Platform Presentations

Grand Plenary Abstracts

GP.01

The relationship between carotid stenosis, cerebral cortex thickness and cognitive function in community dwelling older individuals

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doi: 10.1017/cjn.2018.77

Background: Carotid atherosclerosis is a significant risk factor for stroke and has been associated with cognitive decline and dementia. **Methods:** We assessed 554 community-dwelling subjects from the Lothian Birth Cohort of 1936 (LBC1936) who underwent brain MRI and carotid Doppler ultrasound studies at age 73 years. The relationship between carotid stenosis and cerebral cortical thickness was examined cross-sectionally, controlling for gender, extensive vascular risk factors (VRFs), and IQ at age 11 (IQ-11). The association between carotid stenosis and a composite measure of fluid intelligence was also investigated. **Results:** A widespread negative association was identified between carotid stenosis and cerebral cortical thickness at age 73 years, independent of the side of carotid stenosis, other carotid measures, VRFs, or IQ-11. This association increased in an almost dose-response relationship from mild to severe degrees of carotid stenosis. A negative association was also noted between carotid stenosis and fluid intelligence, which appeared partly mediated by carotid stenosis-related thinning of the cerebral cortex. **Conclusions:** Carotid stenosis is associated with thinner cerebral cortex and lower fluid cognitive abilities at age 73. The findings suggest that carotid stenosis represents a marker of vascular processes that accelerate cortical aging with a negative impact on cognition, independent of measurable VRFs.

GP.02

A population-based study of "no evident disease activity" (NEDA) in multiple sclerosis

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doi: 10.1017/cjn.2018.78

Background: NEDA is a composite measure that may ultimately influence clinical decisions concerning switches of disease modifying therapy (DMT) for relapsing remitting multiple sclerosis (RRMS) patients. Cohort studies from MS clinics suggest NEDA is not sustained over time in most patients despite DMT but may be limited by referral bias. We investigated NEDA in a population-based RRMS cohort. **Methods:** We identified all incident cases of RRMS in Olmsted County from 01/01/2000-12/31/2011. Retrospective chart review was conducted to determine persistence of NEDA following RRMS diagnosis. NEDA failure was defined as new MRI activity, relapse, or expanded disability status scale (EDSS) worsening. **Results:** There were 93 incident cases of RRMS with 82 individuals having sufficient follow-up to determine persistence of NEDA. Prior to NEDA failure 44 were not on DMT, 37 were on first-tier, injectable DMT, and 1 received mitoxantrone. NEDA was maintained by 63% at 1 year, 38% at 2 years, 19% at 5 years, and 12% at 10 years. Disability measured by EDSS was no different at 10 years in patients maintaining NEDA versus those that failed NEDA at one year (p=0.3). **Conclusions:** Maintenance of NEDA beyond 2 years is infrequent among a population-based cohort of newly diagnosed RRMS patients and similar to prior clinic-based cohorts.

GP.03

Immune deficiencies/dysregulations underpinning childhood limbic encephalitis: a case series and literature review

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doi: 10.1017/cjn.2018.79

Background: Limbic encephalitis (LE) is a rare autoimmune syndrome affecting limbic system structures and causing variety of manifestations including memory changes, temporal epilepsies, and psychiatric symptoms. It is a rare disease in children but with a well-recognizable combination of clinical, neuroimaging and/or histological signature. Beyond the association with anti-neuronal auto-antibodies, no clear immune system phenotype has been associated with limbic encephalitis. Our aim is to characterize the clinical and paraclinical features of non-paraneoplasic limbic encephalitis and to correlate them with potential underlying immune deficiencies. **Methods:** Retrospective case series of seven patients with limbic encephalitis recruited at the Montreal Children's Hospital (MCH) with a focus on the immune- and neuro-phenotypes, including anti-neuronal antibodies, lymphocyte sub-typing, key markers of immunoglobulin and complement systems. Literature review showed 77 cases of non-paraneoplastic non-NMDA limbic encephalitis. **Results:** Symptoms included temporal epilepsy (n=5), psychiatric symptoms such as ADHD or autistic symptoms (n=2), and memory changes (n=3). One patient was positive for both voltage gated potassium channel antibodies (VGKC) and anti-thyroid peroxidase antibodies (TPO) and two were positive only for anti TPO antibodies. One patient showed low CD19, and immunoglobulins. Three patients showed chronic low CD56 cell count. **Conclusions:** The study is still ongoing, but at least 3 patients already display some traits of immune dysregulation.

GP.04

Smart human neural stem cells to degrade scar and optimize regeneration after traumatic cervical spinal cord injury

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doi: 10.1017/cjn.2018.81

Background: Human induced pluripotent stem cell-derived neural stem cells (hiPS-NSCs) represent an exciting therapeutic approach for traumatically spinal cord injury (SCI). Unfortunately, most patients are the in chronic injury phase where a dense perilesional chondroitin sulfate proteoglycan (CSPG) scar significantly hinders regeneration. CSPG-degrading enzymes can enhance NSC-mediated recovery, however, nonspecific intrathecal administration causes off-target effects. We aimed to genetically engineer hiPS-NSCs to express a scar-degrading ENZYME into their local environment to enhance functional recovery. **Methods:** A bicistronic scar-degrading ENZYME and RFP reporter vector was non-virally integrated into hiPS-NSCs and monoclonalized. ENZYME activity was assessed by WST-1 and DMMB biochemical assays and an *in vitro* CSPG spot assay with hiPS-NSC-derived neurons. To assess *in vivo* efficacy, T-cell deficient rats (N=60) with chronic (8wk) C6-7 SCIs were randomized to receive (1)SMaRT cells, (2)hiPS-NSCs, (3)vehicle, or (4)sham surgery. **Results:** SMaRT cells retained key hiPS-NSC characteristics while stably expressing ENZYME. The expressed ENZYME could appropriately degrade *in vitro* and *ex vivo* CSPGs. While blinded neurobehavioural and immunohistochemical assessments are ongoing at 40wks post-injury, an interim analysis demonstrated human cells extending remarkably long (≥20,000µm) axons along host white matter tracts. **Conclusions:** This work provides exciting proof-of-concept data that genetically-engineered SMaRT cells can degrade CSPGs and human NSCs can extend long-distance processes in chronic SCI.

GP.05

The risk of malignancy after stereotactic radiosurgery

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doi: 10.1017/cjn.2018.80

Background: A major concern of patients undergoing Gamma Knife radiosurgery (GKS) for benign tumors and other conditions is the risk of a separate secondary malignancy or malignant transformation. The incidence of radiosurgery-associated malignancy based on long-term follow-up remains unknown. **Methods:** We conducted a population-based cohort study to estimate the incidence rate of both malignant transformation and a separate radiation-associated malignancy in patients undergoing GKS from 1987 to 2016 at 5 centers. **Results:** 11 527 patients underwent radiosurgery for meningioma (n=3261), arteriovenous malformation (n=2868), trigeminal neuralgia (n=1982), vestibular schwannoma (n=1957), pituitary adenoma (n=1193), other (n=266). The follow-up time ranged from 0.3 to 23.8 years. Four cases of malignant transformation and 3 new malignant brain tumors were reported, two of which were not within the irradiated field. The incidence of malignant transformation was 6.6 per 100 000 patient-years and of new malignancy, either locally or distant, was 5 in 100 000 patient-years. These risks are not higher than the Central Brain Tumor Registry of the United States derived annual incidence rate of all primary malignant CNS tumors of 7.15 per 100 000. **Conclusions:** Physicians can safely counsel patients that the risk of malignancy after stereotactic radiosurgery remains extremely low, even at long-term follow-up of greater than 10 years.

CNS Chair's Select Abstracts

A.01

Parkinson's disease prognosis by early motor subtypes

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doi: 10.1017/cjn.2018.82

Background: Studies of autopsy-confirmed cases suggest that Parkinson's disease (PD) prognosis can be predicted using motor symptom severity at first visit. We evaluated the association between motor symptom subtype at first visit and severity at eight years disease duration among clinically-diagnosed cases at the Saskatchewan Movement Disorder Program. **Methods:** Retrospective data review identified 374 patients with first visit within three years of symptom onset, a clinical diagnosis of idiopathic PD, and a follow-up visit eight years after symptom onset. Subtypes were grouped as tremor-dominant (TD) if tremor was greater than rigidity and bradykinesia, akinetic-rigid (AR) if rigidity or bradykinesia was greater than tremor, and mixed (MX) if patient was neither TD nor AR based on assessment of all four limbs. Primary outcome was disease severity as measured by Hoehn & Yahr score at eight years after symptom onset. **Results:** The most common subtype was AR (n=164) followed by MX (n=156). TD was least common (n=54). There was no significant difference between subtypes in H&Y scores at eight years disease duration. **Conclusions:** These findings suggest that early PD prognosis cannot be predicted based on motor symptoms in all four limbs at first visit. Earlier studies had longer follow-up and future studies will examine progression at longer periods of disease duration.

A.02

Long-term outcomes in the management of central neuropathic pain syndromes

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doi: 10.1017/cjn.2018.83

Background: Central neuropathic pain syndromes are a result of central nervous system injury, most commonly related to stroke, spinal cord injury, or multiple sclerosis. These syndromes are much less common than peripheral etiologies, with less known regarding optimal treatment. The objective of this study was to determine the long-term clinical effectiveness of the management of central relative to peripheral neuropathic pain at tertiary pain centers. **Methods:** Patients diagnosed with central (n=79) and peripheral (n=710) neuropathic pain were identified from a prospective observational cohort from seven Canadian tertiary centers. Data regarding patient

characteristics, analgesic use, and patient-reported outcomes were collected at baseline and 12-month follow-up. The primary outcome was the composite of reduced average pain intensity and pain interference. Secondary outcomes included assessments of function, mood, and quality-of-life. **Results:** At 12-month follow-up, 13.5% (95%CI,5.6-25.8) of patients achieved ≥30% reduction in pain, whereas 38.5% (95%CI,25.3-53.0) achieved a ≥1 point reduction in pain interference; 9.6% (95%CI,3.2-21.0) of patients achieving both these measures. Patients with peripheral neuropathic pain were more likely to achieve this primary outcome at 12-months (25.3% of patients; 95%CI,21.4-29.5) (p=.012). **Conclusions:** Patients with central neuropathic pain were less likely to achieve a meaningful improvement in pain and function compared to patients with peripheral neuropathic pain at 12-month follow-up.

A.03

Durable clinical and MRI efficacy of alemtuzumab over 6 years in CARE-MS II patients with RRMS who relapsed between Courses 1 and 2

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doi: 10.1017/cjn.2018.84

Background: In RRMS patients with inadequate response to prior therapy, 2 alemtuzumab courses (12 mg/day; baseline: 5 days; 12 months later: 3 days) significantly improved outcomes over 2 years (y) versus SC IFNB-1a (CARE-MS II [NCT00548405]), with durable efficacy over a 4-y extension (NCT00930553). We present 6-y efficacy (2-y core study plus 4-y extension) in patients with relapse (relapsers) between Courses (C) 1 and 2. **Methods:** Annualized relapse rate (ARR); 6-month confirmed disability worsening (CDW); MRI disease activity (Gd-enhancing lesions; new/enlarging T2 hyperintense lesions); brain volume loss (BVL; derived by relative change in brain parenchymal fraction). **Results:** 105/435 (24%) patients relapsed between C1 and C2; 33% (relapsers) versus 55% without relapse (non-relapsers) received neither alemtuzumab retreatment nor another disease-modifying therapy through Y6. ARR (Y1: 1.2) declined post-C2 (0.5), remaining low through Y6 (0.2 [0.1, non-relapsers]; 10/105 [10%] relapsed). Through Y6, patients remained CDW-free (60% [relapsers]; 75% [non-relapsers]), Gd-enhancing lesion-free (94% [relapsers]; 90% [non-relapsers]), new/enlarging T2 hyperintense lesion-free (68% [relapsers]; 69% [non-relapsers]), and MRI disease activity-free (68% [relapsers]; 69% [non-relapsers]). Alemtuzumab slowed median percent yearly BVL (Y6: -0.13% [relapsers]; -0.10% [non-relapsers]). **Conclusions:** Patients relapsing between C1 and C2 improved post-C2 through Y6. These findings support administering 2 alemtuzumab courses to achieve optimal and durable benefit.

A.04

High times? Prevalence and perceptions of marijuana use among patients with epilepsy

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doi: 10.1017/cjn.2018.121

Background: Despite medical advances, almost a third of people with epilepsy have medically refractory epilepsy (MRE). With failure of pharmaceutical options, patients are turning to alternative treatment options. Marijuana use in epilepsy has received extensive attention. Two recent studies evaluated the opinions of marijuana use in individuals with epilepsy, but had discrepant marijuana use rates. **Methods:** The first 200 adult patients with a known diagnosis of epilepsy seen at Hamilton General Hospital after June 1, 2017 were invited to participate. Standardized paper questionnaires gathered information about demographics, epilepsy history, and marijuana use. **Results:** One hundred forty participants returned questionnaires; 29.5% were active marijuana users; 24.5% had consumed marijuana in the past. Increased seizure frequency was significantly associated with marijuana use. There was a non-significant trend towards increased marijuana use with males and MRE. Almost half the active marijuana users noted improvement in seizure frequency. No participants experienced worsening of epilepsy with marijuana use. Side effects were common (30%), most frequent being mood. **Conclusions:** Prevalence of marijuana use among people with epilepsy is higher in our study population compared to an Australian cohort, but similar to Canadian studies. Marijuana use was significantly associated with increased seizure frequency. The majority of patients perceived benefit with regard to seizure control.

