 challenge to assess CVR. Cognitive cortical regions of interests (ROIs) were determined, and mean CVR values were used for statistical analysis. Results: Seventeen participants (mean age 16.9 years, 33% male) were included in this study. The mean sleep duration was 5.44 + 0.68 hours for the SR condition, and 7.07 + 0.74 hours for the IS condition. Reduced CVR in cognitive ROIs, including the cuneal cortex ($p<0.01$), lingual gyrus ($p=0.04$) and temporal occipital fusiform cortex ($p=0.05$) were seen with acute SR compared with IS. Conclusions: Reduced CVR was seen in specific regions of cognitive function with SR compared to IS. This study provides novel data to demonstrate that acute SR is linked to adverse cerebrovascular health, particularly VED, and may be the underpinning mechanism for adverse cognitive outcomes in sleep-restricted adolescents. Modifying sleep

behaviours in adolescents may promote endothelial function and prevent related diseases. Knowledge from this study may offer early insights into the mechanisms of cognitive impairment associated with SR.

P-B-10: ***Paediatric Arterial Ischaemic Stroke during the COVID-19 Pandemic: A Collaborative North of England Study***

Thomas Smith[1], Eusra Hassan[1], Jia Yi Leow[2], Micheal Taylor[3], Mark Atherton[4], Tara Reeves[5], Chris Rittey[4], Anil Israni[2], Ram Kumar[2], Anna Basu[5], Helen McCullagh[3], Grace Vassallo[1], Dipak Ram[1]

[1]Royal Manchester Children's Hospital, [2]Alder Hey Children's Hospital, [3]Leeds General Infirmary, [4]Sheffield Children's Hospital, [5]Great North Children's Hospital

Background and Aims: SARS-CoV-2 as a possible cause for childhood arterial ischaemic stroke (AIS) has been described in a few case reports in literature. We sought to determine rates of AIS in paediatric patients across the North of England during a 12 month period, aiming to establish the underlying aetiology of their stroke. Methods: Tertiary paediatric neurosciences centres across the North of England (Manchester, Liverpool, Sheffield, Leeds, Newcastle) collected retrospective data on patients with AIS and collated information on the following areas: patient's age at presentation, aetiology, co-morbidities, COVID-19 status, imaging modalities, hyperacute therapy and any further management carried out. Results: From February 2020 to February 2021, 32 paediatric patients were diagnosed with AIS (age range 1 month-15 years, mean age 6.1 years). Aetiology consisted of idiopathic 29.1%, underlying vascular abnormality 25%, cardio-embolic 18.7%, post-operative complications 12.5%, coagulopathy 6.3%, infection 3.1%, and inflammatory/ vasculitic 3.1%. At presentation and subsequent testing, 100% of patients were negative on COVID-19 PCR testing. Of note, one patient tested positive a month prior to admission, but negative on presentation and the stroke was not felt to be linked to COVID-19. Conclusions: Analysis of our regional data did not demonstrate that SARS-CoV-2 caused an increase in the number of patients diagnosed with AIS. Although COVID-19 testing is recommended in all patients presenting with AIS, we should not attribute the AIS to COVID-19 unless all other causes have been excluded.

P-B-11: ***When Is Patent Foramen Ovale (PFO) Closure Warranted in Pediatric Stroke?***

Solomon Tatagiri[1], Andrew Stemer[2], Paola Pergami[2]

[1]Georgetown University, [2]Medstar Georgetown University Hospital

Introduction PFO is a relatively common congenital cardiac condition, frequently found in association with cryptogenic stroke in adults (40% of cases) and children. Transcatheter closure of PFO plus medical therapy is considered superior to medical therapy alone in preventing stroke recurrence in adults <60 with cryptogenic stroke and large right-to-left shunt; selection criteria to identify patients likely to have the greatest benefit from PFO closure have been defined. To date, it remains unclear if the same approach can be applied to the pediatric population. Cases We present 4 pediatric cases (males, age 15-18) with cryptogenic embolic stroke (two with posterior circulation, two with MCA territory involvement) and PFO. Two patients presented following intense training involving Valsalva maneuver. Three patients

were heterozygote for PAI-1 4G/5G mutation, considered a low or not clearly determined thrombotic risk. All cases underwent transcatheter PFO repair followed by six-month double anticoagulation treatment. At 2-4 years follow-up all patients remain recurrence-free. They all had complete recovery from the original AIS. Discussion Clear guidelines to the approach of PFO management in pediatric stroke are lacking. Surgical closure is preferred in young adults with PFO, cryptogenic embolic stroke and suggestive clues (Valsalva, travel history). The diagnostic approach for identification of PFO and shunt detection typically involve transthoracic echocardiogram (TTE) with agitated saline injection ("bubble study"); a transesophageal echocardiogram (TEE) or intracardiac echocardiogram (ICE) can further characterize anatomic details of the PFO (i.e. tunnel length, margins), but in children the diagnostic approach is frequently operator dependent. Larger studies are needed to determine expert consensus for PFO management in pediatric stroke and to determine safety and efficacy of surgical treatment of this condition in patients <18.

P-B-12: [Print only] ***Causes and prevention of stroke in children living with sickle cell Anaemia in South-western Nigeria***

Eunice Adeoti[1], Kunle Oguntegbe[2]

[1]Federal Medical Center, Abeokuta, Ogun State, Nigeria, [2]University of Naples, Federico II

Causes and prevention of stroke in children living with sickle cell Anaemia in South-western Nigeria Adeoti Eunice Taiwo1 and Kunle Francis Oguntegbe2 1. Federal Medical Center, Abeokuta, Ogun State, Nigeria. 2. Department of Economics, Management, Institutions, University of Naples, Federico II, Italy. Introduction The statistics of children living with sickle cell anaemia in Nigeria is alarming. In fact, recent report holds that Nigeria has the highest proportion of children living with sickle cell anaemia across the universe. Often times, such children are predisposed to stroke. No thanks to low blood count, inflammation of the blood vessel, heart diseases and problems with blood clotting among other identified factors. Research question In order to establish the remote causes in the Nigerian environment, we raise the research question: What are the causes of stroke in Nigerian children living with sickle cell anaemia and how can it be prevented? Method This study takes an exploratory path to investigate the foundations of stroke in children within the age bracket of 5-12 years, who have confirmed cases of sickle cell. Data was collected through interviews and direct observation as a researcher was directly involved in the treatment and management of some of the use cases. Participants in this research are drawn from registered hospitals located in the southwestern region of Nigeria. Results Results of qualitative content analysis reveal that aside the common medical reasons, some remote causes of child stroke could be traced to socio-economic factors such as ignorance on the part of parents, poverty and dishonesty among partners, to mention but a few. Conclusion This study concludes by offering recommendations towards the prevention of stroke in children living with sickle cell anaemia. For instance, community awareness programmes should be organised to sensitize intending parents about the causes of child stroke and the need to seek early medical assistance.

