GP.4

Can Quantitative Susceptibility Mapping Help Diagnose and Predict Recovery of Concussion in Children?

N Sader (Calgary)* *D Gobbi* (Calgary) *B Goodyear* (Calgary) *R Frayne* (Calgary) *M Beauchamp* (Montreal) *WR Craig* (Edmonton) *Q Doan* (Vancouver) *R Zemek* (Ottawa) *KO Yeates* (Calgary), *J Riva-Cambrin* (Calgary)

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.

GP.5

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

É Lemoine (Montreal)* *J Tessier* (Montreal) *G McDuff* (Montreal) *M Robert* (Montreal) *D Toffa* (Montreal) *F Lesage* (Montréal) *DK Nguyen* (Montreal), *E Bou Assi* (Montreal)

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.

GP.6

Improving Triaging of EEG Referrals for Rule out Infantile Spasms (ITERIS)

D Djordjevic (Toronto)* *J Tracey* (Toronto) *M Alqahtani* (Toronto) *J Boyd* (Toronto), *C Go* (Toronto)

Background: Infantile spasms (IS) is a devastating pediatric seizure disorder for which EEG referrals are prioritized at the Hospital for Sick Children, representing a resource challenge. The goal of this study was to improve the triaging system for these referrals. **Methods:** Part 1: descriptive analysis was performed retrospectively on EEG referrals. Part 2: prospective questionnaires were used to determine relative risk of various predictive factors. Part 3: electronic referral form was amended to include 5 positive predictive factors. A triage point system was tested by assigning EEGs as high risk (3 days), standard risk (1 week), or low risk (2 weeks). A machine learning model was developed. **Results:** Most EEG referrals were from community pediatricians with a low yield of IS diagnoses. Using the 5 predictive factors, the proposed triage system accurately diagnosed all IS within 3 days. No abnormal EEGs were missed in the low-risk category. The machine learning model had over 90% predictive accuracy and will be prospectively tested. **Conclusions:** Improving EEG triaging for IS may be possible to prioritize higher risk patients. Machine Learning techniques can potentially be applied to help with predictions. We hope that our findings will ultimately improve resource utilization and patient care.

Chair's Select Abstracts - Adult Neurology and Neurophysiology

A.1

CSF Findings in Early Active Autoimmune Encephalitis

J Hébert (Toronto)* *P Gros* (Toronto) *S Lapointe* (Toronto) *FS Amtashar* (St. Louis) *C Steriade* (New York City) *RA Wennberg* (Toronto) *GS Day* (Jacksonville), *DF Tang-Wai* (Toronto)

Background: Treatment decisions for patients with autoimmune encephalitis (AE) frequently need to be made before results from autoantibody testing are available, as early treatment is

associated with better outcomes. Cerebrospinal fluids (CSF) white blood cell (WBC) count and protein concentration measured early on in the disease process is often used, in combination with other clinical factors, to evaluate the likelihood that a patient has AE. **Methods:** CSF characteristics (WBC count, protein concentration, and oligoclonal banding) measured in a first AE presentation, prior to results of autoantibodies being available, were retrospectively analyzed at two tertiary care centers. **Results:** Ninety-five patients were included in the study. CSF WBC counts and protein levels were within normal limits for 27% (CI95%: 19–37) of patients with AE. When results of oligoclonal banding were added, 14% (CI95%: 6–16) of patients had "normal" CSF. The median CSF white blood cell count was 8 cells/mm3 (range: 0–544) and the median CSF protein concentration was 0.42 g/L (range: 0.15–3.92). **Conclusions:** A substantial proportion of patients with early active AE had a CSF WBC count or protein concentration within the normal. Inclusion of CSF oligoclonal banding may help identify a higher proportion of patients with an inflammatory CSF profile early in the disease process.