A.05

Association between timing of direct enteral tube placement and outcomes after acute stroke

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doi: 10.1017/cjn.2018.86

Background: The relationship between timing of direct enteral feeding tube (DET; gastrostomy/jejunostomy) placement and outcomes after stroke is unknown. **Methods:** We used the Ontario Stroke Registry and linked administrative databases to identify patients with acute stroke between 2003-2013 who received DET during hospital admission. We used multiple logistic regression and Cox proportional hazard models to determine the association between time from admission to DET placement and outcomes of severe disability at discharge (modified Rankin Scale score 4-5) and 30-day mortality after DET placement, adjusting for age, sex, co-morbidities, stroke type, stroke severity, intensive care or stroke unit admission, palliation, and hospital type. **Results:** 1,342 patients met our inclusion criteria. There was a lower hazard of 30-day mortality for each week in delay to DET placement (adjusted HR 0.89, 95%CI 0.80 to 0.99), but higher odds of severe disability (adjusted OR 1.36, 95%CI 1.14 to 1.62). Patients with DET placement within 1 week had the highest 30-day mortality compared to subsequent weeks (adjusted HR 1.59, 95%CI 1.05 to 2.4). **Conclusions:** Delayed DET placement after stroke is associated with lower 30-day mortality but greater disability. Thirty-day mortality was highest in those who received DET

within 1 week of admission. These associations may inform decisions regarding timing of DET placement after stroke.

A.06

Trends in hospital admission and in-hospital mortality for atrial fibrillation related stroke in Canada

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doi: 10.1017/cjn.2018.87

Background: Atrial fibrillation (AF) is associated with increased risk of ischemic stroke. In Canada, the contemporary burden of AF-related stroke is incompletely characterized. Our objective was to determine temporal trends in hospital admissions and in-hospital mortality for AF-related stroke in Canada from 2007 to 2015. **Methods:** We conducted a retrospective cohort study using Canadian national administrative data to identify admissions to hospital for stroke with comorbid AF between 2007 and 2015. We analyzed temporal trends in age- and sex-standardized proportion of admissions with comorbid AF and associated in-hospital mortality. **Results:** There were 222,100 admissions to hospital for ischemic (182,990) or hemorrhagic (39,110) stroke. The age-sex adjusted proportion of ischemic stroke admissions with comorbid AF increased from 16.2% to 20.5% (p for trend = 0.02) between 2007 and 2015, and was stable among hemorrhagic stroke. In-hospital mortality for ischemic stroke with comorbid AF decreased from 21.6% to 15.0% (p for trend = 0.001). **Conclusions:** Rates of hospital admission for ischemic stroke with comorbid AF have increased, while associated in-hospital mortality has decreased. These results identify AF as an important continued focus for stroke prevention. Our findings provide insight into current trends and highlight the need for continued focus on AF-related stroke.

A.07

Characterizing the epidemiology of epilepsy in Saskatchewan, Canada

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doi: 10.1017/cjn.2018.88

Background: There is no available estimate of the incidence and mortality of epilepsy in all age groups in the Canadian population. This study aimed to measure the incidence, prevalence, mortality and the secular trends for epilepsy in Saskatchewan between 2005 and 2010. **Methods:** A population-based cohort study was established from Saskatchewan's provincial health administrative data. The population was followed until termination of coverage, death, or 31 December 2010. Individuals with epilepsy were identified based on ICD codes algorithms from 2005 to 2010. **Results:** The age-standardized incidence of epilepsy was 62 per 100,000 person-year. The age-standardized incidence rate of epilepsy in self-declared Registered Indians was 122 per 100,000 person-year. There was a significant decrease in the incidence of epilepsy for all groups over the study period. The age-standardized prevalence of epilepsy was 9 per 1,000 people. There was a significant increase in the prevalence of epilepsy over this time period. The adjusted mortality rate was 0.023 per 1000 person-year, and the all-cause Standardized Mortality Ration for epilepsy was 2.45. The SMR remained constant over the six-year period of the study. **Conclusions:** This study is the first in Canada to measure the incidence and all-cause mortality of epilepsy in all age groups.

CSCN / CACN Chair's Select Abstracts

B.01

Neonatal Neuro-Critical Care (NNCC) program associated with improved short term outcomes in neonates significant Hypoxic Ischemic Encephalopathy (HIE)

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doi: 10.1017/cjn.2018.89

Background: Despite advances in neonatal care, neonates with moderate to severe HIE are at high risk of mortality and morbidity. we report the impact of a dedicated NNCC team on short term mortality and morbidities. **Methods:** A retrospective cohort study on neonates with moderate to serve HIE between July 1st 2008 and December 31st 2017. primary outcome : a composite of death and/or brain injury on MRI. Secondary outcomes: rate of cooling, length of hospital stay, anti-seizure medication burden, and use of inotropes. A regression analysis was done adjusting for gestational age, birth weight, gender, out-born status, Apgar score at 10 minutes, cord blood pH, and HIE clinical staging **Results:** 216 neonates were included, 109 before NNCC implementation, and 107 thereafter. NNCC program resulted in reduction in the primary outcome (AOR: 0.28, CI: 0.14-0.54, p<0.001) and brain injury (AOR: 0.28, CI: 0.14-0.55, p<0.001). It decreased average length of stay/infants by 5 days (p=0.03), improved cooling rate (73% compared to 93% , p <0.001), reduced: seizure misdiagnosis (71% compared to 23%, P <0.001), anti-seizure medication burden (P = 0.001), and inotrope use (34% compared to 53%, p=0.004) **Conclusions:** NNCC program decreased mortality and brain injury , shortened the length of hospital stay and improved care of neonates with significant HIE.

B.02

Recessive mutations in ATP8A2 cause severe hypotonia, cognitive impairment, hyperkinetic movement disorders and progressive optic atrophy

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doi: 10.1017/cjn.2018.90

Background: *ATP8A2* mutations have only recently been associated with human disease. We present the clinical features from the largest cohort of patients with this disorder reported to date. **Methods:** An observational study of 9 unreported and 2 previously reported patients with biallelic *ATP8A2* mutations was carried out at multiple centres. **Results:** The mean age of the cohort was 9.4 years old (range: 2.5-28 yrs). All patients demonstrated developmental delay, severe hypotonia and movement disorders: chorea/choreoathetosis (100%), dystonia (27%) or facial dyskinesia (18%). Hypotonia was apparent at birth (70%) or before 6 months old (100%). Optic atrophy was observed in 75% of patients who had a funduscopic examination. MRI of the brain was normal for most patients with a small proportion showing mild cortical atrophy (30%), delayed myelination (20%) and/or hypoplastic optic nerves (20%). Epilepsy was seen in two older patients. **Conclusions:** *ATP8A2* gene mutations have emerged as a cause of a novel phenotype characterized by developmental delay, severe hypotonia and hyperkinetic movement disorders. Optic atrophy is common and may only become apparent in the first few years of life, necessitating repeat ophthalmologic evaluation. Early recognition of the cardinal features of this condition will facilitate diagnosis of this disorder.

B.03

Registered EEG technologists can accurately identify ictal and interictal epileptiform patterns on routine EEG

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doi: 10.1017/cjn.2018.91

Background: Registered EEG technologists (RETs) are trained in both the technical aspects of EEG and in preliminary EEG interpretation. However, there is little research evaluating the accuracy of EEG interpretation by RETs. **Methods:** Retrospective study of consecutive routine EEG recordings performed at SickKids Hospital. Preliminary reports by RETs and final reports by neurophysiologists were compared in 5 domains: background activity, focal abnormalities, ictal and inter-ictal epileptiform discharges and summary. **Results:** 500 EEG recordings were analyzed. Sensitivity and specificity of RET reports was high for the assessment of background (85%, 93%), focal slowing (84%, 93%) and inter-ictal epileptiform discharges (92%, 90%). RET reports identified ictal EEG patterns in 32 cases vs. 29 cases identified by neurophysiologists. RET reports were 100% accurate for noting no EEG change for all of 11 cases with non-epileptic events. **Conclusions:** Preliminary EEG reports by RETs were sensitive and specific for all EEG domains analyzed. In the majority of cases, the preliminary interpretation made by the RET was concordant with the final report of the neurophysiologist. Given these findings, RETs may be able to participate in the screening of routine EEG recordings in order to enhance the productivity of busy EEG laboratories.

B.04

Insight into the mesial frontal negative motor area: The girl with a very unusual interest in having her back patted

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doi: 10.1017/cjn.2018.92

Background: Currently, there is limited insight in to the function of the mesial frontal negative motor area (NMA) and the anatomic structures implicated in its function. **Methods:** We present a patient with a Rett-like phenotype, refractory frontal lobe epilepsy, and reflexogenic seizures in which backpatting induced atonic seizures with a semiology resembling the patient falling asleep. The patient underwent video EEG monitoring and ictal/interictal SPECT imaging capturing the reflexogenic seizures. Iterative reconstruction was performed, with images co-registered to previously acquired MRI with subtraction Ictal-Interictal imaging co-registered to MRI. **Results:** Interictally, the patient's EEG showed a slow background and right frontal spikes. Ictally, the patient had numerous subclinical frontal seizures. The reflexogenic seizures had an ictal pattern at the vertex (Cz) with the ictal SPECT imaging, showing hyperperfusion in the right mesial frontal region, both paramedian precentral and postcentral gyri, and right basal ganglia. **Conclusions:** Our findings support the hypothesis that the negative motor area may be activated by the primary sensory cortex; moreover, the ictal SPECT now suggests involvement of the basal ganglia in the NMA's function.

B.05

Nusinersen in infants who initiate treatment in a presymptomatic stage of spinal muscular atrophy (SMA): interim results from the Phase 2 NURTURE study

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doi: 10.1017/cjn.2018.93

Background: NURTURE (NCT02386553) is an ongoing open-label single-arm efficacy/safety study of intrathecal nusinersen in infants who initiate treatment in a presymptomatic stage of spinal muscular atrophy (SMA). **Methods:** Enrolled infants were age ≤6 weeks at first dose, clinically presymptomatic, had genetically diagnosed SMA, and 2 or 3 copies of *SMN2*. Primary endpoint is time to death or respiratory intervention (≥6 hours/day continuously for ≥7 days or tracheostomy). **Results:** As of July 5, 2017, 25 infants (2 copies *SMN2*, n=15;3 copies, n=10) were enrolled. All infants were alive. Two infants (both with 2 copies *SMN2*) required respiratory intervention (but not tracheostomy or permanent ventilation) during an acute, reversible viral infection and thus met the primary endpoint. At last

visit, 22/24 (92%) infants had achieved WHO motor milestones sitting without support and 8/16 (50%;2 *SMN2*, n=3/11;3 *SMN2*, n=5/5) on study >13 months achieved walking alone. AEs were reported in 24/25 (96%) infants; most 20/25 (80%) had AEs that were mild/moderate in severity; 9 had serious AEs. Four infants had an AE possibly related to study drug, which resolved despite continued treatment. No new safety concerns were identified. **Conclusions:** Nusinersen continued to benefit infants who initiated treatment in a presymptomatic stage of SMA.

Study Support: Biogen

B.06

Safety and efficacy of nusinersen in infants/children with spinal muscular atrophy (SMA): part 1 of the phase 2 EMBRACE study

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doi: 10.1017/cjn.2018.94

Background: EMBRACE (NCT02462759) Part 1 is a randomized, double-blind, sham-procedure controlled study assessing safety/tolerability of intrathecal nusinersen (12-mg equivalent dose) in symptomatic infants/children with SMA who were not eligible to participate in ENDEAR or CHERISH. **Methods:** Eligible participants had onset of SMA symptoms at ≤6 months with 3 *SMN2* copies; onset at ≤6 months, age >7 months and 2 copies; or onset at >6 months, age ≤18 months, and 2/3 copies. Safety/tolerability was the primary endpoint. Exploratory endpoints included Hammersmith Infant Neurological Examination Section 2 (HINE-2) motor milestone attainment, change in ventilator use, and growth. **Results:** EMBRACE Part 1 was terminated early based on positive results from ENDEAR. Safety/tolerability was similar to previous trials. More nusinersen-treated (11/14;79%) vs. sham–treated individuals (2/7;29%) were HINE-2 motor milestone responders. Between Day 183 and 302, mean (SD) hours of ventilator use changed by +1.236 (3.712) hours in nusinersen-treated (n=12) and +2.123 (3.023) hours in sham–treated individuals (n=7). Similar increases in weight and body length were observed in nusinersen-treated and sham–treated individuals by Day 183. **Conclusions:** In EMBRACE Part 1, nusinersen demonstrated a favorable benefit-risk profile. These results add to the aggregated efficacy, safety/tolerability data of nusinersen in SMA.