P-B-13: ***SAMHD1-associated moyamoya syndrome treated with janus kinase inhibition***

Ariane Soldatos[1], Ayelet Zerem[2], Adriana de Jesus[3], Moran Hausman-Kedem[2], Kader Cetin Gedik[3], Sara Alehashemi[3], Gina Montealegre Sanchez[3], Edward Smith[4], Aviva Fattal-Valevski[2], Merav Heshin-Bekenstein[5], Raphaela Goldbach-Mansky[3]

[1]National Institute of Neurological Disorders and Stroke, [2]Tel Aviv Sourasky Medical Center, Tel Aviv University, [3]National Institute of Allergy and Infectious Diseases, [4]Boston Children's Hospital, [5]Tel Aviv University

SAMHD1 deficiency leads to Aicardi-Goutières syndrome (AGS) type 5, which can be accompanied by cerebral arteriopathy including moyamoya syndrome. Interferonopathies such as AGS are autoinflammatory diseases that have been recently discovered to improve with janus kinase inhibitors. Case 1: 21-year-old female presented at age 7 years with photosensitive malar rash, arthritis of small joints in the hands, and some positive autoantibodies (ANA and anti-Smith). Initially diagnosed with SLE and treated with hydroxychloroquine and systemic steroids. She then experienced a right hemispheric stroke. Treated with cyclophosphamide for presumed childhood small vessel primary angiitis of the CNS. Prior to her genetic diagnosis, based on her elevated interferon signature and elevated CSF neopterin, she was started on baricitinib (an oral janus kinase inhibitor that is selective for JAK1 and JAK2) which enabled weaning of chronic steroids to a low dose, and resulted in a clinical remission for many years. Whole-genome sequencing detected a small biallelic 9Kb deletion in SAMHD1. Following the diagnosis of moyamoya syndrome, she underwent a neurosurgical revascularization procedure by EDAS at the age of 15 years. Until recently, she had been neurologically stable for many years except for the development of symptomatic intracranial hypertension controlled with acetazolamide. Case 2: This is an 8.9-year-old girl who presented at 4 months of age with motor delay, irritability, exaggerated startle, and spastic paraparesis. Exome sequencing was unrevealing. Following the appearance of chilblains, SAMHD1 related Aicardi-Goutières was suspected. Multiplex Ligation-dependent Probe Amplification (MLPA) confirmed biallelic 9Kb deletion in SAMHD1. She had no headaches or history of transient ischemic attacks. Cerebral MRI at the age of 5.2 years demonstrated moyamoya syndrome with stenosis of the M1 and M2 segments of the left middle cerebral artery. Treatment with aspirin was initiated. MRI at the age of 6.6 years demonstrated signs of progressive ischemia with ivy sign. Baricitinib was started at the age of 7.2 years. MRI performed 5 months after initiation of baricitinib demonstrated stable arteriopathy with no signs or progressive ischemia. The patient tolerated this treatment well for a period of 14 months. She is currently stable neurologically, however is wheelchair-dependent. Her older sibling has normal development, short stature, and chilblains and shares her genotype.

P-B-14: [Print only] ***A Case of SMART Syndrome (Stroke-Like Migraine Attacks After Radiation Therapy) and Utility of Pentoxyfylline and Veramapil in Reduction of Recurrent Episodes.***

Gayatra Mainali[1], Zahra Zhu[2], Eric Sobieski[2], Sunil Naik[1]

[1]Penn State Children's Hospital, [2]Penn State College of Medicine

Introduction: SMART Syndrome is a rare, late long-term complication of cerebral radiation therapy for the treatment of central nervous system malignancy, characterized by complex

migraines and focal neurological abnormalities. Diagnosis can be made 1 to 35 years post-radiation, and presents more commonly in adults and/or males. It is not related to tumor recurrence and the mechanism and treatment of this disorder remains unclear. Case: A 12-year-old girl with a past history of posterior fossa grade IV medulloblastoma treated with surgical resection, chemotherapy, and radiation therapy, with radiation-induced necrosis of the brain and mild right hemiparesis presented 3 years later after radiation therapy with intense headache, seizures, and left upper extremity weakness. Brain MRI showed a right MCA posterior territory infarct of the brain. She had a normal cardiac evaluation including echocardiogram and a coagulopathy evaluation. She was started on levetiracetam and aspirin. Her left-sided weakness improved after a few weeks. Four months later, she presented with headaches, seizures, and worsening right hemiparesis. MRI of the brain showed a new infarct in the left posterior MCA territory. MRA with MR vessel wall, CTA of head and neck/cardiac work up was again negative. She was started on verapamil and pentoxifylline, and has not had any symptom recurrence since then. Repeat MRI performed 6 months after the second episode showed no new strokes, except expected areas of encephalomalacia in the bilateral parieto-occipital lobes, and gliosis with cortical laminar necrosis consistent with prior infarcts. Discussion: We hypothesize that along with aspirin, verapamil may prevent vasospasm and pentoxifylline may decrease blood viscosity and increase blood flow to the affected microcirculation, which may reduce the risk of recurrent strokes/stroke-like episodes in SMART syndrome. To note that pentoxifylline and verapamil are not FDA approved for treatment of SMART syndrome.

P-B-15: [Print only] ***Getting Very Important Parents to Consent for the VIPS Study: Who says 'No' and 'Why'***

Wilmot Bonnet[1], Michael Dowling[1]

[1]U Texas Southwestern

Getting Very Important Parents to Consent for the VIPS Study: Who says 'No' and Why? Patricia A. Plumb, RN, MSN; Wilmot Bonnet, M.D.; Michael M. Dowling, M.D., PhD. University of Texas Southwestern Department of Neurology and Pediatrics Introduction: We explored the parental consent rates for participation in an observational acute stroke study, VIPS, the Vasculopathy and Infection in Pediatric Stroke Study. We hoped to gain insight into why some parents are hesitant to participate in research in this Quality Improvement/Quality Assurance project to optimize the consent process. Methods: For QI/QA purposes, we collected demographic information from our VIPS1 & 2 screening logs and compared those who consented to those who refused with t-test or Chi-Square test as appropriate. Results: In VIPS1, 86 children screened: 19 ruled out; 6 refusals. 67 parents approached (8.96% refusal rate, 4/6 Female). Reasons for refusal: 3 uninterested in research, 1 parental stress, 1 child stress, 1 non-assent from teenager. In VIPS2: 54 screened: 22 ruled out; 2 refusals/ 32 parents approached (6.25% refusal rate, 1 / 2 female). Reasons for refusal: 1 not interested, 1 parental stress. We found no significant differences between those who consented vs refused for mean age, gender, race, ethnicity, language (English vs Spanish), or insurance status. Conclusions: We had an overall 92% consent rate which limited our ability to identify any significant demographic differences in those 8 families refusing consent. Stress was a reported concern for 3/8 and lack of interest in research in 4/8, with one non-assent. Our study team utilized a

strategy of a "not a too soon" approach. Per the VIPS protocol, we had 72 hours from stroke onset to obtain consent. Stroke team staff introduced the study early, but the coordinator did not approach the parents until after 36 hours but prior to 72 hours for informed consent. By waiting a day, attempting to allay stress and with appropriate introductions to the study staff, we endeavored to decrease stress on the family and explain the importance of research.

Acute Treatment

P-C-16: *A suicide attempt goes awry: Successful thrombolysis using tissue-plasminogen activator (tPA) in a post extracorporeal membrane oxygenation (ECMO) pediatric patient with cerebral ischemic infarct*

Barbra Giourgas[1], Reshma Joshi[1], Hamid Ali[1], Sonal Bhatia[1]

[1]Medical University of South Carolina

INTRODUCTION: Stroke after ECMO is common in the pediatric population, but management is not well studied. Data from the National Extracorporeal Life Support Organization (ELSO) Registry reports cerebral infarction occurring in 5.8% of children undergoing ECMO. There is growing evidence for tPA thrombolysis in pediatric stroke, but there are no reports of children receiving tPA for ECMO-related strokes. Here we present a case of stroke due to a right middle cerebral artery (MCA) thrombus 12 days after veno-arterial ECMO (VA-ECMO) decannulation in an adolescent female with successful thrombolysis using tPA. CASE: A 14-year-old female presented in distributive shock after a suicide attempt with over ingestion of diltiazem requiring VA-ECMO via right common carotid artery (CAA) cannulation. Twelve days later, she was dizzy, dysarthric, with a left facial droop and left-sided extremity weakness (NIHSS 9). CTA Head and Neck showed a thrombus of the distal right M1 segment of the MCA. Suture ligation of the proximal right CAA with distal opacification was seen, as well as mismatched perfusion within the right MCA territory. tPA was administered 3 hours later. MRI Brain 24 hours post tPA showed restricted diffusion in the right caudate and lentiform nucleus consistent with right MCA territory infarct. Upon discharge, neurological exam was normal. At 3 month follow up, there were no deficits or symptom reoccurrence. DISCUSSION: Although stroke is a common adverse outcome related to ECMO, its management in children is poorly studied. There are no reported cases of tPA use in the acute or subacute period following ECMO decannulation for ischemic strokes. To our knowledge, ours is the first case in which tPA was successful in this situation. This highlights the need for further studies related to the use of pediatric tPA and understanding the causes and management of ECMO related cerebral ischemic infarcts in children.