A.2

Clinical application of T1-w/T2-w ratio images for in vivo comparisons of myelin content in patients with trigeminal neuralgia

C Li (London)* *PP Chu* (Toronto) *P Hung* (Toronto) *D Mikulis* (Toronto), *M Hodaie* (Toronto)

Background: Novel magnetic resonance (MR) imaging techniques prompted the emergence of T1-w/T2-w images or "myelin-sensitive maps (MMs)" to measure myelin *in vivo*. However, acquisition-related variations in MR intensities prevent meaningful quantitative comparisons between MMs. We propose an improved pipeline to standardize MMs that is applied to patients with classic trigeminal neuralgia (CTN) and trigeminal neuralgia secondary to multiple sclerosis (MSTN). **Methods:** 3T scanner was used to obtain T1-w and T2-w images for 17 CTN and 17 MSTN patients. Template images were obtained from ICBM152 database. MS plaques and normal-appearing white matter (NAWM) were labelled. A Gaussian curve-fit was applied to the histogram of the intensity distribution of each patient image, and transformed to match the Gaussian curve-fit of the template image. **Results:** MM intensities were decreased within MS plaques, compared to NAWM in MSTN patients (*p<0.001*) and its corresponding regions in CTN patients (*p<0.001*). Qualitatively, the standardized patient image and its histogram better resembled the ICBM152 template. **Conclusions:** MM analysis revealed reduced myelin content in MS plaques compared to corresponding regions in CTN patients and surrounding NAWM in MSTN patients. The standardized MM serves as a non-invasive, clinical tool for quantitative analyses of myelin content between different brain regions and different patients *in vivo*.

A.3

Use of diffusion-weighted imaging to distinguish seizure-related change from limbic encephalitis

A Budhram (Rochester)* *JW Britton* (Rochester) *GB Liebo* (Rochester) *A McKeon* (Rochester) *SJ Pittock* (Rochester), *NL Zalewski* (Rochester)

Background: Limbic encephalitis (LE) classically causes medial temporal lobe T2-hyperintensity on magnetic resonance imaging (MRI), but this can also occur with seizure activity. Identifying neuroimaging patterns that can distinguish between LE and seizure activity may help avoid diagnostic confusion in such challenging cases. **Methods:** Through retrospective review of Mayo Clinic patients who had medial temporal lobe T2-hyperintensity on MRI, we identified non-LE patients with seizure-related medial temporal lobe T2-hyperintensity. Their diffusion-weighted imaging (DWI) was reviewed to look for diffusion restriction patterns potentially unique to seizure activity. Next, a control cohort of LE patients with medial temporal lobe T2-hyperintensity was identified, and their DWI was reviewed to see if these diffusion restriction patterns could help distinguish seizure activity from LE. **Results:** We identified 10 non-LE patients who had medial temporal lobe T2-hyperintensity due to seizure activity; 9/10 had one of two medial temporal lobe diffusion restriction patterns we uncovered as being potentially unique to seizure activity. In contrast, only 5/57 LE patients had one of these diffusion restriction patterns identified, all of whom had seizures reported. **Conclusions:** We report two diffusion restriction patterns that may help distinguish seizure activity from LE. Recognition of these diffusion restriction patterns should prompt evaluation for possible seizure activity.

A.4

A Novel Recessive TNNT1 Congenital Core-Rod Myopathy in French Canadians

D Pellerin (Montreal)* *A Aykanat* (Boston) *B Ellezam* (Montreal) *EC Troiano* (Boston) *J Karamchandani* (Montreal) *M Dicaire* (Montreal) *M Petitclerc* (Lévis) *R Robertson* (Montreal) *X Allard-Chamard* (Montreal) *D Brunet* (Quebec city) *CG Konersman* (San Diego) *J Mathieu* (Sherbrooke) *J Warman Chardon* (Ottawa) *VA Gupta* (Boston) *AH Beggs* (Boston) *B Brais* (Montreal), *N Chrestian* (Quebec city)

Background: Mutations in the slow skeletal muscle troponin T (*TNNT1*) gene cause a congenital nemaline myopathy resulting in death from respiratory insufficiency in early infancy. We report on four French Canadians with a novel congenital *TNNT1* myopathy. **Methods:** Patients underwent lower extremity and paraspinal MRI, quadriceps biopsy and genetic testing. *TNNT1* expression in muscle was assessed by quantitative PCR and immunoblotting. Wild type or mutated *TNNT1* mRNAs were co-injected with morpholinos in a