Study Supported by: Ionis and Biogen

B.07

Review of patients with Spinal Muscular Atrophy treated with Nusinersen in Ontario

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doi: 10.1017/cjn.2018.95

Background: Spinal Muscular Atrophy (SMA) is an autosomal recessive neurodegenerative disease. In June 2017, Health Canada approved Nusinersen, currently the only available drug for SMA. Since 2016, patients in Ontario have been treated clinically with Nusinersen through different access programs. **Methods:** Retrospective case series of patients with SMA treated clinically with Nusinersen in Ontario, describing clinical characteristics and logistics of intrathecal Nusinersen administration. **Results:** Twenty patients have been treated across four centres. To date, we have reviewed 8 cases at one centre (seven SMA Type I, one SMA Type II). Age at first dose ranged from 3-156 months and disease duration 9-166 months. Patients had received 4-7 doses at last evaluation. Three patients with scoliosis (2 with spinal rods) required fluoroscopy-guided radiologist administration, and 4 required general anesthesia. No complications/adverse events were reported. At last follow up, 5/8 families reported improved daily activities. Of 5 patients with baseline and follow up motor function testing, 3 demonstrated improved scores. One patient died due to respiratory decline at age 9 months, despite improved motor outcome scores. **Conclusions:** We describe the first Canadian post-marketing experience with Nusinersen. Timely dissemination of this information is needed to guide clinicians, hospital administrators, and policy-makers.

CNSS Chair's Select Abstracts

C.01

Endoscopic versus open microvascular decompression of trigeminal neuralgia: a systematic review and comparative meta-analysis

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doi: 10.1017/cjn.2018.96

Background: Microvascular decompression (MVD) is commonly used in the treatment of trigeminal neuralgia with positive clinical outcomes. Fully endoscopic microvascular decompression (E-MVD) has been proposed as a minimally invasive, effective alternative, but a comparative review of the two approaches in the literature has not been conducted. **Methods:** We performed a meta-analysis comparing patient outcome rates and complications for both techniques. From a pool of 1,039 studies, 22 articles were selected for review: 12 open MVD and 10 E-MVD. The total number of patients was 6,734. **Results:** Good pain relief was achieved in 81% of MVD and 88% of E-MVD patients, with a mean recurrence rate of 14% and 9% respectively. Average rates of complications in MVD versus E-MVD included facial paresis or weakness, 9%, 3%; hearing loss,

4%, 1%; cerebrospinal leak, both 3%; cerebellar damage and infection, 2%, <1%; and mortality <1%, 0% respectively. **Conclusions:** The reviewed literature revealed similar clinical outcomes with respect to pain relief for both approaches. Recurrence rate and incidence of complications, notably facial paresis and hearing loss were higher for MVD. We concluded that E-MVD appears to offer at least as good a surgical outcome as MVD, with possibly a shorter operative time, smaller craniectomy and lower recurrence rates.

C.02

Predictors of survival in a surgical series of Metastatic Spinal Cord Compression and a complete external validation of 8 models in a prospective multi-centre study

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doi: 10.1017/cjn.2018.97

Background: We aimed to identify preoperative predictors of survival in Metastatic Epidural Spinal Cord Compression (MESCC) patients surgically treated, examine how these predictors relate to eight prognostic models, and to perform the first full external validation of these models in accordance with the TRIPOD statement. **Methods:** 142 surgically treated MESCC patients were enrolled in a prospective, multicenter cohort study and followed for 12 months or until death. Cox proportional hazards (PH) regressions were used. Non-collinear predictors with <10% missing data, ≥10 events per stratum and $p<0.05$ in univariable analysis were tested through a backward stepwise selection. For the original and revised Tokuhashi, Tomita, modified Bauer, van der Linden, Bartels, OSRI, Bartels and Bollen, we examined calibration and discrimination; survival stratified by risk groups with the Kaplan-Meier method and log-rank test. **Results:** Primary tumor, organ metastasis and SF-36v2 PC were associated with survival in multivariable analysis; corrected discrimination was 0.68. These three predictors were common to most current prognostic models. However, calibration was poor overall while discrimation was possibly helpful. **Conclusions:** Primary tumor type (breast, prostate and thyroid), absence of organ metastasis, and a lower degree of physical disability are preoperative predictors of longer survival in surgical MESCC patients. Clinicians should use these 8 prognostic models with caution.

C.03

Surgical complications with and without image guidance: meta-analysis of Ommaya reservoir insertions

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doi: 10.1017/cjn.2018.98

Background: There remains an important role for consolidating evidence on the utility of image guidance (IG) in neurosurgery. In 1963, Ayub Ommaya proposed a surgical technique for the placement of a subcutaneous reservoir and pump to allow access to intraventricular cerebrospinal fluid. In this study, we sought to compile evidence from the literature about surgical outcome in ORI with and without IG. **Methods:** A systematic review was conducted in accordance with PRISMA guidelines. Overall surgical complication rate was considered a primary outcome and further classified into specific complication categories. **Results:** 40 studies were identified, including our own series, for a total of 1947 independent ORI procedures. Pooled rates of outcome for IG compared to non-IG were 6.0% versus 13.6% for overall complications; 2.0% versus 2.8% for catheter malfunction; 1.9% versus 2.3% for catheter malposition; 0.5% versus 4.0% for early infection; 4.3% versus 9.4% for any infection; and 0.4% versus 1.4% for mortality. **Conclusions:** We observed that IG ORI resulted in improved accuracy and decreased complications compared to non-IG. To our knowledge, this study comprises the largest observational analysis of operative outcomes demonstrating evidence for the utility of IG.

C.04

A systematic review and meta-analysis of 7551 patients with post-operative radiation for the management of functioning and non-functioning pituitary adenomas

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doi: 10.1017/cjn.2018.99

Background: Although surgery is the mainstay of treatment for most pituitary adenomas, post-operative radiotherapy has been shown to be of benefit in improving tumor control and recurrence-free survival. To understand potential side effects of radiotherapy we performed a systematic review and meta-analysis to determine the efficacy and safety of post-operative radiotherapy for pituitary adenoma. **Methods:** A systematic review was performed according to the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) guidelines. We searched PubMed, MEDLINE and Cochrane databases with no language or publication date restrictions. Outcomes included 5- and 10-year progression-free survival and adverse events rates. **Results:** A total of 48 studies from 1986-2016 met the inclusion criteria, with 7551 cumulative patients. The cumulative 5- and 10-year s progression-free survival rates were 90.8% (95% CI 86-94%) and 88.6% (95% CI 81-93%), respectively. The overall adverse events rate was 8% (95% CI 5-12%). All outcomes were associated with significant heterogeneity ($I^2 \geq 70\%$). No differences in survival rates or adverse events in relation to study date, tumor pathology, radiosurgery system used or dose of radiation. **Conclusions:** Post-operative radiotherapy for pituitary adenomas is effective and safe. Because of the significant heterogeneity and lack of matched controls in the literature, optimum timing and dosage are still unclear. Further prospective studies are needed.

C.05

Anticoagulant prophylaxis against venous thromboembolism following severe traumatic brain injury: a prospective observational study and systematic review

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doi: 10.1017/cjn.2018.100

Background: Venous thromboembolism (VTE) is a serious complication following severe TBI, however, anticoagulant prophylaxis is often withheld over concerns of intracranial hemorrhage (ICH) progression. We analyzed practice patterns and outcomes among severe TBI patients and systematically reviewed the literature for studies of anticoagulant prophylaxis after severe TBI. **Methods:** We prospectively screened consecutive patients with severe TBI (highest GCS≤8 from time of injury to ICU admission) admitted to a Level-I trauma centre between Oct 1,2015–Sept 30,2016 to assess type/timing of anticoagulant prophylaxis, rates of new VTE and ICH progression. **Results:** We identified 64 eligible patients with severe TBI. Most (53;83%) received anticoagulant prophylaxis, initiated ≥3d after TBI in 67%. Ten (16%) developed VTE during hospitalization; 8 started prophylaxis prior to VTE. No significant difference was observed in VTE incidence or ICH progression between patients with early prophylaxis (<3d) vs.later (≥3d). Our systematic review identified 5 studies of heterogeneous quality/design, with reported VTE incidence of 11-30% in patients without anticoagulant prophylaxis and 5-10% in patients with prophylaxis. **Conclusions:** VTE is a common complication after severe TBI despite routine use of anticoagulant prophylaxis. Anticoagulant prophylaxis is often started late (≥3d) post-injury. The relative benefits of early prophylaxis versus possible risks of ICH progression should be directly compared in an appropriately powered RCT.

C.06

Somatotopic organization of the human spinothalamic tract: CT-guided mapping in awake patients undergoing cordotomy

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doi: 10.1017/cjn.2018.101

Background: After correlating in vivo macrostimulation-induced pain or temperature sensation during percutaneous cervical cordotomy with simultaneous CT imaging of the electrode tip location, we present a modern description of the somatotopy of the human cervical spinothalamic tract **Methods:** Twenty patients with medically refractory, unilateral, nociceptive pain due to malignancy received contralateral cervical percutaneous cordotomy. In a post-hoc analysis of the data, each individual's cervical spinal cord was measured from the CT image using PACS software. The location of the electrode tip during each stimulation-induced response was then superimposed on a diagram of their cord **Results:** The lower limb responses were found more superficial and posterior to those of the upper limb. Interestingly, the region for upper limb responses surrounded that for lower limb primarily anteriorly and medially (deep) but also posteriorly **Conclusions:** This work simultaneously combined awake physiologic localization of fibers within the human spinothalamic tract (STT) with neuroimaging documenting their precise anatomical localization within the spinal cord. The resultant map of the STT demonstrates, for the first time, that fibers from the lower limb are located superficially and posteriorly within the anterolateral spinal cord with the fibers from the upper limb surrounding them primarily deep and anteriorly but also posteriorly

C.07

Calgary shunt protocol, an adaptation of the hydrocephalus clinical research network shunt protocol reduces risk of shunt infection in children

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doi: 10.1017/cjn.2018.102

Background: The effectiveness of the Hydrocephalus Research Network (HCRN) shunt protocol has not been validated in a non-HCRN, small-to-medium volume pediatric neurosurgery center. This study evaluates whether the 9-step Calgary Shunt Protocol (CSP) adapted from the HCRN shunt protocol reduced shunt infections. **Methods:** The CSP was prospectively applied at Alberta Children's Hospital from May 23rd, 2013 to all children undergoing any shunt procedure. Children undergoing shunt surgery before CSP implementation acted as a control-cohort. The strict HCRN definition of shunt infection was applied. **Results:** A total of 268 shunt procedures were performed. There was a significant absolute risk reduction of 10.0% ([95%CI 3.9%-15.9%], p=0.004) in shunt infections after implementation of the CSP. In univariate analyses, chlorhexidine compared to povidone skin prep reduced shunt infection by 8.2% ([95%CI 1.84-14.6%], p=0.02) and waiting ≥ 20 min between receiving preoperative antibiotics and skin incision reduced shunt infections by 9.6% ([95%CI 2.4%-16.9%], p=0.02). In multivariate analysis, only protocol implementation independently reduced shunt infections (OR 0.19 [95%CI 0.06-0.67], p=0.004). **Conclusions:** This study externally validates the published HCRN protocol for reducing shunt infection in an independent, non-HCRN, and small-to-medium volume neurosurgery setting. Chlorhexidine skin prep and waiting ≥ 20 min between preoperative antibiotic and skin incision may have contributed to the protocol's quality improvement success.

Poster Presentations

Dementia and Cognitive Disorders

P.001

Factors associated with having a will, power of attorney and advanced healthcare directive in patients presenting to a rural and remote memory clinic

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doi: 10.1017/cjn.2018.103

Background: A will, power of attorney and advanced healthcare directive are critical to guide decision-making in people with cognitive decline. We identified characteristics that are associated with the existence of these documents in patients who presented to a rural and remote memory clinic (RRMC). **Methods:** 95 consecutive patients were included in this study. Patients and caregivers completed questionnaires on initial presentation to the RRMC and patients were asked if they have legal documents. Patients also completed neuropsychological testing. Statistical analysis (t-test and χ^2 test) was performed to identify significant variables. **Results:** 70 patients had a will, 62 had a power of attorney and 21 had an advanced healthcare directive. Having a will was associated with good quality of life (p=0.001), living alone (p=0.034), poor verbal fluency (p=0.055) and European ethnicity (p=0.028). Factors associated with having a power of attorney included good quality of life (p=0.031), living alone (p=0.053) and poor verbal fluency (p=0.015). Old age (p=0.015), poor verbal fluency (p=0.023) and severity of cognitive and functional impairment (p=0.023) were associated with having an advanced healthcare directive. **Conclusions:** Our results indicate that poor quality of life, good verbal fluency, non-European ethnicity and living with others are associated with a lower likelihood of creating legal documents in patients with cognitive decline

P.002

Exosomal miR-204-5 and miR-632 in CSF are candidate biomarkers for frontotemporal dementia: a GENFI study

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doi: 10.1017/cjn.2018.104

Background: To determine whether exosomal microRNAs (miRNAs) in CSF of patients with FTD can serve as diagnostic biomarkers, we assessed miRNA expression in the Genetic FTD Initiative (GENFI) cohort and in sporadic FTD. **Methods:** GENFI participants were either carriers of a pathogenic mutation or at risk of carrying a mutation because a first-degree relative was a symptomatic mutation carrier. Exosomes were isolated from CSF of 23 pre-symptomatic and 15 symptomatic mutation carriers, and 11 healthy non-mutation carriers. Expression of miRNAs was measured using qPCR arrays. MiRNAs differentially expressed in symptomatic compared to pre-symptomatic mutation carriers were evaluated in 17 patients with sporadic FTD, 13 patients with sporadic Alzheimer's disease (AD), and 10 healthy controls (HCs). **Results:** In the GENFI cohort, miR-204-5p and miR-632 were significantly decreased in symptomatic compared to pre-symptomatic mutation carriers. Decrease of miR-204-5p and miR-632 revealed receiver operator characteristics with an area of 0.89 [90% CI: 0.79-0.98] and 0.81 [90% CI: 0.68-0.93], and when combined an area of 0.93 [90% CI: 0.87-0.99]. In sporadic FTD, only miR-632 was significantly decreased compared to sporadic AD and HCs. Decrease of miR-632 revealed an area of 0.89 [90% CI: 0.80-0.98]. **Conclusions:** Exosomal miR-204-5p and miR-632 have potential as diagnostic biomarkers for genetic FTD and miR-632 also for sporadic FTD.