P-C-17: *Urgent computed tomography angiography for pediatric stroke*

Romain Briest[1], Andrew Cheung[2], Tejaswi Kndula[1], Michael Cardamone[1], Sekhar Pillai[1], Hugo Sampaio[1], Hooi-Ling Teoh[1], Richard Webster[3], Jason Wenderoth[2]

[1]Sydney Children's Hospital, [2]Sydney Children's Hospital and Prince of Wales Hospital, [3]Children's Hospital Westmead

INTRODUCTION: Our acute ischemic stroke (AIS) pathway highlights rapid, local neuroimaging with MRI/MRA, or brain CT and computed tomography angiography of head and

neck (CTA) if MRI/MRA is not quickly available. HYPOTHESIS: Clinical presentation and rapidity of neuroimaging influence speed of diagnosis and delivery of thrombolysis and endovascular thrombectomy (EVT) for childhood AIS. METHODS: We identified factors influencing speed of diagnosis and delivery of acute therapies in a prospective cohort of 21 children with suspected AIS (8 AIS, 13 stroke mimics) and explored them in a retrospective cohort of 43 children with confirmed AIS. RESULTS: Application of the acute stroke pathway significantly improved speed of diagnosis and delivery of therapies. In both the prospective, suspected stroke and the total AIS cohorts, approximately 50% presented with acute, sustained hemiparesis, and were diagnosed relatively quickly (median delay from triage to diagnosis 55 minutes in the prospective cohort). In contrast, AIS was suspected and diagnosed relatively slowly in the 50% presenting with symptoms other than sustained hemiparesis (median delay from triage to diagnosis 219 minutes in the prospective cohort). 31/51 (61%) AIS patients had arterial abnormalities identified by CTA or MRA: 11 large vessel occlusion (LVO), 6 dissection, 5 moyamoya, 9 other arteriopathies. 20/51 (39%) had AIS, without arterial abnormalities on CTA or MRA: 8 lenticulostriate vasculopathy, 12 other small vessel AIS. Patients initially imaged with CTA were diagnosed more quickly than those initially imaged with MRI/MRA, which facilitated EVT and thrombolysis (median delays from triage to diagnosis: Total AIS cohort - CTA 367 minutes, MRI/MRA 747 minutes; Patients with identified arterial abnormalities - CTA 49 minutes, MRI/MRA 508 minutes). The 20 patients without identified arterial abnormalities showed good outcomes with supportive treatment alone and 16 (80%) were ineligible for thrombolysis for reasons beyond delay to diagnosis. CONCLUSIONS: Clinical features at presentation influence rapidity with which childhood AIS is suspected and diagnosed. Readily-available, urgent CTA is sufficient to direct EVT in patients with LVO. CTA was also sufficient to direct thrombolysis in most, but not all, eligible patients. Patients with AIS without identified arterial abnormalities were mostly ineligible for thrombolysis and showed good outcomes with supportive treatment alone.

P-C-18: ***Successful Anterior Circulation Thrombectomy After 24 Hours in An Adolescent***

Victoria Vinarsky[1], Lisa Sun[2], Lindsay Schleifer[2], Karissa Arthur[2], Ferdinand Hui[3], Dana Harrar[1]

[1]Childrens National Medical Center, [2]John Hopkins Hospital, [3]John Hopkins Hosptial

Introduction: Arterial ischemic stroke (AIS) is a leading cause of morbidity and mortality in children. Children with AIS are increasingly being treated with mechanical thrombectomy, but little is known about the risks and benefits of this procedure after 24 hours after a patient's last known normal (LKN) time. Case: A 16-year-old female presented with acute onset of dysarthria and right hemiparesis with LKN time 22 hours prior. Pediatric National Institutes of Health Stroke Scale (PedNIHSS) was 12. MRI showed diffusion restriction and T2 hyperintensity primarily in the left basal ganglia. MRA revealed a left M1 occlusion. Arterial spin labeling (ASL) showed a large perfusion deficit. She underwent uncomplicated thrombectomy, with TICI3 recanalization 29.5 hours after her LKN time. At 2 months follow up, her neurologic examination was normal aside from moderate right hand weakness and mild diminished sensation of the right arm. Discussion: As adult thrombectomy trials included patients within 24 hours of LKN, little is known about thrombectomy outside of this time frame.

Adult data suggests that some patients maintain a favorable perfusion profile for over 24 hours and that without intervention many go on to experience delayed infarct expansion. This suggests that some patients may benefit from reperfusion beyond 24 hours. The persistence of a favorable perfusion profile likely reflects robust collateral circulation. We hypothesized our patient was relying on her collateral circulation to maintain the non-infarcted areas of her left MCA territory. Due to concern for eventual collateral failure, thrombectomy outside of the 24-hour window was performed as the risk of a full territory left MCA infarct was thought to outweigh potential adverse effects of thrombectomy. This case serves as a call to action to better understand the impact of collateral circulation on cerebral perfusion in children with large vessel occlusions and delineate which children are likely to benefit from thrombectomy in a delayed time window

P-C-19: ***Implementation of a Pediatric Stroke Alert System in a large medical center: 1-year experience***

Viola Caretti[1], Ajay Thomas[1], Varun Kannan[1], Aishwarya Pareek[1], Alexander Ankar[1], Mikael Guzman-Karlsson[1], Jamie Solís[1], Peter Campbell[1], Alexander Sandweiss[1], Jon Cokley[1], Jennifer Erklauer[1], Daniel Davila-Williams[1]

[1]Baylor College of Medicine, Houston, TX, USA

Introduction: Stroke is an important cause of morbidity and mortality in children. In contrast to adults, stroke is often not considered in the differential diagnosis for children who present with acute neurological deficits. To address this issue, we implemented a Pediatric STAT Stroke Alert System (PSSAS) at Texas Children's Hospital (TCH), Houston, TX, United States. When a child presents to TCH (main or satellite campuses) with acute onset of neurological symptoms, a stroke alert is sent to multiple services: Neurology, Medicine, Pharmacy and Radiology. Methods: We performed a PSSAS retrospective chart review and data analysis, including demographics, mimics, and time to imaging, evaluation, and treatment. Results: In about 1 year, PSSAS has been activated for 55 children, 56% female, mean age was 11 years old (range 3 months to 20 years old), 39% were Hispanic, 30% African American and 26% Caucasian, 65% were on Medicaid or on Charity while 35% had Standard Insurance. In total, 27% of patients were diagnosed with transient ischemic attack (TIA) or stroke, of which 3 were TIA, 10 ischemic, and 2 hemorrhagic strokes. Other common diagnoses were seizures (13%), brain neuro-inflammatory conditions (9%), peripheral neuritis, migraine and functional neurological disorders (all accounting for 7% each). Mean time from arrival to our main campus emergency department or from stroke alert activation (when patient was already in hospital) to imaging was 96 minutes (S.D. 82), and to neurological evaluation was 59 minutes (S.D. 58). No patient has met criteria for acute therapy thus far. Conclusions: PSSAS allows for a prompt and multidisciplinary approach to caring for children identified at risk of stroke at TCH. Moving forward, we plan to analyze the same data set for the 2 years prior to implementation of PSSAS to test whether PSSAS has improved evaluation and treatment of children at risk for stroke and to compare clinical characteristics of patients who are diagnosed with stroke versus a stroke-mimic.

