

A.4

Entropy on routine EEG: an interictal marker of seizure frequency?

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Background: Sample entropy (SampEn) can quantify the unpredictability of a physiological signal. We sought to assess if SampEn on EEG could reflect recent seizure activity. **Methods:** Charts of all patients undergoing an outpatient EEG between January and March 2018 were reviewed to assess seizure occurrences in the follow-up period between the two clinical visits surrounding the EEG. 9s-EEG segments were extracted at pre-specified time points. SampEn was calculated for all segments and values aggregated at the 25th percentile. We performed a multivariate zero-inflated analysis to test the association between SampEn and seizure rate around the EEG, after controlling for age, presence of IED, presence of abnormal slowing, and presence of a focal brain lesion. **Results:** 269 EEGs were screened and 133 met inclusion criteria (112 patients). 80 EEGs (60%) were from patients with epilepsy, of which 47 had at least one seizure within the year preceding the EEG. Remaining EEGs were from patients who were deemed not to have epilepsy at last follow-up. Each 1SD decrease in SampEn was associated with a 3.93-fold increase in the rate of daily seizures (95% CI: 1.19–12.99, $p = 0.02$). **Conclusions:** Sample entropy of EEG is a potential objective method to assess contemporary seizure occurrence.

A.5

Neuropathology of eight cases of the New Brunswick cluster of Neurological Syndrome of Unknown Cause (NSUC)

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Background: In March 2021, at a press conference, the presence of a cluster of patients, claimed to have a novel neurological syndrome, was announced in New Brunswick. These patients were suggested to have symptoms reminiscent of CJD. The onset of disease was between 2015 and 2021. The size of this cluster has been reported as approximately 50 cases. Further news publications have suggested that various environmental factors were causing this disease. **Methods:** Between 2019 and 2021 eight patients have died in this cluster. Their neuropathological findings are reported here. **Results:** There was one case of metastatic carcinoma, one case of FTLD-TDP43, one case of neocortical Lewy body pathology, one case of neocortical Lewy body pathology and AD, 2 cases of AD with vascular pathology, one case of mainly vascular pathology, and one case without significant pathology (consistent with patient's history). In all these patients no evidence for a prion disease was found, nor novel pathology. **Conclusions:** We suggest that these 8 patients represent a group of misclassified clinical diagnoses. Classical probability theorem based statistical evaluation shows

that this group of deceased patients is representative for the entire cluster at a $p=0.0001$ level, which would suggest that the entire cluster is based on misdiagnoses.

CHAIR'S SELECT ABSTRACTS - NEUROSURGERY/NEURORADIOLOGY/STROKE (CNSS/CSNR/CSC)

B.1

Can quantitative susceptibility mapping help diagnose and predict recovery of concussion in children?

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Background: Quantitative susceptibility mapping (QSM) is an MR sequence that has potential as a biomarker in concussion. We compared QSM in pediatric concussion patients versus a comparison group of children with orthopedic injuries (OI) and assessed QSM's performance relative to the current clinical benchmark (5P risk score) for predicting persistent postconcussion symptoms (PPCS). **Methods:** Children ($N=967$) aged 8-16.99 years with either concussion or OI were prospectively recruited from 5 Canadian centers. Participants completed QSM at a post-acute assessment 2-33 days post-injury. QSM z-score metrics for 9 regions of interest (ROI) were derived from 371 children (concussion=255, OI=116). PPCS at 1-month post-injury was defined using reliable change methods. **Results:** The concussion and OI groups did not differ significantly in QSM across ROI. Increased frontal white matter (WM) susceptibility predicted reliable increases in parent-rated cognitive symptoms ($p=0.001$). Together, frontal WM susceptibility and the 5P risk score were better at predicting persistent cognitive symptoms than the 5P risk score alone ($p=0.0021$). AUC were 0.71 (95%CI: 0.62-0.80) for frontal WM susceptibility, 0.67 (95%CI: 0.56-0.78) for the 5P risk score, and 0.73 (95%CI: 0.64-0.82) for both. **Conclusions:** This is the first study to demonstrate a potential imaging biomarker that predicts persistent symptoms in children with concussion compared to the current clinical benchmark.

B.2

Does gender equality exist in the surgical management of degenerative lumbar disease?