P.003

Feasibility and validity of a novel video-conference administration protocol for the NIH toolbox - cognition battery

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doi: 10.1017/cjn.2018.105

Background: The NIH Toolbox - Cognition Battery (NIHTB-CB) is a computerized cognitive assessment designed for clinical research that is administered in-person. Here, we explored the feasibility and validity of a novel video-conference protocol for administering the NIHTB-CB. Since our protocol required repeated assessments, we further explored the NIHTB-CB's practice effect. **Methods:** Twenty-five healthy participants completed the NIHTB-CB under two separate conditions four weeks apart. The standard condition followed the recommended administration protocol, whereas the video-conference condition had the examiner and participant in separate rooms but able to communicate over video-conference. A linear mixed-model analysis was performed to explore the fixed effect of testing condition and time on NIHTB-CB performance. **Results:** Across all three NIHTB-CB composite scores (total, fluid and crystallized cognition) no significant fixed effect of administration condition was found. A significant practice effect was observed for the fluid and total cognition composite scores over a 29.0 (± 2.1) day test-retest interval. **Conclusions:** Our novel video-conference protocol for the NIHTB-CB is equivalent to the standard protocol in healthy participants, and may provide a solution for researchers seeking to engage study participants at remote sites. If the NIHTB-CB is used longitudinally to monitor patients, corrections for repeated measures may be required.

P.004

Neurogenic orthostatic hypotension results in impaired information processing speed

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doi: 10.1017/cjn.2018.106

Background: Neurogenic orthostatic hypotension (NOH) is characterized by a reduction in systolic blood pressure of ≥20mmHg or diastolic blood pressure of ≥10mmHg within three minutes of upright posture. NOH is prevalent in the elderly population who is at increased risk for cognitive decline, therefore it is imperative to investigate if there is a relationship between NOH and impaired cognition. **Methods:** Currently, 9 control subjects and 4 NOH patients have been recruited. Cognitive function is assessed using the symbol digit modalities test (SDMT) which assesses information processing speed and the Stroop test which measures response inhibition. SDMT and Stroop test are administered when the table is supine and during tilt. **Results:** NOH patients scored significantly worse on SDMT when lying (p=0.018) and standing (p=0.004) compared to the control group. Control subjects performed significantly better when standing for both SDMT (p=0.008) and Stroop (p=0.026), whereas NOH patients had similar scores when lying and standing for SDMT and Stroop. **Conclusions:** Preliminary results show that information processing speed is slower in NOH patients than controls in both the supine and standing positions. NOH patients have a more difficult time inhibiting unwanted responses compared to controls when standing, which is represented by a greater interference score in NOH patients.

P.005

Lisdexamfetamine precipitated pathological gambling

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doi: 10.1017/cjn.2018.107

Background: Lisdexamfetamine has not heretofore been reported to cause pathological gambling. Such a case is presented. **Methods:** A middle-aged woman, without past interest in gambling, gaming, or risk taking behavior, with childhood history of attention deficit hyperactivity disorder presented with difficulty focusing and concentrating. Lisdexamfetamine was started at 20 mg daily and gradually escalated due to lack of efficacy. At 70 mg daily, she began binging on sweets and gambling all day, every day at nearby riverboats, which she had never frequented previously. Upon reduction to 60 mg daily, the gambling resolved. Ritalin 20 mg every morning and 50 mg every afternoon was used without gambling reoccurrence. **Results:** Mental Status Examination: Alert, cooperative and oriented x 3 with good eye contact. Euthymic, without mania, thoughts logical and goal directed. **Conclusions:** Enhanced dopamine in the nucleus accumbens may induce hedonic activities including gambling, binging on sweets, or sexual activity (Moore *et al*. 2014). Lisdexamfetamine has been described to induce mania, and pathological gambling may have been an isolated manifestation of early mania. In those who have recently begun lisdexamfetamine, query should be made regarding change in gambling behavior and in those who are pathologically gambling, investigation should be entertained as to whether they are taking lisdexamfetamine.

P.006

Role of repeat antithyroid antibody testing in the diagnosis of Hashimoto's Encephalopathy

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doi: 10.1017/cjn.2018.108

Background: We present a case of a previously well 71-year-old woman who developed rapidly progressive dementia. She had several prolonged hospital admissions and extensive investigations were performed. Her illness was steroid-responsive with clinical features suggestive of Hashimoto's Encephalopathy (HE). However, multiple thyroid antibody panels acquired were initially normal, becoming elevated during subsequent relapses that occurred 3 years after initial presentation. The case signifies the importance of repeating antithyroid antibody levels in a patient with a clinical picture suggestive of HE. **Methods:** Case report. **Results:** The diagnosis of HE was established because of a compatible clinical picture including a relapsing encephalopathy with motor involvement and steroid responsiveness. In addition, although initial antithyroid antibody testing was negative, subsequent attacks were associated with significant elevations and reverted to normal with resolution of the attacks. **Conclusions:** In a patient with normal levels of antithyroid antibodies and a clinical presentation suggestive of HE, we recommend repeat antithyroid antibody testing to confirm diagnosis. Further studies are necessary to clarify the pathogenic role of elevated antithyroid antibodies in the mechanism of HE.

P.007

Familial idiopathic normal pressure hydrocephalus in a Canadian family

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doi: 10.1017/cjn.2018.109

Background: Idiopathic Normal-pressure hydrocephalus (iNPH) is characterized by cognitive impairment, gait disturbance, enlarged ventricles with/without cerebral atrophy, with/without urinary incontinence, and normal cerebrospinal fluid pressure. Familial iNPH is very rarely described in the literature. A Canadian family with more than one generation of iNPH has never been described. **Methods:** Patient 1: 50-year-old female presented with wide-based and magnetic gait, multiple falls with subsequent freezing. LP with large volume tap was performed. Patient had ventriculo peritoneal (VP) shunt surgery. Patient 2: 52 year male (brother): Presented with long-standing cognitive impairment and fatigue. Montreal Cognitive Assessment (MOCA) was performed. Whole exome sequencing(WES) of both siblings as well as an unaffected first cousin was done. The father and grandmother of both patients was diagnosed with iNPH. **Results:** Patient 1: Opening pressure on LP was 22 cm-H2O. She responded well to large volume tap. She had VP shunt resulting in improved gait. Patient 2: Opening pressure on LP was 16cm-H2O. CSF flow study was slow for age indicative of NPH. MoCA score was 25/30. WES of patients and unaffected first cousin is underway. **Conclusions:** We present an undescribed Canadian family with iNPH in more than one generation. WES is underway for better understanding of genetic predesposition and inheritance of familial iNPH

Epilepsy and EEG

P.008

Could Transient neurological Symptoms with subdural hematoma be explained by Cortical spreading depolarization Activity in Neurons? (CT-SCAN)

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doi: 10.1017/cjn.2018.110

Background: Transient neurological symptoms in patients with subdural hematoma (SDH) are often attributed to secondary epilepsy despite a negative workup. We believe a significant proportion of these patients could rather suffer from cortical spreading depolarization (CSD). **Methods:** We performed a retrospective case-control study of patients with transient neurological symptoms post-SDH evacuation between 1996 and 2017. The clinical features of patients with negative EEG were compared to those with positive EEG (ictal or interictal abnormalities) and a clinical scoring system was created. **Results:** 59 patients were included, 20 (34%) with a positive EEG. Speech-related symptoms (OR 4.8, p=0.018) and prolonged episodes (OR 23.1, p=0.001) were associated with a negative EEG. Clonic movements (OR 0.014, p<0.0005), impaired awareness (OR 0.013, p<0.0005), positive symptoms (OR 0.05, p<0.0001), complete response to standard antiepileptic drugs (OR 0.06, p=0.007) and mortality (OR 0.021, p=0.003) were associated with a positive EEG. We built a clinical score based on these features, which showed a 90% sensitivity and 100% specificity. **Conclusions:** We believe that the differences observed between both groups were driven by the presence of CSD rather than seizure in the case group. Our proposed scoring system can help predict EEG results and may be useful to identify CSD in future trials.

P.009

Improving triaging of Infantile Spasm EEG referrals in a large Canadian institution

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doi: 10.1017/cjn.2018.111

Background: Infantile spasms (IS) is a seizure disorder in young children which can be challenging to recognize. Early diagnosis and treatment of IS is critical for prevention of developmental delay. At the Hospital for Sick Children, rule-out IS accounts a large percentage of outpatient EEG referrals, while few result in a diagnosis. The goal of this study was to characterize the seizure semiology and source of referral, in order to explore ways in which triaging of these referrals may be improved. **Methods:** A retrospective review was done on all 84 rule-out IS EEG referrals within the last year at the Hospital for Sick Children. Source of referral, description of episodes, and result of EEG was extracted and data qualitatively analyzed. **Results:** Neurologists at Hospital for Sick Children accounted for the least number of referrals however contributed the greatest percentage of IS diagnoses. Non-neurologists contributed the most referrals, however 75% of these EEGs were normal. Common semiologies as described by referring physicians are discussed. **Conclusions:** Improved triaging of EEG referrals may be achieved through screening of referrals by paediatric neurologists, clarification of event semiology, and better IS education. This represents a critical opportunity for improvement of resource allocation as well as patient care and outcomes within all major referral centres.

P.011

Not just for babies: positive rolandic sharp waves in adult post-hypoxic myoclonus

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doi: 10.1017/cjn.2018.113

Background: Post-hypoxic myoclonus is broadly divided into myoclonic status epilepticus (MSE) and Lance-Adams syndrome (LAS), where diagnosis depends on clinical and electroencephalographic (EEG) findings. Positive rolandic sharp waves (PRS) are a classic EEG finding in pre-term infants with white matter necrosis, but they are not known to be epileptogenic and have never been described in adults. **Methods:** We report a unique case of PRS correlated with myoclonic seizures in a post-hypoxic adult patient. **Results:** Shortly after cardiac arrest, a 21-year-old woman developed multifocal post-hypoxic myoclonus. Early development of myoclonus suggested MSE, but her EEG findings were atypical for MSE; initially, the only notable feature on EEG were subtle PRS. LAS did not fit the clinical picture or EEG findings. As myoclonus persisted over the following weeks, PRS evolved on EEG into positive rolandic predominant generalized polyspike-wave complexes that became definitively time-locked to each myoclonic jerk. PRS were diagnosed as epileptogenic and frequent myoclonic jerks were diagnosed as continuous myoclonic seizure. Myoclonus resolved to medication and mental status returned to baseline. **Conclusions:** We report for the first time that PRS can appear in adult patients and be epileptogenic, and produce a non-classical variant of post-hypoxic myoclonus that carries good prognosis.

P.012

Post-operative hippocampal volume changes on magnetic resonance volumetry in patients with mesial temporal lobe epilepsy

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doi: 10.1017/cjn.2018.114

Background: We evaluate long-term post-operative hippocampal volume (HV) on non-epileptic hippocampus using MR volumetry as well as the neuropsychological outcome in patients with surgery for unilateral mesial temporal lobe epilepsy (MTLE) and achieved seizure-freedom. **Methods:** We studied 1.5-Tesla MRI before and after epilepsy surgery in 24 patients with MTLE. Serial MRI studies were scheduled at 4 post-operative consecutive periods; 6m-1y; 1-2y; 2-3y; 3-5y. We compared neuropsychological outcomes for memory and estimated IQ at the same periods with serial MRI up to 3 years. **Results:** The pre-operative non-epileptic HV was significantly smaller than HV in age-matched controls (n=14) (p<0.05). The HV became progressively atrophic after the surgery (p<0.05), correlating with the age at surgery (p<0.05) and pre-operative larger non-epileptic HV (p<0.05), but not with seizure duration. In 14 patients with

non-dominant MTLE, the smaller dominant HV at 2-3y period correlated with decline of verbal memory ($p<0.05$). **Conclusions:** Post-operative progression of non-epileptic hippocampal atrophy was found with significantly more pronounce in patients with older age at surgery and larger pre-operative non-epileptic hippocampus. After the epileptogenic hippocampus is resected, the remaining hippocampus alone might exhaust to maintain the memory, especially in elders.

P.013

Convulsive status epilepticus due to intracranial hypotension

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doi: 10.1017/cjn.2018.115

Background: Intracranial hypotension (IH) is typically characterized by an orthostatic headache. There have been limited case reports describing iatrogenic IH presenting with seizures. **Methods:** Case report. **Results:** A 71-year-old woman with chronic back pain developed convulsive status epilepticus (SE), characterized by generalized clonic seizures, immediately following scoliosis surgery. She had no history of seizures or seizure risk factors. Despite treatment with Midazolam, Phenytoin and Lacosamide, seizures recurred five times over three hours. Thus, Propofol and Midazolam infusions were initiated. An electroencephalogram revealed burst suppression and bilateral hemispheric epileptiform discharges. MRI brain was consistent with IH without cortical vein thrombosis. Fluid from the surgical drains was positive for Beta-2 transferrin, indicating cerebral spinal fluid. Her intracranial hypotension was likely due to an intraoperative dural tear causing SE. Over two weeks, she remained on bedrest, sedation was weaned, and Phenytoin and Lacosamide were tapered and discontinued. She had no further seizures. **Conclusions:** IH is an under recognized cause of seizure following spinal or cranial surgery, lumbar puncture, or spinal anaesthesia. Proposed mechanisms include traction on cortical structures, increased cerebral blood flow and cortical irritation secondary to subdural hygromas.