P-C-20: [Print only] ***Spinal cord infarction in children and adolescents.***

Inna Shchederkina[1], Alexandr Kessel[1], Yury Khachaturov[1], Timur Basakai[1], Ksenia Khasanova[1]

[1]Morozov Children City Clinical hospital

Patients with a spontaneous SCI are often misdiagnosed as having transverse myelitis. Diagnostic criteria for SCI are lacking. Aim: description of two clinical cases of SCI in two pediatric patients Methods: clinical, laboratory tests, MRI, CT, electromyography. Results: in 2021 at the Pediatric Stroke Center in Moscow two patients were treated with SCI: boys 17 and 8 years old, no infectious anamnesis. An 8 year old boy on the day before the stroke fell on his back. At the onset of SCI back pain, weakness in the lower extremities up to 1-2 points, sensory disturbance, urinary retention were noted. Deep tendon reflexes were absent in the lower limbs and the plantar response was silent bilaterally. The diagnosis was lower paraplegia. Laboratory tests: blood and urine test, coagulogram, antiphospholipid syndrome, vasculitis test were within normal limits. A 17-year-old boy - homocysteine up to 16.36 μmol/l. Cerebrospinal fluid noninflammatory in both cases. Electroneuromyography: «signs of spinal cord injury (in both cases) and correlated with the area of spinal cord injury». CT scan of the spine -no traumatic lesions. MRI of the spinal cord in a 17-year-old boy: at the level of Th10-Th12, a zone with limits diffusion ("snake's eyes"). MRI of the spinal cord in an 8-year-old patient -an inhomogeneous increase in the T2 WI signal at the level of the Th6 and distally as ischemic edema up to a cone. According to the Proposed Spinal Cord Infarction (SCI) Diagnostic Criteria (2018), both patients had «definite spontaneous spinal cord infarction» (1, 2A, 2B, 2C, 3.4). Patients received anticoagulant therapy (heparin), vitamins, physiotherapy and were transferred to a rehabilitation center. At discharge patients showed an increase in muscle strength up to 3 points, a significant improvement in sensitivity. Conclusion. In our observation, in one case, the possible cause of the stroke was a back injury, in the other case, the cause could not be identified (except for a slight increase in the level of homocysteine). MRI diagnostics is of great importance in the diagnosis of spinal infarction. If non-inflammatory myelopathy occurs in children and adolescents, the differential diagnosis should include spinal cord infarction.

P-C-21: [Print only] ***Lessons learned from Mechanical thrombectomy for a 12-year-old boy with large vessel occlusion***

Sahar Hassanein[1], Wessam Sherin[1], Mostafa Farid[1], Ahmed Rihan[1], Maha Mohammed[1]

[1]Faculty of Medicine, Ain Shams University

Introduction While childhood acute ischemic stroke is rare, if untreated; it carries lifelong handicap and often death. Nowadays, thrombolysis and mechanical thrombectomy are standard of care in adults, yet there is very little evidence for them in children. Case description We present a 12-year-old boy, second order of birth of non-consanguineous parents with no history of medical disease or history of hospital admission. One week before presentation the patient started to develop signs of respiratory tract infection (Rhinorrhea, fever, sore throat, and cough) which improved on symptomatic treatment. He presented to the ER with headache, right sided hemiparesis, facial palsy, and expressive aphasia (for 3 hours). Three hours before presentation the patient started to develop agonizing headache which was attributed to his

respiratory tract infection, and his parents advised him to go to sleep. Two hours later the patient awoke with right sided hemiparesis, expressive aphasia, and mouth deviation. His initial total NIHSS score was 19. Non- contrasted CT brain showed left hyperdense MCA sign. ASPECT score 8. MRI, and Phase contrast time of flight MRA revealed no flow in the left ICA. Interventional Neuroradiology team was informed, and mechanical thrombectomy performed at 9 hours from last seen well. The procedure was done by a Stent-riever that was advanced through a 6F guiding catheter placed in the left CCA. Rapid resolution of neurologic deficits over a week. His cardiac examination and ECHO revealed mitral valve stenosis and left atrial thrombus. Clexane 40 mg twice daily, started 48 h after thrombectomy for stroke and atrial thrombus. Secondary prevention of rheumatic fever. Balloon mitral valve dilatation performed 1-month later after the complete resolution of the Lt. atrial thrombus. Warfarin started post cardiac intervention, dose-adjusted warfarin (INR 3.0). Discussion Early recognition of acute pediatric stroke is challenging and critical. Mechanical thrombectomy for large vessel occlusion in children, especially older age, can be performed safely with good neurological recovery. In our case, the availability of all neuroimaging modalities, a well-established reporting staff and system, qualified intervention neuroradiologists and safe anesthesia saved his brain. This child stimulated us to establish a childhood acute stroke management guidelines and pathway in the children's hospital of Ain Shams University.

Outcomes and Rehabilitation

P-D-22: ***Current modelling of transcranial direct current stimulation in children with perinatal stroke***

Helen Carlson[1], Adrianna Giuffre[1], Patrick Ciechanski[1], Adam Kirton[1]

[1]University of Calgary

Perinatal stroke (PS) is the leading cause of hemiparetic cerebral palsy, usually resulting from middle cerebral artery occlusion (arterial ischemic stroke, AIS) or periventricular venous infarction (PVI). Subsequent motor impairments are lifelong and therapies to improve motor function during periods of maximal developmental neuroplasticity are limited. Via electrodes placed on the scalp, transcranial direct-current stimulation (tDCS) induces weak electric fields (EF) in underlying neuronal tissue, altering cortical excitability, and enhancing motor learning when paired with a behavioral task. Multisite phase 3 clinical trials are now testing the ability of tDCS to enhance motor function in children with PS. However, mechanisms are poorly understood and tDCS modelling suggests different effects in children as compared to adults. Systematically modelling tDCS EF in children with PS is required to maximize safety and therapeutic potential. We created MRI-based models of tDCS-induced EF and current density using five motor cortex-targeting tDCS montages in children aged 6-19 years with AIS, PVI, and typically developing controls (TDC). Current modelling (SimNIBS, www.simnibs.de) used T1- and T2-weighted anatomical and diffusion-weighted images to simulate three traditional and two high-definition tDCS montages targeting motor function in the paretic hand (1mA intensity). Field characteristics were extracted for each montage and compared between groups. Eighty-three children were successfully modelled (32 TDC, 21 AIS, 30 PVI). The AIS group showed higher peak EF strength for montages utilizing active anodes over lesioned tissue compared to TDC but lower EF strength in specifically-targeted motor regions of

interest. Montages using active anodes over lesioned tissue appeared more sensitive to variations in underlying anatomy (lesion and tissue volumes) than montages using active cathodes over non-lesioned tissue. We conclude that tDCS current modelling may provide relevant insight into the safety and efficacy of tDCS interventions in an individualized, patient-centered manner to better inform neuromodulation interventions in children with perinatal stroke.