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Background: Despite efforts toward gender equality in clinical trial enrollment, females are frequently underrepresented and gender-specific data analysis is often unavailable. The purpose

of this study was to determine if gender equality exists in the management of degenerative lumbar disease. **Methods:** Part 1: A systematic scoping review was conducted according to PRISMA guidelines, in order to synthesize the adult surgical literature regarding gender differences in pre- and post-operative clinical assessment scores for patients diagnosed with degenerative lumbar disease.

Part 2: An ambispective cohort analysis (multi-variate logistic regression) of the Canadian Spine Outcomes Research Network registry was performed to address knowledge gaps identified in “Part 1”. **Results:** Part 1: Thirty articles were identified, accounting for 32,951 patients. Female patients have worse absolute pre-operative pain, disability and health-related quality-of-life (HRQoL). Following surgery, females have worse absolute pain, disability, and HRQoL, but demonstrate an equal or greater interval change compared to males.

Part 2: Data was analyzed for 5,039 patients. Significant gender differences in pre-operative utilization of healthcare resources (medication use, diagnostic testing, medical and allied healthcare professional visits) were identified. **Conclusions:** Significant gender disparities in clinical assessment scores and the pre-operative utilization of healthcare resources were identified for patients undergoing surgery for degenerative lumbar disease.

B.3

Activated gene pathways in post-infectious hydrocephalus (PIH):: proteogenomics and the PIH expressome

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Background: Proteogenomics, the integration of proteomics and RNASeq expands the discovery landscape for candidate expressed gene networks to obtain novel insights into host response in post-infectious hydrocephalus (PIH). We examined the cerebrospinal fluid (CSF) of infants with PIH, and case controlled against age-matched infants with non-postinfectious hydrocephalus (NPIH) to probe the molecular mechanisms of PIH, leveraging molecular identification of bacterial and viral pathogens. **Methods:** Ventricular CSF samples of 100 infants ≤ 3 months of age with PIH (n=64) and NPIH (n=36) were analyzed with proteomics and RNASeq. 16S rRNA/DNA sequencing and virome capture identified *Paenibacillus spp.* and cytomegalovirus as dominant pathogenetic bacteria implicated in our PIH cohort. Proteogenomics assessed differential expression, gene set enrichment and activated gene pathways. **Results:** Of 616 proteins and 11,114 genes, there was enrichment for the immune system, cell-cell junction signaling and response to oxidative stress. Proteogenomics yielded 33 functionally and genetically

associated gene sets related to neutrophil activation, platelet activation, and cytokines (interleukins and interferon) signaling. **Conclusions:** We identified PIH patients with severe disease at time of hydrocephalus surgery, to have differential expression of proteins/genes involved in neuroinflammation, ependymal barrier integrity and reaction to oxidative stress. Further studies are needed to examine those proteins/genes as biomarkers for PIH.

B.4

Spatiotemporal mapping and decoding of oculomotion in the pediatric frontal eye field

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Background: The frontal eye fields (FEFs) are linked to oculomotor control and hypothesized to reside in the prefrontal cortex, where electrical stimulation reportedly evokes contraversive eye movements. The exact location and function of the FEFs in humans is controversial. Stereo-electroencephalography (SEEG) is a minimally invasive technique used to guide epilepsy surgery. It provides a unique opportunity to collect human neurophysiological data outside of the operating room and has been used by other groups to advance our understanding of specific brain functions. **Methods:** Two pediatric subjects undergoing non-lesional epilepsy workup were enrolled into this prospective, IRB-approved study, and received brain MRI prior to SEEG implantation. SEEG recordings were collected with video of the subjects' eyes while performing gaze-related tasks. **Results:** Stimulation testing elicited contraversive head turning with or without eye deviation, and hemifacial spasm, depending on the site of stimulation. Low-threshold sites eliciting these stereotyped movements were located just deep to the inferior precentral gyrus. Stimulation of sites in the posterior middle frontal gyrus did not elicit eye movements. **Conclusions:** Our findings suggest that the FEFs are located more posteriorly than widely held, involving the motor cortex. Further testing in pediatric and adult subjects is warranted to confirm this hypothesis.

B.5

Prospective cohort analysis of normal versus mild cognitive impairment for quality of life outcome following DBS for Parkinson's disease

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Background: All guidelines for DBS in Parkinson's disease (PD) include a contraindication for ‘dementia’. It is unclear where this cut-off should occur and if patients with mild cognitive impairment (MCI) do not do as well. This prospective cohort