P.014

Survey of epilepsy and seizure awareness in Manitoba: an evaluation (SESAME)

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doi: 10.1017/cjn.2018.116

Background: Epilepsy/seizure awareness is improving across Canada. With the formation of a Comprehensive Epilepsy Program in Manitoba (including a new Pediatric Epilepsy Monitoring Unit), a provincial strategy has been proposed outlining a path towards improved access to epilepsy care. We now sought to qualify the current state of clinician knowledge and comfort towards diagnosis and management of this condition. **Methods:** A qualitative online survey, comprised of 36 short-answer questions, was delivered to primary care and specialist physicians in Manitoba. **Results:**108 subjects responded, across varying medical disciplines. 101 (93.5%) have previously managed epilepsy patients, and 87 (80.6%) have previously ordered an EEG. A total of 63 (59.4%) have referred to a neurologist, with a lower proportion (30, 28.3%) referring specifically to an epileptologist. 36 respondents (33.3%) have heard of the ILAE guidelines, with 43 (63.2%) reporting refractory epilepsy to be defined by the failure of 3 (or more) medications. 61 (56.5%) were unaware of invasive EEG techniques. Most (85, 78.7%) understood a role for surgery in treating epilepsy, with 12 (11.1%) unaware of surgical therapies beyond VNS. **Conclusions:** SESAME successfully identified strong awareness towards epilepsy, with small lapses in knowledge that will benefit from a formal provincial-wide educational curriculum.

P.015

Mesial Temporal Sclerosis is a rare occurrence in Intractable Pediatric Temporal Lobe Epilepsies

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doi: 10.1017/cjn.2018.117

Background: Temporal lobe epilepsy (TLE) accounts for approximately 20% of pediatric epilepsy cases. Of those, many are considered medically intractable and require surgical interventions. In this study, we hypothesized that mesial temporal sclerosis (MTS) was less common in patients who had undergone surgery for intractable pediatric TLE than in adult series. We further hypothesized that there was a radiological and pathological discordance in identifying the cause of pediatric TLE. **Methods:** We retrospectively reviewed the charts of pediatric patients with TLE who had undergone surgical treatments as part of the University of Alberta's Comprehensive Epilepsy Program between 1988 and 2018. Along with preoperative magnetic resonance imaging (MRI) reports, post-surgical pathology results and seizure outcomes were studied **Results:** Of the 83 pediatric patients who had undergone temporal lobe epilepsy surgery, 28% had tumors, 22% had dual pathologies, 18% had MTS, 11% had focal cortical dysplasia, and 22% had other pathologies. In addition, for 36% of these patients, discordance between their pre-surgical MRI reports and post-surgical pathology reports were found. **Conclusions:** This was one of the largest retrospective cohort studies of pediatric patients who had undergone surgery for intractable TLE. This study showed that tumors, and not MTS, were the most common pathology in surgical pediatric TLE .

P.016

A novel de novo GABRA1 mutation linked to epileptic encephalopathy: pathophysiology and potential therapeutic options

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doi: 10.1017/cjn.2018.118

Background: Epileptic encephalopathy (EE) is a severe neurological disorder characterized by treatment-resistant seizures and poor neurodevelopmental outcomes. EE is associated with mutant genes, including those that encode for γ-aminobutyric acid type A (GABA) receptor subunits. We identified a novel *de novo* GABRA1 mutation in a patient with EE, characterized its impact on GABA receptor function, and sought potential therapeutic options. **Methods:** We described the clinical and electrophysiological features of a patient with a novel *de novo* GABRA1 (R214C) mutation; performed

functional studies; and determined the effect of diazepam and insulin on wild type and mutant GABA receptors. **Results:** The patient is a 10-year-old girl with EE, treatment-resistant seizures, intellectual disability and autism. Her GABRA1 (R214C) mutation dramatically decreased whole-cell GABA-evoked currents by reducing GABA surface receptors, decreasing single channel open time, and altering channel kinetic properties. The combination of diazepam and insulin partially repaired these effects by enhancing channel activity and increasing the number of surface receptors, respectively. **Conclusions:** Diazepam and insulin partially mitigated a *de novo* GABRA1 (R214C) mutation's effects on GABA receptor number and function. Given the risks of insulin use, pharmacological agents with similar mechanisms of action but fewer side effects, such as IGF-1, should be studied and considered for clinical application.

P.017

Results of a Pilot feasibility study to develop reduce wait times strategy in the evaluation of children with new onset epilepsy

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doi: 10.1017/cjn.2018.119

Background: The goal was to understand factors leading to prolonged wait times for neurological assessment of children with new onset seizures. A second objective was to develop an innovative approach to patient flow through and achieve a reduction in waiting times utilizing limited resources.

Methods:

1. Audit of the referrals, flow through, wait times
2. Identification of bottlenecks
3. Development of triaging strategy:
   i. Suspected Febrile seizures and non-epileptic events;
   ii. Suspected benign and absence epilepsies;
   iii. Suspected other Focal epilepsies, generalized epilepsies, epilepsy under 2 years
4. Initiation of early telephone contact and support
5. Development of a ketogenic diet

Results: Using a triaging strategy and focusing on timely access to investigations, wait times for clinic evaluations were shortened despite larger numbers of referrals (mean wait time reductions from 179 to 91 days). Limiting factors such increase in referral numbers, attrition in support staff, interfered with sustainability of reduced wait times achieved in the initial phase of the program. **Conclusions:** This pilot study highlights the effectiveness of an innovative triaging strategy and improvements in patient flow through in achieving the goals of reduction in wait times for clinical evaluation and timely investigations to improve care for children with new onset seizures. Insights into limitations of such strategies and factors determining sustainability are discussed.

P.018

Forced normalization after vagal nerve stimulation in a case of intractable Lennox-Gastaut syndrome

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doi: 10.1017/cjn.2018.120

Background: Forced normalization is the development of psychiatric symptoms in a patient experiencing remission of intractable seizures. The mechanism of this phenomenon is unknown. We present a complex case of Lennox Gastaut syndrome that experiences forced normalization after vagus nerve stimulation (VNS). **Methods:** This case details a 31-year-old male with seizures since early childhood. The patient has intractable epilepsy and failed AEDs, VNS, and a partial callosotomy. **Results:** The patient was in remission from 2-12 years old, when seizures returned at a frequency of 2-5 per day. He has multiple types of seizures including drop attacks, absences, and tonic-clonic seizures. Patient experienced status epilepticus multiple times. Twelve AEDs were failed before VNS was started in 2010, which helped curb the severity of seizures and the potential for clusters. Forced normalization developed over the course of treatment with VNS. The patient behavior was characterized by aggression, paranoia, and hallucinations. VNS was turned off late in 2010 and then re-started in January of 2011. Patient proceeded to cycle between several days of seizures without psychiatric symptoms and several days of psychosis without seizures. **Conclusions:** Vagus nerve stimulation gave way to forced normalization, characterized here as aggressive behaviour and psychosis. Forced normalization is seen commonly after epilepsy surgery, but rarely following VNS.

P.020

Novel GRIN2A variant in family members with variable phenotypic expression of epilepsy

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doi: 10.1017/cjn.2018.122

Background: Epilepsy aphasia spectrum of disorders is characterized by developmental and language regression with EEG abnormalities that include electrical status epilepticus of sleep (ESES). Landau-Kleffner syndrome (LKS) and epileptic encephalopathy with continuous spike-wave during sleep (CSWS) are the most severe presentations. GRIN2A mutations have been recognized as causative. **Methods:** we present two sisters with different epilepsy phenotypes. A variant of unknown clinical significance (VUS) in GRIN2A gene was found in one of the sisters and her similarly affected father. **Results:** The first sister presented with focal onset seizures at the age of 3 years accompanied by language and cognitive regression and EEG features consistent of ESES, meeting criteria for LKS. Multiple anticonvulsants were tried until she responded well to steroids regaining developmental milestones. Her 5-year-old sister recently presented with focal onset seizures. Her language development is appropriate. Her EEG showed independent multifocal spikes but no ESES during sleep. Her seizures were controlled on monotherapy anticonvulsants. **Conclusions:** We observed a variable EEG-clinical phenotype and different severity among these family members as

expected with GRIN2A-related disorders. This report contributes to evidence of the GRIN2A variant pathogenicity.

P.021

Childhood small vessel primary angiitis of the CNS: a potentially treatable cause of super-refractory status epilepticus

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doi: 10.1017/cjn.2018.123

Background: Childhood primary angiitis of the central nervous system (cPACNS) is a rare inflammatory disease of brain vessels. The small vessel subtype is diagnosed on brain biopsy and often presents with cognitive and behavioural changes, headaches and seizures. However, there are few reported cases of super-refractory status epilepticus. **Methods:** We present a case of small vessel cPACNS complicated by super-refractory status epilepticus and review the literature. **Results:** Our patient is a previously healthy 11-year-old boy who presented with new-onset seizures and encephalopathy in the context of fever. He developed super-refractory status epilepticus, requiring burst suppression for four weeks with various IV infusions. During this time, he was on the ketogenic diet and tried eight anti-seizure medications. Extensive investigations included brain biopsy confirming small vessel cPACNS. He was treated with IV methylprednisolone, oral steroids, IVIG, and cyclophosphamide. After prolonged rehabilitation, he recovered almost completely and has a normal neurological examination with no epileptiform activity on EEG. **Conclusions:** Small vessel cPACNS should be considered in the differential diagnosis of super-refractory status epilepticus. Despite being in SE for four weeks, symptomatic management of seizures and immunosuppression to treat the underlying pathology resulted in favourable neurological outcomes. This is one of the longest cases of SE in small vessel cPACNS in the literature.

Functional Neurosurgery and Pain

P.022

Hemifacial Spasm due to dolichoectatic vertebrobasilar artery compression

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doi: 10.1017/cjn.2018.124

Background: Hemifacial Spasm (HFS) is rarely caused by a dolichoectatic vertebrobasilar artery (eVB) compression of the Facial Nerve. This can pose a surgical challenge when performing microvascular decompression as vessel mobilization is often difficult due to atherosclerosis, tethering from brainstem perforators, and large size. These patients are often not considered for surgery. **Methods:** A retrospective chart review of patients who were surgically treated by the senior author between 2003 and 2017 with an admitting diagnosis of HFS was performed. Patients with preoperative neuroimaging demonstrating eVB compression of their facial nerve/root were included. **Results:** During the 15-year review, 315 patients underwent microvascular decompression for HFS and 21 (6.7%) had dolichoectactic vertebrobasilar compressions. At final followup (>3 months) 19 patients (90.4%) experienced reduction in symptoms with 15 (71.4%) having complete resolution. One patient required re-operation and benefitted from subsequent symptom relief. The majority of culprit compression was found proximally on the pontine surface. Mobilization of the culprit vessel was achieved successfully in the majority of cases with Teflon pledgets. There were no perioperative strokes or death. Complications are presented **Conclusions:** Microvascular Decompression for Hemifacial Spasm caused by dolichoectatic vertebrobasilar artery compression can be performed with a high rate of safety and success in the setting of a high case volume centre.

P.023

Clinical and patient satisfaction outcomes after partial sensory rhizotomy for refractory trigeminal neuralgia among MS patients

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doi: 10.1017/cjn.2018.125

Background: MS related trigeminal neuralgia (MS-TN) is associated with high recurrence and retreatment rates. Optimal treatment and role for partial sensory rhizotomy (PSR) for MS-TN remains to be determined. **Methods:** We analyzed time to treatment failure (TTF) after PSR (n=14) versus other prior procedures (n=53) among 12 consecutively treated MS-TN patients. Kaplan-Meier curves and Log-Rank tests were utilized to compare BNI pain scores and TTF after PSR vs prior procedures using the same patient cohort as their own control group. Subsequent analysis compared TTF after PSR to other procedures (n=93) among a second cohort of 18 MS-TN patients not undergoing PSR. **Results:** TTF was significantly longer after PSR compared to prior procedures among the PSR cohort ($p<0.0001$) with median TTF of 79 vs 10 months respectively. Similarly, there was a longer TTF after PSR compared to prior procedures among the MS-TN cohort with median TTF 79 vs 16 months respectively ($p<0.001$). PSR resulted in a higher proportion of excellent pain scores when compared to prior procedures in the MS-TN cohort (77% vs 29%, $p<0.001$). **Conclusions:** TTF was significantly longer following partial sensory rhizotomy compared to other prior procedures in MS-TN patients. A higher proportion of patients achieved excellent BNI pain scores after PSR.