P-D-23: ***Assessment of post-stroke consequences in children on the results of neuroimaging in acute phase of the disease.***

Ilona Kopyta[1], Beata Sarecka-Hujar[2], Dorota Raczkiewicz[1], Katarzyna Gruszczynska[1], Magdalena Machnikowska-Sokolowska[2]

[1]Assistant Professor, [2]Medical University of Silesia in Katowice

Arterial ischemic stroke (AIS) in children is a rare condition; its frequency is estimated at approximately 3 new onsets in 100,000 children per year. The diagnosis of pediatric stroke is commonly delayed and the knowledge on risk factors, clinical outcomes and consequences of pediatric AIS is still lacking. The aim of the study was to analyze the clinical presentation of pediatric AIS and its consequences according to the neuroimaging results and location of ischemia. The research was retrospective and observational. The analyzed group consisted of 75 AIS children (32 girls, 43 boys), the age of the patients at stroke onset ranged from 9 months to 18 years. All the patients were diagnosed and treated in one tertiary center. Results: The most frequent stroke subtype in alaysed patients' group was total anterior circulation infarct (TACI) with most common ischemic focus location in temporal lobe and vascular pathology in middle cerebral artery (MCA). The location of ischemic focus in the brain correlated with post-stroke outcomes: intellectual delay and epilepsy, hemiparesis corresponded to the location of vascular pathology. A correlation found between ischemic lesion location and vascular pathology with post-stroke consequences in pediatric AIS may be important information and helpful in choosing proper early therapy. The expected results should lead to lesser severity of late post-stroke outcomes. Conclusions: Neuroimaging is crucial at the stoke diagnosis and its' results may be also heplpful in predicting of post-stroke consequences in children.

P-D-24: ***Novel Pediatric Stroke Motor Impairment Measure (PSMIM): A Pilot Project***

Laura Malone[1], Nicole Andrejow[2], Erin Naber[2], Lisa Sun[3], Ryan Felling[3], Luke Kalb[1], Stacy Suskauer[1]

[1]Kennedy Krieger Institute/Johns Hopkins, [2]Kennedy Krieger Institute, [3]Johns Hopkins

Introduction: To identify optimal rehabilitation treatments, we must measure motor impairments accurately and precisely. Many of the available pediatric tools have limitations (e.g., lack sensitivity, have age restrictions, require training), as affirmed by our multinational, multi-disciplinary survey results. As a result, our team developed an innovative, novel, observation-based motor impairment measure - the Pediatric Stroke Motor Impairment Measure (PSMIM). The PSMIM, structured similarly to the widely used adult Fugl-Meyer, includes a scale for both the upper and lower extremity. It has 17 items for the upper extremity subscale and 13 items for the lower extremity. It does not require specialized

equipment/training, is designed to be quick to administer (in-person or remotely) and is intended to be used longitudinally from 6 months to 18 years of age. Methods: Two therapists administered and videotaped the PSMIM to children with stroke ages 6 months to 18 years. All study team members later scored the videotaped assessments. Hypothesis: We hypothesized that internal consistency (Cronbach's alpha) and inter-rater reliability (intra-class correlations; ICC) of the PSMIM will be >0.80 and >0.60, respectively, suggesting good reliability. Results: We have tested 9 children with stroke, ages 19 months to 15 years old. Time to administer the PSMIM averaged 6 minutes, 52 seconds +/- 2 minutes, 7 seconds. Cronbach's alpha was 0.93 (total PSMIM), upper extremity subscale=0.921, lower extremity subscale=0.776. Intraclass correlation coefficients were: total PSMIM= 0.889, upper extremity subscale=0.897, lower extremity subscale=0.696. Conclusions: Our preliminary results indicate that the PSMIM is feasible to administer (e.g., time to administer) and has good internal consistency and inter-rater reliability. We continue to refine the PSMIM and will test participants both with stroke and typically developing children as control participants to investigate criterion validity. We will also assess tele-administration feasibility and compare performance of the PSMIM to a battery of commonly used assessments in pediatric stroke.

P-D-25: ***Comparing Apparent Diffusion Coefficients and Cognitive Outcomes in Children with Congenital Heart Disease and Stroke***

Maria Vu[1], Kirstin Walker[2], Nomazulu Dlamini[2]

[1]University of Toronto, [2]Hospital for Sick Children

Introduction Children with cardiac disease are at risk for arterial ischemic stroke (AIS) and account for up to 30% of all childhood strokes. 50-70% of children have adverse neurological outcomes which include cognitive impairments. An important observation is that cognitive impairments are prevalent in children with congenital heart disease (CHD) in the absence of stroke and up to 70% of impairments seen in children with stroke are not explained by lesion characteristics. We propose a global mechanism of injury, affecting perfusion, present prior to stroke occurrence. Hypothesis We hypothesize that apparent diffusion coefficients (ADCs) in the contralesional hemisphere of cardiac stroke patients are abnormal. We also hypothesize a gradient of ADC abnormality that is associated with a spectrum of cognitive outcome. Methods Patients with CHD and a history of AIS between 2003-2017 were included in the analysis if the acute diagnostic MRI scan was taken up to 10 days post-stroke. Patients must have also had a neuropsychological assessment within 2 years of the stroke. Diffusion weighted imaging was assessed for each subject and further analyzed to collect ADCs. ADC values were compared with outcome scores from the BRIEF Parent Report to measure executive function and WISC sub-tests to measure intelligence. Results Preliminary results from 3 patients in the cardiac stroke cohort and 3 age-matched controls show that the patient cohort scored below average on most outcome sub-tests. Interestingly, processing speed (M=87.7, SD=26.4) and global executive composite (M=61, SD=13.5) scores display a spectrum of impairment that correspond to a spectrum of ADCs. The ADC values (mm2/s x 10-3) in both the ipsilesional (M=0.83, SD=0.03) and contralesional (M=0.84, SD=0.05) hemisphere of cardiac stroke patients were elevated compared to controls. Conclusions This preliminary data suggests that specific cognitive outcomes may be moderated by global hypoperfusion in the brains of childhood stroke patients.

P-D-26: *Common data elements for neuropsychological outcome studies in pediatric stroke*

Richard Boada[1], Christine Mrakotsky[2], Leigh Sepeta[3], Robyn Westmacott[4], Lauren Krivitzky[5]

[1]Children's Hospital Colorado, [2]Boston Children's Hospital, [3]Children's National Health System, [4]Hospital for Sick Children, [5]Children's Hospital of Philadelphia

INTRODUCTION: Common Data Elements (CDE) exist for a wide variety of clinical populations in order to facilitate the comparability and reproducibility of research findings across researchers and clinical cohorts. Specifically, CDE provide content standards that enable clinical investigators to systematically collect, analyze, and share data across the research community. Although NIH CDE have been developed for other pediatric populations and adult stroke, CDE for neuropsychological outcomes in pediatric stroke are lacking. Our goal was to fill this gap by creating CDE for the pediatric stroke population. METHODS: A working group of five pediatric clinical neuropsychologists involved in clinical care and research at multidisciplinary stroke centers in North America was created. Existing CDE guidelines for other pediatric medical populations were used as a starting point. A comparison of clinical batteries at each stroke center was conducted, as well as a review of test batteries used in the extant pediatric stroke research literature. Subsequent refinement of the proposed CDE was performed via expert consensus taking into consideration feasibility of each measure, psychometric properties, appropriateness for use with children of different ages and stroke subtypes, administration time, and adequate coverage of relevant neuropsychological domains. Psychometric tests and parent rating scales were included. Core and supplemental measures were chosen to ensure breadth and depth of assessment. RESULTS: The CDE battery developed for this population includes measures of cognitive, academic, adaptive, social-emotional, and behavioral functions. The proposed CDE are organized by neurobehavioral domain and age allowing investigators to study a variety of neuropsychological outcome questions. CONCLUSIONS: Adoption of the proposed CDE will facilitate increased reproducibility of future research, as well as allow for more in-depth and longitudinal analyses of long-term neuropsychological outcomes in pediatric stroke.

P-D-27: *Towards a nonsurgical brain-machine interface (BMI) for children with stroke*

Michelle Krueger[1], Krishna Desabhotla[1], Alejandro Rubiano[2], Stuart Fraser[3], Sean Savitz[3], Jose Contreras-Vidal[1]

[1]University of Houston, [2]Fellow - Vascular Neurology, [3]University of Texas McGovern Medical School

Introduction: Recent studies of electroencephalography-based brain-machine interface (BMI) therapies show favorable clinical outcomes in the neuro-motor rehabilitation of chronic stroke patients in adults. During robot-guided neurotherapy, BMI systems actively include the patient in the control loop thereby making the therapy 'active' while engaging patients in the rehabilitation tasks. This emergent neurotechnology has seen limited use in pediatrics. Moreover, given the neuroplasticity of children, BMI systems have the potential to both assay and guide the developing neural representations for motor control and promote neurorecovery

in young children with brain injury such as stroke. Hypothesis: The underlying hypothesis of this research proposal is two-fold. H1: Developing neural representations for motor control can be inferred or decoded from scalp EEG in children with chronic stroke, and H2: The decoded neural features can be used for designing closed-loop BMI systems for diagnostic and therapeutic purposes. Proposed Methods: For reasons of safety and accessibility, pediatric BMI systems should be non-invasive, engaging, and personalized to the needs of the patient. Our team has demonstrated that brain activity, acquired via high-density EEG, can be used to decode the kinematics of overground gait in neurotypical children (Luu, Eguren, Cestari and Contreras-Vidal, IEEE SMC, 2019, pp. 2608). Here we propose to use our EEG gait decoding approach to design a BMI system to control a virtual walking avatar in children with stroke. The neural decoder will be trained using machine learning methods with EEG and gait data acquired over multiple sessions. Next, the trained BMI system will use the child's brain activity to drive the walking avatar in real-time. An initial phase will acquire longitudinal data on neurotypical, able-bodied children from a wide range of ages to determine a normative baseline and analyze the natural changes of brain development with age. A second phase will test the outcomes of Phase 1 by repeating the experiment using patients age 6-12 with hemiparesis from perinatal or childhood onset stroke, in relation to gender and age-matched controls. Expected Outcomes:Using our decoding approach, the BMI-avatar will build a model to decode in real-time the neural activations driving lower limb movement and use the visual feedback provided to improve performance and promote neurorecovery.

P-D-28: [Print only] ***Clinical Profile and Outcomes of Pediatric Patients with COVID-19 and Ischemic Strokes: A Systematic Review***

Elbert John Layug[1], Rudolf Kuhn[2], Almira Doreen Abigail Apor[1], Marilyn Tan[1]

[1]University of the Philippines - Philippine General Hospital, [2]National Kidney and Transplant Institute

Abstract Introduction: Coronavirus disease 2019 (COVID-19) caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been shown to have a multitude of systemic manifestations. The vasculopathy and hemostatic derangements brought by the complex interplay of the virus and the immune system predispose the host to cerebrovascular and thrombotic disorders. Due to this hypercoagulable state, patients are at increased risk of ischemic strokes. Data in children, however are limited to reports and series. To improve the understanding on the cerebrovascular effects of COVID-19 in the pediatric population, a comprehensive review of publications was done. Methods: A systematic literature search was performed in MEDLINE (through PubMed), EMBASE, Web of Science and Google Scholar from inception until February 2022. The search terms "pediatric ischemic stroke", "pediatric cerebral sinus venous thrombosis", "SARS-CoV-2", and "COVID-19" were utilized. Patient demographics, neurologic findings, clinical course, neuroimaging results, intervention and outcomes were recorded. Results: The search produced 397 records. After screening for titles and abstracts, removal of duplicate entries and exclusion of those which did not meet the inclusion criteria, a total of 64 articles passed for full text review. From which, 34 articles met the inclusion criteria. The cohort has slight male predominance (55%), with mean age of 8.9 years (+2 SD 5.6) and with documented arterial ischemic strokes (80.8%), cerebral venous thrombosis (12.8%) and combined arterial and venous strokes (6.4%). In arterial ischemic

strokes, the most common territory involved is the middle cerebral artery (MCA) and identified etiologies included vasculopathies (36%) and thrombophilia (21%). Fourteen cases (29.7%) had concomitant comorbidities and only 14.8% met the criteria for multisystem inflammatory syndrome in children (MIS-C). Outcomes ranged from complete recoveries (6/34), residual deficits (19/34), and mortalities (9/34) either from neurologic or the systemic sequelae of the disease. Conclusion: The study illustrates the clinical profiles and outcomes of pediatric ischemic strokes in the background of COVID-19 supporting prior hypotheses that the virus can cause both a vasculopathy and induce a derangement in the coagulation system predisposing to ischemic strokes.

P-D-29: [Print only] ***Risk factors and neurocognitive outcomes of paediatric strokes in Nigeria***

IkeOluwa Lagunju[1], Michael Adeyekun[1], OreOluwa Lagunju[1], Amarachi Bayo[1]

[1]University College Hospital

Background: Stroke is increasingly recognised as an important cause of neurodisability in children. The aetiology of paediatric strokes varies widely making its diagnosis and management a challenge. Aim: To determine the risk factors and the long-term neurocognitive outcomes in a Paediatric Neurology service in Nigeria. Methods: A prospective longitudinal study. Cases of paediatric strokes seen in the Paediatric Neurology unit of the UCH, Ibadan were enrolled into the Ibadan Stroke Registry. All were evaluated clinically and by neuroimaging. EEG was performed in those with epilepsy. Results: A total of 88 children; 47 males and 41 females presented with stroke over the 5-year period. Ischaemic stroke accounted for 72 (81.8%) of the cases and 14 (15.9%) of them were neonatal strokes. Median time to hospital presentation after the stroke event was 3.0 months. The major risk factors for postneonatal stroke were sickle cell disease (SCD) (63.5%), intracranial infections (17.6%), structural heart disease (4.1%), vascular brain malformations (4.1%) and coagulopathy (4.1%). The cause of stroke could not be identified in 3 cases. The MCA territory was the most frequently involved in arterial ischaemic stroke (62.2%) and right hemispheric involvement was predominant. Nineteen children had recurrent stroke episodes, all due to SCD. Stroke recurrence was associated with a higher risk of severe motor disability and dropping out of school (P<0.001). Long term neurocognitive sequelae identified in the cohort were motor disability (73.2%), intellectual disability (48.8%), speech problems (40.2%), epilepsy (29.3%), visual defects (11.0%) and hearing impairment ()8.5%. Six children died giving a case fatality rate of 6.8%. Haemorrhagic stroke was associated with a higher risk of mortality (P=0.001). Conclusion: Delayed presentation is a major challenge with paediatric strokes in Nigeria. Sickle cell disease accounts for nearly two-thirds of the cases. Stroke represents a major threat to the educational attainment of children in Nigeria.