HEADACHE

P.024

Educational needs in migraine care: results from a mixed-methods study among Canadian primary care providers and specialists

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doi: 10.1017/cjn.2018.126

Background: Migraines are sub-optimally treated, affect millions of Canadians, and are underrepresented in medical training. A study was conducted to identify the needs of Canadian Healthcare Providers (HCPs) for migraine education, with the aim to inform the development of learning activities. **Methods:** This ethics-approved study was deployed in two consecutive phases using a mixed-methods approach. Phase 1 (qualitative) explored the causes of challenges to migraine care via a literature review, input from an expert working group, and semi-structured interviews with multiple stakeholders. Phase 2 (quantitative) validated these causes using an online survey. **Results:** The study included 103 participants (28 in phase 1; 75 in phase 2): general practitioners=37; neurologists=24; nurses=14; pharmacists=20; administrators, policy influencers and payers=8. Four areas of sub-optimal knowledge were identified: (1) Canadian guidelines, (2) diagnostic criteria, (3) preventive treatment, and (4) non-pharmacological therapies. Attitudinal issues related to the management of migraine patients were also identified. Detailed data including the frequencies of knowledge gaps among general practitioners and general neurologists will be presented along with qualitative findings. **Conclusions:** Educational activities for general practitioners and general neurologists who treat patients with migraines should be designed to address the four educational needs described in this study.

This study was financially supported with education research funds from TEVA Canada.

P.025

Is this headache normal?: Assessing electronic referrals for headache from primary care physicians

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doi: 10.1017/cjn.2018.127

Background: Headache is one of the most frequent complaints in primary care. We reviewed headache questions submitted to an electronic consultation service in Ontario to classify the types of headaches and describe the questions being asked. We also identified reasons why answers were not retrievable within UpToDate, an online clinical resource . **Methods:** 65 headache eConsults were further divided into 85 questions and categorized by headache type and question theme. Questions were manually searched within UpToDate to determine if they could be answered using this resource. The intent to refer the patient for a face-to-face referral after the eConsult was collected. **Results:** The top classifications were migraine, unclassified headache, and exertional and/or coital headache. The themes identified were medication questions (41.7%), investigation questions (33.3%), clinical concerns despite normal neurologic exam and/or imaging (15.5%); and abnormal imaging findings (9.5%). Answers to 40.1% of the questions were not retrievable in UpToDate. The main reason for irretrievability was an unusual presentation. Only 33.8% of eConsults resulted in a face-to-face referral to a specialist. **Conclusions:** Although electronic resources may be useful in some cases, clinical nuances cannot be accounted for. By providing physicians with rapid access to specialists, eConsult services may obviate the need for formal, face-to-face referrals.

P.144

Health care utilization by patients seen at a tertiary headache clinic

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doi: 10.1017/cjn.2018.85

Background: Multidisciplinary treatment programs benefit headache patients. No evidence exists as to whether they change resource use.

A historical prospective cohort study was performed to compare the frequency of ambulatory care and emergency department visits for the purposes of headache by patients seen at the Calgary Headache Assessment and Management Program (CHAMP) in the three years before, and after, their first appointment. **Methods:** Administrative data from Alberta Health was used. All patients seen by a physician at CHAMP from 2003-2013 were included. Sample characteristics were described and the Wilcoxan signed rank sum test was used to compare the number of ambulatory care and emergency department visits in the three years before and after each patient's first physician appointment at CHAMP. Follow-up visits at CHAMP were excluded from analyses. **Results:** The median number of ambulatory care visits over three years changed from 4 to 2 ($p < 0.001$). The median number of emergency department visits was zero before and after assessment at CHAMP. The mean number of emergency department visits changed from 1.5 to 1.2 ($p < 0.0001$). **Conclusions:** Enrollment in a multidisciplinary headache program reduces the number of ambulatory care visits and emergency department visits for purposes of headache.

MS / NEUROINFLAMMATORY DISEASE

P.026

Rare association in childhood vasculitis: unique case of pituitary involvement in a child with GPA

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doi: 10.1017/cjn.2018.128

Background: Granulomatosis with polyangitis (GPA) is a rare systemic vasculitis with a prevalence of 0.6 per million in the pediatric population. CNS involvement occurs in 7-18% of cases. Pituitary involvement is only noted in 1% of cases. **Methods:** A 16-year-old

girl with newly-diagnosed GPA presented to our hospital with progressive debilitating headaches, polyuria, and polydipsia. **Results:** Initial MRI showed changes to the pituitary. Lumbar puncture (LP) revealed opening pressure of 26. She developed central diabetes insipidus (DI) and visual changes. Repeat head imaging showed adenohypophysitis. The GPA was previously treated with steroids and cyclophosphamide, followed by Cellcept. Once the pituitary involvement was discovered, she was given re-induction therapy with Rituximab and steroid dose was increased. DI is being treated with DDAVP. Her headaches are improving. **Conclusions:** CNS inflammatory diseases are rare in childhood. Pituitary involvement is extremely rare in GPA. Induction therapy for adults with GPA and pituitary involvement includes glucocorticoids and cyclophosphamide, which often leads to improvement of MRI abnormalities but is not effective in resolving pituitary dysfunction. Our patient had already received this treatment when she developed the CNS findings. This case demonstrates that cerebral involvement is often resistant to classic therapy, and one should be vigilant in looking for CNS inflammation in these patients.

P.027

Efficacy of a fourth alemtuzumab course in RRMS patients from CARE-MS II who experienced disease activity after three prior courses

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doi: 10.1017/cjn.2018.129

Background: In RRMS patients with inadequate response to prior therapy, 2 alemtuzumab courses (12 mg/day; baseline: 5 days; 12 months later: 3 days) significantly improved outcomes versus SC IFNB-1a over 2 years (CARE-MS II [NCT00548405]). Efficacy remained durable in a 4-year extension (NCT00930553); patients could receive as-needed alemtuzumab retreatment (≥12 months apart) for disease activity, or another disease-modifying therapy (DMT). Through Year 6, 88% remained on study; 50% received neither alemtuzumab retreatment nor another DMT; 16% received ≥4 courses; 3% received ≥5 courses. We evaluated Course 4 (C4) efficacy in patients receiving ≥4 courses. **Methods:** Annualized relapse rate (ARR); improved/stable Expanded Disability Status Scale (EDSS) score (versus baseline); 6-month confirmed disability improvement (CDI). 11% of patients met inclusion criteria: ≥4 courses within 60 months of baseline; no DMT. Those receiving C5 were censored at that time. **Results:** ARR decreased after C4 (12 months pre-C4 [-12M]: 0.75; 12 months post-C4 [+12M]: 0.19; $P<0.0001$), remaining low (0.23) at Year 3 post-C4. More patients had stable/improved EDSS scores +12M (67.5%) versus at C4 administration (53.5%). Percentage with CDI increased post-C4 (-12M: 10.0%; +12M: 26.7%). **Conclusions:** C4 reduced relapses and stabilized/improved disability in patients with disease activity after initial treatment (C1, C2) plus one additional course (C3).

P.028

Each revision of the McDonald diagnostic criteria for multiple sclerosis allow earlier diagnosis in more patients

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doi: 10.1017/cjn.2018.130

Background: The 2005, 2010, and 2017 McDonald diagnostic criteria for multiple sclerosis (MS) were compared at baseline in participants of a Canadian multicentre clinical trial of minocycline in clinically isolated syndrome (CIS). **Methods:** The cohort included 142 participants. Baseline clinical and imaging data were used to determine if participants met criteria for dissemination in space (DIS) and time (DIT) as required for each version of the criteria. We also explored the impact of permitting a clinical diagnosis of transverse myelitis to represent a spinal cord lesion, and for multifocal clinical onset to represent DIS. **Results:** The clinical trial excluded patients meeting the 2005 McDonald criteria at baseline. The 2010 criteria were met by 28.9% (41/142) of participants. If a multifocal clinical presentation was considered evidence of DIS 29.6% (42/142) met the 2010 criteria. The 2017 criteria were met by 36.7% (52/142). Allowing a clinical diagnosis of transverse myelitis to confirm a spinal lesion, or multifocal onset to confirm evidence of DIS, led to a diagnosis in 38% (54/142) and 38.7% (55/142), respectively. **Conclusions:** This study confirms that each revision of the McDonald diagnostic criteria allowed an MS diagnosis in more CIS patients at onset. Exploration of other modifications suggests further improvement may be possible.

P.029

Case report: pediatric enterovirus encephalitis - a rare complication of rituximab therapy

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doi: 10.1017/cjn.2018.131

Background: Opportunistic infection should be considered when seeing neurological complications in the setting of immunosuppression. Accumulating evidence that enteroviral meningoencephalitis can occur after rituximab administration exists but differentiating it from non-infectious conditions can be challenging. **Methods:** Case report **Results:** We describe a 4 year-old-boy with a history of pulmonary capillaritis, treated with immunosuppressive therapy including steroids, rituximab, and azathioprine. He developed mutism and ataxia after 18 months on rituximab. MRI Brain/Spine revealed extensive T2/FLAIR hyperintensities in the deep subcortical white matter, temporal lobes, globus pallidi, thalami, brainstem, and cerebellum; and swelling of the dorsal cervical cord, showing primarily grey matter involvement. IgG levels had a decreasing trend over the course of Rituximab. CSF, and subsequent brain biopsy, were both positive for enterovirus RNA by RT-PCR. He was thought to have enterovirus encephalitis secondary to rituximab therapy, and was treated with IVIG and fluoxetine. **Conclusions:** One should consider chronic opportunistic CNS infections in children treated with immunosuppressive therapy, and to consider chronic enterovirus infection when B-cell suppression has occurred. As rituximab is being increasingly used in the pediatric population, and is generally

thought to be safe, attention should be paid to any child with chronic neurological signs, particularly younger children who may be at higher risk for chronic enterovirus infection.

P.030

Clinical findings, immunotherapy and neuroimaging results in Pediatric Anti-NMDA Receptor Encephalitis

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doi: 10.1017/cjn.2018.132

Background: Anti-NMDAR Encephalitis is an autoimmune disease of children and adults which most often presents with subacute psychiatric disturbance or seizures, but includes a broad group of potential clinical manifestations. Routine neuroimaging, such as cerebral MRI, is often nonspecific or normal. **Methods:** This study reports a series of retrospectively reviewed pediatric patients with AntiNMDAR encephalitis with emphasis on the evolution of clinical features over time, cerebral MRI, 18-FDG Positron emission tomography (PET) findings, and post illness neurocognitive features. **Results:** Four cases of Antibody confirmed AntiNMDAR encephalitis were included, two male and two female, of a mean of 13 years of age. Patients had a mean of three symptom categories by presentation, though many of these were subtle, progressing to 6.5 by the end of the first month. MRI, CSF and EEG were abnormal for one, three and all patients, respectively. All patients had abnormal cerebral PET scans, and all displayed some temporal lobe hypermetabolism on either initial or repeat cerebral PET Scan. **Conclusions:** Anti-NMDAR encephalitis is a variable disorder with an evolving clinical presentation in children. Temporal hypermetabolism on cerebral PET may be a time dependent feature of the disorder.

P.031

A qualitative study of patient perspectives regarding the role of the neurologist in advanced Multiple Sclerosis

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doi: 10.1017/cjn.2018.133

Background: With few evidence-based disease-modifying therapies being available for patients with progressive multiple sclerosis (PMS), how can neurologists best care for their patients? Little is known about the perspectives of patients with respect to the role they would like their neurologist to play in their care. We hereby report an update to our abstract presented at the Canadian Neurological Sciences Federation's annual congress in 2016. **Methods:** Patients with PMS having an Expanded Disability Status Scale (EDSS) score of 6 or more were invited to participate. Semi-structured interviews were conducted with patients and their caregivers, and written questionnaires were completed by all participants. Collected data was subjected to thematic coding. **Results:** We have now interviewed a total of 18 patients (compared to 10 in 2016) and have reached thematic saturation. The majority of patients identified the neurologist as a useful figure in their care. Three main reasons were identified: (1) The neurologist provides information about new research and therapies (2) The neurologist educates patients about their disease and available services (3) The neurologist is viewed as an important supportive figure. **Conclusions:** Despite a lack of disease-modifying treatments for progressive multiple sclerosis, patients with PMS view the neurologist as an essential provider of care.

Neuro-oncology

P.032

Cavernous sinus masses: An unusual case and review of the literature

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doi: 10.1017/cjn.2018.134

Background: We present a 67-year-old male with a two-week history of progressive double vision. Past medical history included oropharyngeal SCC, T4N2cM0, post-CCRT, and remote sarcoidosis. Clinically, the patient had multiple cranial nerve palsies affecting bilateral occular motor function. Neuroimaging showed an enhancing mass involving the sella and cavernous sinuses. Whole-body PET showed FDG-avid lesions in the sella and liver. Transsphenoidal biopsy of the sellar mass was obtained for tissue diagnosis. **Methods:** Details of the case were obtained from the patient's EMR. Neuroimaging and neuropathology were reviewed with the appropriate subspecialists. A literature search was performed using multiple databases (PubMed, Web-of-Science) and relevant articles were included for review. **Results:** Sellar mass biopsy confirmed p16+ve SCC, identical to the patient's known primary malignancy. On review of enhanced skull-base images, there was no evidence of direct tumor extension, favouring hematogenous spread. **Conclusions:** This case demonstrates the localizing potential of cavernous sinus masses. SCC metastases to the cavernous sinus are rare, and confer a poor prognosis.The presence of a p16 mutation has public health implications, as this mutation demonstrates more frequent and aggressive distant metastatic potential, and as a surrogate marker for high-risk HPV infection, represents a preventable risk-factor for a rapidly increasing cause of head and neck cancer in the Western world.