P-D-30: [Print only] ***Social Cognition and Social-Emotional Outcomes Following Pediatric Stroke***

Samantha Feldman[1], Claire Champigny[1], Nomazulu Dlamini[1], Peter Dirks[1], Mary Desrocher[1], Robyn Westmacott[1]

[1]The Hospital for Sick Children

Introduction:Following stroke, children frequently experience cognitive sequelae, which may have an impact on functional outcomes and quality of life. An underappreciated element of pediatric stroke is its effect on social cognition and in turn, social-emotional outcomes. Stroke characteristics such as lesion location have been associated with social cognitive ability and aspects of social functioning. However, the impact of other factors - including stroke mechanism, affected hemisphere, or brain regions affected on - social cognition remains unclear. Objectives: To assess the impact of these stroke characteristics on social-emotional outcomes and evaluate social cognition as a potential mediator of this association. Methods: Cross-sectional study in a cohort of youth with a past of arterial ischemic stroke or cerebral hemorrhage. 42 youth (age 6-16) participated in the current study at the Hospital for Sick Children in Toronto, Canada. MRIs were evaluated to determine lesion location, hemisphere affected, and stroke mechanism. Social cognition was evaluated through the use of two neuropsychological assessment measures and a parent-report measure. Multiple linear regressions and a mediation analysis was conducted to evaluate whether social cognition mediates the association between stroke characteristics and social-emotional outcomes. Results: Having a left hemisphere stroke significantly predicts the likelihood of a child experiencing poorer social-emotional functioning following stroke (b= -11.819, p=0.002), and this association is fully mediated through social cognition as indexed by parent-report scores (z=-2.25, p=0.027). Ischemic stroke is predictive of worse social-emotional outcomes compared to hemorrhagic stroke (b= -8.321, p=0.022), however, it is not mediated by social cognition. Neither neuropsychological assessment measure significantly predicts social-emotional outcomes nor do they mediate the association between stroke characteristics and social-emotional outcomes. Conclusions: Distinct predictive stroke characteristics emerged which influenced social-emotional outcomes and this relationship was mediated by social cognition. This work signals the importance of evaluating social cognition following pediatric stroke, to help identify those who may be at risk of poorer social-emotional outcomes. Extant measures provide a starting point for future research exploring social cognition in more detail, with a focus on validation of new measures.

Perinatal Stroke

P-E-31: ***A National, Electronic Health Record-Based Study of Perinatal Hemorrhagic and Ischemic Stroke***

Stuart Fraser[1], Samantha Levy[1], Stuart Fraser[1], Sean Savitz[1], Alicia Zha[2], Hulin Wu[1]

[1]UTH McGovern School of Medicine, [2]Ohio University School of Medicine

Background: Perinatal stroke occurs in approximately 1 in 3000 live births and is the most common cause of hemiplegic cerebral palsy in term infants. Historically, the majority of the studies on perinatal stroke focused only on ischemic stroke and have been conducted using single-center or regional data. Large Electronic Health Record data can provide information on exposures associated with perinatal stroke in a larger number of patients than is achievable through traditional clinical studies. Methods: The data for patients aged 0-28 days with a diagnosis of either ischemic or hemorrhagic stroke were extracted from the Cerner Health Facts Electronic Medical Record database from 2009-2018. Incidence of birth demographics,

perinatal complications, anti-epileptic use, and aspirin use were assessed. Odds ratios were calculated against a perinatal control group. Results: 535 (63%) neonates were identified with ischemic stroke and 312 (37%) with hemorrhagic stroke. The most common exposures for ischemic stroke were perinatal sepsis (16%, OR=8.6), head and scalp birth injury (13%, OR=6.9), and hypoxic injury (12%, OR=38.7). The most common comorbidities for hemorrhagic stroke were head and scalp birth injury (30%, OR=19.7), prematurity (26%, OR=4.2), and perinatal sepsis (23%, OR=13.3). Procedure and diagnosis codes related to critical illness, including intubation and resuscitation, were prominent in both hemorrhagic (15%, OR=34.9) and ischemic stroke (9%, OR=19.4). 23% of infants with hemorrhagic stroke received antiepileptics, while 27% of infants with ischemic stroke received antiepileptics. The amount of perinatal ischemic stroke patients receiving aspirin was 16%. Conclusion: This Electronic Health Record-based study of perinatal stroke, the largest of its kind, demonstrated a wide variety of comorbid conditions with ischemic and hemorrhagic stroke. Sepsis, prematurity, and hypoxic injury are associated with perinatal hemorrhagic and ischemic stroke, though prevalence varies between types. Much of our data was similar to prior, smaller studies, which lends validity to the Electronic Health Record database as a tool to study this population. Interestingly, head and scalp birth injuries were significantly associated with perinatal ischemic stroke.

P-E-32: [Print only] ***Breast milk stem cells as a new source for stem cells therapy in neonatal brain injury***

Sandrine Cornaz Buros[1], Stefanie Ganal[1], Nerea Fernandes Trigo[1], Andreina Schöberlein[1], Maja Steinlin[1]

[1]Inselspital Bern

Several animal and human studies have shown a potential benefit from stem cell therapy in brain insult during newborn period. However, despite promising data and ongoing clinical studies, these therapies are facing several issues, notably availability of stem cells as well as high costs. Finding a cheap, readily available alternative source of stem cells would represent a major breakthrough. Although the chemical composition of breast milk has been extensively studied, recent evidence, describe the presence of a cellular subpopulation having stem cell properties. These cells would constitute ideal candidates for stem cell therapy in newborn but are still partly characterized. In this study, we performed FACS analysis on 6 Samples of freshly isolated breast milk, showing a subpopulation of 0.5 to 2% of putative stem cell. As a further step, we would like to analyze the cellular content of primary breast milk cells through 10xGenomic single cell RNA sequencing. This method, used in cancer to address cellular heterogeneity, would provide precise and exact data on nature and proportion of stem cell subpopulations in primary breast milk samples.

Moyamoya

P-F-33: ***Presurgical Neuropsychological Function in Children Undergoing Revascularization Surgery for Moyamoya Disease***

Christine Mrakotsky[1], Julie Swanson[1], Banu Ahtam[1], Alfred See[1], Darren Orbach[1], Edward Smith[1], Laura Lehman[1]

[1]Boston Children's Hospital/Harvard Medical School

Introduction: Moyamoya disease (MMD) is a progressive arteriopathy causing significant steno-occlusive changes with a high risk for stroke. Revascularization surgery provides the most effective treatment to mitigate this risk. While MMD-associated stroke can cause cognitive deficits, there is evidence that presenting TIA or even asymptomatic MMD may affect cognitive function (attention/processing speed) with positive changes noted after surgery. However, little is known in children. We here present preliminary presurgical data from an ongoing study on neurocognitive underpinnings of MMD. Hypothesis: Children with MMD scheduled to undergo revascularization surgery demonstrate poorer cognitive and behavioral function prior to surgery compared to population means regardless of ischemia/TIA. Methods: Children and adolescents with moyamoya disease (n=23) age 6-17 years (M=12.2, SD=3.9) underwent brief presurgical neuropsychological screening of general cognitive ability, processing speed, executive functions, language and nonverbal functions through age-appropriate standardized clinical and research tests (NIH Toolbox). In addition, parents and children completed ratings of executive and emotional function. Data from presurgical evaluations was analyzed retrospectively. Cognitive and behavioral function of the overall sample were compared to population means. Results: Compared to population means, MMD patients demonstrated poorer nonverbal intellectual ability (p=.001) with comparable verbal ability. As predicted, test-based executive functions (attention, processing speed, working memory, retrieval, flexibility) were diminished (ps < .05-.10), while parents and patients did not report more EF or emotional problems (i.e. anxiety) on rating scales; in fact, children reported better attention. No differences were detected between patients with or without ischemia, although sample sizes were small. Conclusions: MMD was associated with diminished cognitive function (nonverbal, speed, executive) in children and adolescents undergoing revascularization on test-based measures and this was not explained by ischemia. Findings are preliminary yet highlight the need for neuropsychological screening in addition to patient/parent symptom reporting and this should include asymptomatic patients as well.

P-F-34: ***Symptoms May Not Be Associated with Degree of White Matter Alterations in Children with Moyamoya without Stroke***

Banu Ahtam[1], Christina Lildharrie[1], Julie Swanson[1], Fan Zhang[2], Lauren O'Donnell[2], Yogesh Rathi[2], Henry Feldman[1], Christine Mrakotsky[1], Edward Smith[1], Darren Orbach[1], Alfred See[1], P. Ellen Grant[1], Laura Lehman[1]

[1]Boston Children's Hospital, [2]Brigham and Women's Hospital

Introduction: Moyamoya is a progressive cerebrovascular disease leading to arterial stenosis of the circle of Willis. Using diffusion tensor imaging (DTI), adults with moyamoya have significantly decreased white matter fractional anisotropy (FA) compared to controls even when conventional imaging is normal. We recently showed that children with moyamoya without stroke also have altered white matter in tracts in watershed areas of their brain. To our knowledge, altered white matter tracts have not been compared in children with moyamoya based on symptoms at presentation. Hypothesis: Hemispheres with transient ischemic attacks

(TIA) will have higher mean diffusivity (MD) and radial diffusivity (RD) compared to hemispheres without TIA. Symptomatic hemispheres (TIA, headache, seizure) will have higher MD and RD compared to asymptomatic hemispheres. Methods: We prospectively enrolled 11 children with moyamoya between 6 and 18 years of age for research magnetic resonance imaging (MRI) scan prior to revascularization surgery. The MRI included DTI analyzed using unscented Kalman filter (UKF) tractography and with major white matter pathways extracted using a fiber clustering method. We compared the fractional anisotropy (FA), MD, axial diffusivity (AD), and RD within each white matter tract using ANOVA. Results: We analyzed 17 hemispheres. We found no statistical difference between symptomatic compared to asymptomatic hemispheres or hemispheres with TIA compared to no TIA in any white matter tracts analyzed except for the thalamo-frontal tract. In the thalamo-frontal tract asymptomatic hemispheres and hemispheres without TIA had higher MD (p=0.005, p=0.03) and RD (p=0.02, p=0.03) compared to symptomatic hemispheres and hemispheres with TIA, respectively. Discussion: Our findings were unexpected and reverse of our hypothesis, given that higher MD and RD is typically associated with white matter tract injury. Our preliminary findings suggest that alterations in white matter tracts are not associated with symptoms of the child at moyamoya presentation.

P-F-35: ***Shunting Prevalence in Children with Moyamoya***

Michael Dowling[1], Lori Xu[1], Wilmot Bonnet[1]

[1]University of Texas Southwestern Medical Center

Introduction: Moyamoya (MM) is a rare progressive stenosis of anterior cerebral circulation of unknown etiology that occurs at higher prevalence in patients with sickle cell disease (SCD), trisomy 21, neurofibromatosis 1, and East Asians. Hypothesis: Our objective was to compare the prevalence of potential shunting in MM patients versus controls without MM. We hypothesized that vasoactive substances, normally inactivated in the lungs, may escape inactivation through potential right-to-left shunting and contribute to the development of Moyamoya in at-risk groups. Methods: In an IRB-approved, retrospective case-control study we identified 67 MM patients who had echocardiograms between 1991-2018 and compared the prevalence of potential right-to-left shunting with that of a control group of 123 patients without MM or stroke from a prior study. Results: In the MM group, 32 (48%) had potential shunting identified on echocardiogram (23 (34%) intracardiac and 9 (13%) intrapulmonary) versus 29 (24%) potential shunting in our control group (P=0.0006). These results were also consistent when comparing our individual at-risk groups to our controls. Conclusions: In conclusion, these observations support our hypothesis that shunting could contribute to MM development, possibly through unknown vasoactive substances escaping lung inactivation, subsequently inducing vascular changes in patients with predisposing conditions. This has potential mechanistic and therapeutic implications and will need to be verified in larger prospective studies.

P-G-36: *Case report: Basilar artery thrombosis in a term neonate with posterior circulation ischemic stroke*

Ratika Srivastava[1], Stephanie Hammond[1], Michael Esser[1], Adam Kirton[1], Aleksandra Mineyko[1]

[1]University of Calgary

Introduction: Posterior circulation strokes are uncommon in neonates and presumed to occur in less than 20% of all neonatal arterial ischemic stroke (NAIS) cases. Although thromboembolic occlusion is a presumed mechanism, thrombus detection at the time of diagnosis is uncommon and evidence of residual thrombus in the basilar artery is extremely rare. We describe the case of a term neonate who presented with refractory seizures after a difficult delivery and was found to have basilar artery thrombosis and multifocal ischemic strokes in the posterior circulation, leading to complex management considerations. Case: A term newborn was admitted to the NICU at three hours of age after recurrent apneas and right hemibody posturing in the context of hypoglycemia. He was found to be hypotonic, hypotensive, and thrombocytopenic with a large cephalohematoma after a vacuum-assisted delivery. Seizures were treated with multiple medications. Neuroimaging revealed an occlusion at the tip of the basilar artery and multiple discrete areas of acute focal infarction in the left posterior cerebral artery territory, bilateral thalami, midbrain, bilateral cerebellum, and right occipital region. There was no evidence of vertebral dissection. Echocardiogram was normal and anticoagulation was deferred. After discussion with interventional experts, endovascular thrombectomy was not attempted due to multiple concerns including unknown age of stroke, risk of hemorrhage, and absence of safety evidence. Repeat neuroimaging three days later was unchanged. Discussion: This complex case identified basilar artery thrombosis in a neonate with arterial ischemic stroke, which is an extremely rare occurrence in perinatal stroke literature and clinical practice. Though isolated cases of mechanical thrombectomy in newborns with AIS including basilar artery occlusion have recently been reported, the risks are substantial and undefined while theoretical benefit is questionable.

P-G-37: *Case series: Intra-arterial calcium channel blocker treatment for pediatric subarachnoid hemorrhage-associated vasospasm*

Varun Kannan[1], Ajay Thomas[1], Viola Caretti[1], Samuel McClugage[1], Daniel Davila-Williams[1]

[1]Baylor College of Medicine at Texas Children?s Hospital

Introduction Vasospasm after subarachnoid hemorrhage (SAH) can cause devastating delayed cerebral ischemia (DCI). While there is substantial evidence guiding management of vasospasm in adult aneurysmal SAH, robust pediatric data is lacking. We present three children with SAH-associated vasospasm who were treated with intra-arterial calcium channel blocker (IA-CCB), and discuss the diagnostic yield of transcranial Doppler ultrasound (TCD) and electroencephalography (EEG) in screening for vasospasm and monitoring for treatment response. Case 1 Previously healthy five-month-old male presented with a ruptured right vertebral traumatic pseudoaneurysm after a fall with cervical acceleration-deceleration injury,

with extensive SAH and intra-ventricular hemorrhage (IVH). He developed TCD evidence of symptomatic vasospasm on post-bleed day (PBD) 7, with MRI confirmation of DCI (right ACA territory infarction), prompting angiographic intervention and IA-CCB treatment. Case 2 Thirteen-year-old female with remote history of left temporal malignant glioneuronal tumor status post resection and focal radiation presented with rupture of left lenticulostriate artery with SAH and intra-parenchymal hemorrhage, secondary to radiation-induced moyamoya disease. She developed TCD evidence of symptomatic vasospasm on PBD 4 with MRI confirmation of DCI (left midbrain/pontine infarction), prompting angiographic intervention and IA-CCB treatment. Case 3 Previously healthy fifteen-year-old male presented with ruptured large left MCA dissecting aneurysm with associated SAH and intra-parenchymal hemorrhage. He underwent coiling, complicated by left M2 division infarction. He developed TCD evidence of vasospasm on PBD 8 (unable to obtain MRI due to clinical instability), prompting pre-emptive angiography which confirmed radiographic vasospasm which was subsequently treated with IA-CCB. Results Increase in TCD Lindegaard ratio (LR) preceded the onset of clinical/angiographic vasospasm in all three of our cases, though EEG background changes did not. While all three patients had immediate improvement in vessel caliber upon IA-CCB infusion, biomarkers for sustained improvement (TCD LR, EEG background) were not as consistent among the patients. Conclusions Although limited by small sample size and clinical heterogeneity, our data reinforces the use of TCD Lindegaard ratio in pediatric vasospasm screening, and supports the use of IA-CCB in the treatment of symptomatic vasospasm.