P.033

Biopsy versus subtotal versus gross total resection in patients with low-grade glioma: a systematic review and meta-analysis

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doi: 10.1017/cjn.2018.135

Background: The role of extent of surgical resection (EOR) on clinical outcomes in patients with low-grade glioma requires further examination. **Methods:** We systematically searched MEDLINE, Embase, and the Cochrane Library for studies published between January 1, 1990 and January 5, 2018 on predefined patient outcomes regarding different EOR of low-grade glioma. **Results:** Our literature search yielded 60 studies including 13,289 patients. Pooled estimates of overall survival showed an increase from 3.79 years (95% CI, 2.37–5.22) in the biopsy group to 6.68 years (95% CI, 4.19–9.16) in

STR to 10.65 years (95% CI, 6.78–14.52) in GTR. When compared to STR, GTR prolonged progression-free survival by 2.08 years (95% CI, 0.26–3.89; P=0.025). Pooled estimates of seizure control showed an improvement from 47.8% (95% CI, 26.7–69.6) with biopsy to 54.2% (95% CI, 48.7–59.6) with STR to 81.0% (95% CI, 74.6–86.2) with GTR. Compared to STR, GTR delayed malignant transformation (RR, 0.43; 95% CI, 0.20–0.93; P=0.032), without increasing postoperative mortality (RR, 0.38; 95% CI, 0.07–1.97; P=0.250) or morbidity (RR, 1.22; 95% CI, 0.65–2.28; P=0.540). **Conclusions:** Among patients with low grade gliomas, higher degrees of safe EOR, were associated with longer overall and progression-free survival, better seizure control, and delayed malignant transformation, without increased mortality or morbidity.

P.034

Supratentorial lateral ventricle hemangioblastoma in Von Hippel Lindau

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doi: 10.1017/cjn.2018.136

Background: Supratentorial ventricular hemangioblastoma (HB) associated with Von Hippel Lindau (VHL) are extremely rare. Due to their vascularity and location, their management can be difficult. **Methods:** A 35 year old female with VHL, has been followed for 25 years with multiple intracranial and spinal tumours. Surgical removal was carried out on one large cystic and solid posterior fossa lesion. In addition, she underwent adrenalectomy for pheochromocytoma. There were no pancreatic or renal lesions. On serial follow up for years, a left frontal ventricular lesion showed increasing size with clinical signs of increased ICP and marked hydrocephalus, requiring shunting procedures, which were carried out 11 years ago. She has been clinically stable since. **Results:** Hemangioblastomas of the CNS are rare and account for 2% of primary CNS tumours. Supratentorial location is estimated at 4% for sporadic and 13% for HB associated with VHL. The lateral ventricular location is extremely rare. Review of the literature revealed a total of 9 cases of supratentorial ventricular location. The majority of the lesions are associated with VHL and they are solid and vascular lesions. In our cases there was a cystic component. **Conclusions:** If removal is contemplated, angiography with possible preoperative embolization may be required.

P.035

Peritumoral brain edema in meningiomas: correlation with surgical findings and prognosis

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doi: 10.1017/cjn.2018.137

Background: Peritumoral brain edema(PTBE) in meningiomas had been a subject of interest; its occurrence in an extra-axial tumor was the reason of many studies and published data.Our study was made to evaluate the exact implication of Peritumoral brain edema in meningiomas in intraoperative and short postoperative prognosis. **Methods:** During 2006 to 2011,45 patients with supratentorial meningiomas were studied.Intraoperatively,certain findings were reported including: easy or difficult resection,Simpson's grade of removal,brain tumor interface,plane of cleavage, pial vascularization of the tumor and arachnoid disruption.Morbidity and mortality were recorded;also postoperative CT and/or MRI were obtained within the first 3 months. **Results:** There were 26 meningiomas (57.7%) with peritumoral edema and 19 meningiomas without (42.3%).Pial vascularization of the tumor was defined in 24 patients (53.3%),four patients(21%) had a pial blood supply in edema negative group compared to 20 patients (76.9%) in edema positive group. In this study, there was one case mortality (2.2%) in edema positive group.As regard morbidity, eight (30.6%) patients in edema positive group suffered an early postoperative morbidity this is in comparison to four patients(21%) in the edema negative group. **Conclusions:** Our study shows that PTBE in meningiomas affects the surgical prognosis and confers a higher risk of morbidity and postoperative complications. Preoperative management of PTBE and immediate post-operative monitoring are important.

P.036

Securing the nasoseptal flap in endoscopic transsphenoidal surgery: no Foley catheter needed!

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doi: 10.1017/cjn.2018.138

Background: The nasoseptal flap, commonly used in endoscopic transsphenoidal surgical, is typically held in position for several days post-operatively by a nasal Foley catheter balloon. The purpose of this study is to describe our experience with an alternative technique to buttress the nasoseptal flap that renders the use of a Foley catheter unnecessary. **Methods:** A review of our Halifax Neuropituitary Program's database identified patients who underwent endoscopic transsphenoidal surgery for a pituitary macroadenoma with nasoseptal flap, secured with small rolls of Gelfoam™ rather than a nasal Foley catheter. Minimum follow-up clinical and MRI assessments: 3 months. **Results:** 69 patients (mean follow-up: 22 months) met the inclusion criteria: 53 non-functioning and 16 functioning pituitary adenomas. 36 patients had an intraoperative CSF leak: 29 high flow and 7 low flow leaks. 35 patients were repaired by a fat +/- fascia graft. One patient had a post-operative CSF leak repaired by subsequent surgery without the use of a Foley catheter. **Conclusions:** In our experience, 1 of the 69 (1.4%) patients required post-operative CSF leak repair, well within the incidence of 1 to 3% reported in the literature. Securing the nasoseptal flap can be achieved without the use of a nasal Foley catheter.

P.037

Disseminated leptomeningeal hemangioblastoma in a case of Von Hippel Lindau

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doi: 10.1017/cjn.2018.139

Background: Leptomeningeal dissemination of hemangioblastomas (HB), whether sporadic or associated with Von Hippel Lindau (VHL), are extremely rare. Very scanty literature is available. **Methods:** A 36 year old female with VHL and stable pancreatic, adrenal

and renal lesions was operated upon 4 years ago for a large symptomatic cervicomedullary cystic and solid tumor. 2 years after surgery the tumour recurred and further removal was unsuccessful due to medullary adhesions. Radiation was given to the posterior fossa area and to several small nodules over the cauda equina resulting in severe pain. Serial follow up imaging revealed diffuse leptomeningeal dissemination increasing in size of the suprasellar region, ambient cistern and Sylvian fissures. Clinically, she has been stable with small dose of steroids and VP shunt insertion for papilledema. **Results:** Review of the literature consists of 2 series of 7 and 21 patients each with leptomeningeal dissemination involving sporadic HB and VHL associated HB. Leptomeningeal dissemination is estimated at about 4.3%. It is postulated that the tumour starts in the Pia and spreads in an extra medullary fashion throughout the subarachnoid spaces. **Conclusions:** Long term recurrence has been noted raising the question of aggressive treatment with some drug therapy related to angiogenesis is postulated.

P.038

Investigating the role of long non-coding RNAs in glioblastoma multiforme

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doi: 10.1017/cjn.2018.140

Background: Malignant gliomas are the most common and deadly brain tumors. Mean survival rate for a patient diagnosed with a glioblastoma multiforme (GBM) remains slightly over one year. Standard of care consists of treatment with temozolomide (TMZ) and radiotherapy. Recent work has highlighted functions of long non-coding RNAs (lncRNAs) in GBM progression and TMZ response even though the information regarding these newly discovered molecules is sparse. The overarching objective of this project was thus to assess the expression of select lncRNAs in GBM tumor samples and in models of TMZ resistance. **Methods:** A qRT-PCR-based approach was undertaken to measure six lncRNAs in 19 primary GBM samples, four GBM cell lines and in-house developed TMZ-resistant GBM cells. **Results:** Elevated levels of Hotair and H19 were observed in primary GBM tumors while decreased expression of MEG3 was recorded in the same samples. Interestingly, levels of PANDA increased 3.4-fold in GBM cells resistant to TMZ when compared with their sensitive counterparts. **Conclusions:** Overall, this work provides evidence of lncRNA deregulation in GBM tumors and reveals a previously unexplored lncRNA potentially involved in TMZ resistance. Modulation of lncRNA targets via RNAi-mediated approaches is envisioned to clarify their function and to strengthen their position as therapeutic options in GBMs.

P.039

In-hospital endocrinology consultation in post-operative pituitary surgery: is it necessary?

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doi: 10.1017/cjn.2018.141

Background: In-hospital Endocrinology consultation (IHEC) following transsphenoidal surgery is often routine but may be unnecessary, lead to excessive blood testing, and prolong in-hospital stay. Purpose of this study: to determine whether the necessity of IHEC can be predicted by a standardized operative assessment tool. **Methods:** Retrospective review of all transsphenoidal surgeries from January 1, 2016, when we instituted an operative assessment tool to identify patients for which IHEC is required. Minimum follow-up: 3 months. **Results:** 78 patients (42 male; mean age: 57 yrs); the assessment tool identified 17 patients (22%) for IHEC and accurately identified those who would not require IHEC. IHEC patients had longer hospital stay (8.3 vs. 2.9 days), higher rate of new post-operative hormonal deficit (17.6% vs. 0%) and higher 30-day readmission rates (35% vs. 16%). Less than 10% had transient symptoms attributable to steroids; there were no long-term complications from routine post-operative steroid administration. **Conclusions:** Use of our operative assessment tool shows that at least three quarters of pituitary surgery patients can be managed safely without IHEC. Our data indicate that identifying these patients may reduce in-hospital stay and costs with no evidence of compromise of hormone-related care.

P.040

New-onset secondary hormone deficiency in patients with incidental versus clinically manifesting sellar masses

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doi: 10.1017/cjn.2018.142

Background: Secondary hormonal deficiency (SHD) in patients with sellar masses (SM) is associated with significant morbidity. Purpose: to compare long-term risk of new-onset SHD in SM found incidentally (ISM) versus those clinically manifesting (CMSM). **Methods:** From the Halifax Neuropituitary Program's database, we identified all patients having non-functioning and non-pituitary SM from January 1, 2006, with $\geq$ 12 months follow-up. **Results:** There were 214 CMSM (108 with baseline SHD) and 148 ISM (37 with baseline SHD) patients (mean follow-up: 5.7 and 5.0 years, respectively). In patients who underwent early surgery (<90 days from diagnosis), 3-month post-op hormonal function was considered baseline. Despite unchanged tumour size in over 95%, 129 (35.6%) developed new-onset SHD at up to 120 months. The risk of developing new-onset SHD was similar in CMSM and ISM groups (HR = 1.10; CI= 0.69-1.75; p= 0.7), and in surgical and non-surgical patients (HR=1.24; CI= 0.59-2.61; p = 0.58). **Conclusions:** More than one third of patients with non-functioning or non-pituitary SM, presenting either with clinical manifestations or as incidental lesions, will develop new-onset SHD. Furthermore, SHD may develop several years later and despite stability of tumors, highlighting the need for ongoing, long-term hormonal assessment.

P.042

Raloxifene sensitizes glioblastoma cells to hypoxia-induced death through inhibition of stress granule dissolution

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doi: 10.1017/cjn.2018.144

Background: Glioblastoma (GBM) is the most common primary malignant brain tumour. Despite aggressive therapy, median survival is only 14 months. Death typically results from treatment failure and local recurrence. The GBM microenvironment is highly hypoxic, which correlates with treatment resistance. Cytoplasmic RNA stress granules (SGs) form in response to hypoxic stress and act as sights of mRNA triage, allowing preferential translation of pro-survival mRNA during stress. We hypothesize that SGs may play a role in hypoxia-induced resistance to therapy, and may be targetable by chemotherapeutics to improve outcomes. **Methods:** We screened 1280 approved compounds to identify drugs that inhibited formation or dissolution of SGs in U251 glioma cells. Raloxifene inhibited SG dissolution in a dose dependent manner. We treated cells with raloxifene and incubated them in hypoxia, and then measured rates of cell death using cell counting and Presto blue. **Results:** Cell death rates were synergistically higher in cells treated with the combination of raloxifene and hypoxia compared to either treatment alone. **Conclusions:** Raloxifene inhibits the dissolution of SGs in glioma cells, and combination treatment results in synergistic tumour cell death. Taken together, this provides evidence that inhibition of SG dissolution may be a viable target for future GBM chemotherapeutics.

P.043

Volumetric analysis of low-grade glioma growth in serially-imaged patients

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doi: 10.1017/cjn.2018.145

Background: Diffuse low-grade gliomas (LGGs) are infiltrative, slow-growing primary brain tumors that remain relatively asymptomatic for long periods of time before progressing to aggressive high-grade gliomas. **Methods:** We retrospectively identified LGG patients that were stably managed by observation with numerous ($\geq$ 8) serial magnetic resonance imaging (MRI) studies. Tumour volumes were measured by manual segmentation on imaging to study the growth of the lesion. Patient demographic information, tumour characteristics, and histological data were collected from electronic medical records. **Results:** Of 74 LGG patients, 10 (13.5%) patients were included in the study. The number of MRIs acquired ranged from 8 to 18 (median, 11) over a median of 79.7 months (range, 39.8-113.8 months). Tumor diameter increased at a median rate of 2.17 mm/year in a linear trajectory. Cox regression analysis revealed that initial tumour volume predicted time to clinical intervention, and Mann-Whitney *U* test found that patients diagnosed prior to age 50 had significantly slower-growing tumors. Clinical intervention was more likely for tumours larger than 73.8 mL. **Conclusions:** We retrospectively analyzed the natural history of LGGs in patients with numerous serial MRIs managed at a single institution. Comparisons to the literature suggest that this is a subset of particularly slow-growing and low-risk tumours.

P.044

Salvage therapy in recurrent pediatric medulloblastoma: A single centre experience

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doi: 10.1017/cjn.2018.146

Background: Children diagnosed with medulloblastoma (MB) that are refractory to upfront therapy or experience recurrence have very poor prognoses. Reports of phase I and II studies for these children exist, but bear significant treatment related morbidity and mortality. **Methods:** A retrospective review of children diagnosed with a pediatric MB from 2002-2015 from the McMaster Pediatric Brain Tumour Study Group (PBTSG) captured a number of pediatric recurrent MB. **Results:** Over the 13-year period, 31 children with a histological diagnosis of MB were treated. At two years, 21 (67.7%) of 31 patients were free of recurrence and 25 (80.6%) survived. Thirteen children had recurrent or treatment refractory MB. mean time to recurrence was 14.6 months. The mean follow-up for survivors of recurrent MB was 4.0 years. In 3 recurrent MB, the disease had significantly progressed and the patients palliated. For the remaining children, therapy offered included surgery, radiation, and chemotherapy agents either in isolation or in varying combinations. **Conclusions:** Recurrent MB in our cohort carried a poor prognosis despite administration of salvage therapy. Though there is standardization of the upfront treatment exists, we observed great heterogeneity in the treatment of our 13 patients experiencing recurrence. A greater understanding of the biology of recurrent MB has the potential to guide salvage therapy.

P.046

Flow cytometry in cerebrospinal fluid: utility in the diagnosis of central nervous system lymphoma

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doi: 10.1017/cjn.2018.148

Background: Flow cytometry in the cerebrospinal fluid (CSF) is used as an adjunct to cytology to increase the sensitivity of detecting central nervous system (CNS) lymphoma. We aim to evaluate CSF flow cytometry as a diagnostic tool for lymphoma in patients presenting with undifferentiated neurologic symptoms. **Methods:** We retrospectively reviewed all CSF flow cytometry samples sent in the Calgary region from 2012-2015. Clinical data, laboratory investigations, radiologic imaging studies, and pathological data were analyzed. Clinical review extended to 2 years post CSF flow cytometric testing. **Results:** The number of samples of CSF flow cytometry that were positive for a hematological malignancy was 43/763 (5.6%). The overall sensitivity of the test was 72.9%. A positive result was more likely to occur in patients with a prior history of a hematological

malignancy or abnormal enhancement on MRI (p<0.0001). In fact, CSF flow cytometry was negative in all patients who did not have a previous hematological malignancy or abnormal enhancement on MRI (n = 247). **Conclusions:** CSF flow cytometry has very limited role in the screening for primary CNS lymphoma, unless a strictly endorsed testing algorithm is applied. It is, however, an invaluable tool in assessing CNS involvement in patients with previous diagnosis of hematolymphoid malignancy.

P.047

IDH mutations are associated with pro-inflammatory microglia and macrophages in heterogeneously infiltrated glioblastomas

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doi: 10.1017/cjn.2018.149

Background: CNS innate immune cells, microglia and macrophages (MMs), are the largest component of the inflammatory infiltrate in glioblastoma (GBM). They initially participate in tumor surveillance, but are co-opted by GBM to further angiogenesis and invasion. There are no effective immunotherapies against GBM in part because GBM-associated MMs are not well understood. We hypothesized that the extent and inflammatory phenotype of MM infiltration into GBM is variable between patients. This variability could have important implications on immunotherapy selection and treatment outcomes. **Methods:** Using automated quantitation of fluorescently labeled human GBMs, flow cytometry/live cell sorting, collection of conditioned GBM-associated MM media, and corroboration with TCGA and previously published scRNA-seq data, we have uncovered there is surprisingly marked variation in the amount of MM infiltration between tumors. **Results:** MM infiltration can range from almost non-existent, to comprising ~70% of GBM cells. By detecting cell surface markers and secreted cytokines, we determined that a mixture of pro- and anti-inflammatory MMs are found in each tumor. The overall inflammatory phenotype did not depend on the amount of infiltration. Interestingly, IDH-mutant GBM-associated MMs are more pro-inflammatory and less heterogeneous than IDH-wildtype GBMs. **Conclusions:** Taken together, the highly variable immunologic status of GBMs suggests the success of immunotherapies hinges on selecting appropriately vulnerable tumors.

P.048

Correlation of preoperative serum lactate, MR spectroscopy and frozen tissue lactate levels as a biomarker for giomas – a prospective clinical study

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doi: 10.1017/cjn.2018.150

Background: Lactate, a by-product of glycolysis, has been well established as a marker of poor tissue perfusion. Elevated lactate production is observed in tumor glycolysis known as the Warburg effect. We have previously shown that serum lactate correlated with brain tumor grade. In this prospective study we aimed to determine if the preoperative serum lactate correlated with preoperative MR spectroscopy and in lactate levels in the fresh frozen tissue samples. **Methods:** Twenty-one glioma patients (13 male, 8 female) ages 34 – 86 underwent craniotomy at a single institution by lead author. Tumor pathology revealed a Glioblastoma (n=16), grade II (oligodendroglioma n=1) and Grade III Glioma (anaplastic astrocytoma n=4). Preoperative spectroscopy was performed on 18 patients. A fellowship trained neuro-radiologist (JPC) was blinded to the serum and tissue lactate levels and graded the spectroscopy lactate levels as low or elevated. **Results:** There was direct correlation of spectroscopy tissue lactate levels with serum lactate levels. Pre-operative serum lactate (range 6.6- 29.9 mg/dl) was directly correlated with the fresh frozen tissue lactate levels (range 0.1 – 0.39 ug/mg; Pearson r=0.6 p = 0.0021). **Conclusions:** This study supports that serum lactate correlates with spectroscopy and tissue lactate levels.

P.049

Repeat surgery in recurrent glioblastoma: a systematic review and meta-analysis

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doi: 10.1017/cjn.2018.151

Background: Recurrent glioblastoma portends a poor prognosis and the role of repeat surgery in improving survival remains uncertain. Our systematic review and meta-analysis aims to address whether re-resection provides a meaningful survival benefit and to what degree. **Methods:** Articles were collected from Pubmed, CINAHL, EMBASE, Medline and Cochrane from January 1990 to 2018. Studies in the temozolomide era with both single surgery and re-resection cohorts were included. Primary outcomes were odds ratio for survival at 6, 12, and 24 months following re-resection and initial surgery. **Results:** Fourteen articles were included for analysis (3048 patients). Meta-analysis showed improved overall survival following re-resection at 6- (OR 1.73, 95% CI 1.23-2.45, p<0.05), 12- (OR 1.71, 95% CI 1.20-2.45, p<0.05), and 24-months (OR 2.24, 95% CI 1.01-4.95, p<0.05). Overall survival from diagnosis or first surgery was also improved in patients who underwent re-resection at recurrence, similarly at 6- (OR 8.22, 95% CI 5.23-12.93, p<0.01), 12- (OR 4.16, 95% CI 3.25-5.36, p<0.01), and 24- (2.35, 95% CI 1.77-3.11, p<0.05) months. Subgroup analyses were done for patients stratified by age, performance status, and number of re-resections. **Conclusions:** Repeat surgery for recurrent glioblastoma is associated with a significant survival advantage independent of other salvage therapies that include chemotherapy, radiation, and other antineoplastic regimens.

P.050

NICO-assisted neuroendoscopic management of enlarging subependymal giant cell astrocytoma in tuberous sclerosis complex: a case report

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doi: 10.1017/cjn.2018.152

Background: Tuberous sclerosis complex (TSC) is an autosomal dominant neurocutaneous syndrome classically associated with mental disability, seizure disorder and adenoma sebaceum, among other anomalies. One of the major causes of mortality and

morbidity in adults is the exclusive occurrence of subependymal giant cell astrocytoma (SEGA) which responds in at least 35% of cases to everolimus, mTOR inhibitor. However, drug treatment is associated with 33% rate of adverse events and requires long-term treatment **Methods:** In this report, we present a case of 49-year old female with TSC and a left enlarging SEGA that was approached endoscopically in order to minimize morbidity associated with open surgical approaches. **Results:** The use of NICO Myriad system is described in this case to achieve successful tumor debulking without post-operative neurologic morbidity. **Conclusions:** This report reveals the value of minimally invasive neuroendoscopic techniques in the management of challenging intraventricular tumors while avoiding injury to crucial deep venous structures.

P.051

5-hydroxymethylcytosine profiling identifies differential targeting in IDH1 mutant versus IDH1 wild-type high-grade gliomas

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doi: 10.1017/cjn.2018.153

Background: Gliomas demonstrate epigenetic dysregulation highlighted by the Glioma CpG-Island Methylator Phenotype (G-CIMP) seen in *IDH1* mutant tumors. *IDH1* mutation perturbs the balance between 5-methylcytosine (5mC) and 5-hydroxymethylcytosine (5hmC) by inhibiting TET-mediated active demethylation. The role 5hmC plays in *IDH1* mutant tumors remains poorly understood. **Methods:** We profiled 5hmC in high grade *IDH1* mutant (n = 12) and wild-type (n = 9) tumors on the Illumina MethylationEPIC Beadchip. We examined regions with high 5hmC abundance (top 1% probes), and differentially hydroxymethylated regions (DHMR). 5hmC profiles were correlated with gene expression. **Results:** Mean 5hmC b-values were 4.6%% and 3.8% for *IDH1* mutant and wild-type tumors, respectively. Top 1% and DHMR probes demonstrated *increased* 5hmC among *IDH1* mutants. 5hmC enriched for enhancer and super-enhancers. Among G-CIMP target genes, 22/50 were hydroxymethylated in our *IDH1* mutant cohort, suggesting that 5hmC contributes to their overall methylation. Gene expression was associated with gene body 5hmC. 48 genes differentially expressed between *IDH1* cohorts showed a positive Spearman correlation between 5hmC and gene expression, in particular for genes upregulated in *IDH1* mutants. **Conclusions:** Locus-specific gain of 5hmC, targeting regulatory regions and associated with over-expressed genes, suggests a significant role for 5hmC in *IDH1* mutant HGG.

P.052

Case Report: Brentuximab associated toxic neuropathy

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doi: 10.1017/cjn.2018.154

Background: A 28 year old male with a previous diagnosis of Ewing's Sarcoma in 2008, and a revised diagnosis to Hodgkin's lymphoma in 2016, presented to the Neurology service 6 months after starting the novel monoclonal antibody, Brentuximab. Concurrent therapy included adriamycin, vincristine and daunorubicin. He was referred for progressive weakness and sensory symptoms starting in the legs and spreading to the arms over 6 months. **Methods:** Examination demonstrated distal symmetric weakness with power of 3 proximally and distally in the lower extremities. Reflexes were absent at the ankles and severely reduced at the patella. Gait was consistent with a sensory ataxia, and there was pseudoathetosis of the left hand. **Results:** MRI demonstrated no relevant abnormalities. Electrophysiology was consistent with a motor predominant, distal symmetric sensorimotor axonal neuropathy. **Conclusions:** A review of the literature demonstrated that the monoclonal antibody brentuximab has a high incidence (48%; n = 89) of a reversible distal symmetric polyneuropathy. The mechanism likely relates to microtubule dysfunction by the conjugated compound monomethyl auristatin E. This case adds to the existing body of literature around a severe but potentially reversible neuropathy, resulting from the new monoclonal antibody brentuximab, which may also serve as a model of disease in neuropathy with a well elucidated mechanism of toxicity.

P.053

Expanded endoscopic endonasal approach for petrous apex lesions: our clinical experience and surgical techniques

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doi: 10.1017/cjn.2018.155

Background: Traditionally petrous apex lesions surgical approach is associated with multiple complications including brain injury secondary to brain retraction. Expanded endoscopic endonasal trans-clival (EEET) can be used in selected patients with minimal complications. **Methods:** We are presenting our experience over the last three years in patients who underwent EEET resection of petrous apex lesions: 8 patients underwent such procedure. All patients underwent extensive workup including MRI and CTA to identify the relation of the carotid to the lesion. All surgeries were done with neuro-physiological monitoring. Intraoperative neuronavigation and endoscopic Doppler were used to identify the petrous segment of the internal carotid artery. Our follow up ranged from 6 months to 2.5 years. **Results:** All patients presented with severe neurologic symptoms related to either fifth cranial nerve, sixth cranial nerve or brain stem compression. Pathologies included chondrosarcoma, cholesterol granulomas and lymphangioma. All patients demonstrated improvement in their symptoms. None of our patients had intraoperative vascular injury. There was no post-operative CSF leak or infection. Postoperative imaging demonstrated excellent resection with no clear residual. Three patient required adjuvant stereotactic radiosurgery because of their underlying pathology. **Conclusions:** The expanded endoscopic endonasal approach for petrous apex lesion should be considered as a minimally invasive approach in selected cases.

P.054

Clinical characteristics and outcomes of patients treated for acromegaly at The Ottawa Hospital

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doi: 10.1017/cjn.2018.156

Background: Acromegaly is associated with significant morbidity. The purpose of this study was to establish characteristics and outcomes of patients treated for acromegaly at The Ottawa Hospital, to compare our results with published reports from other centers and to identify opportunities to improve patient care. **Methods:** A retrospective chart review of patients surgically and medically treated for acromegaly between January 1, 2007 and December 31, 2016 was completed. Demographic information, biochemical data, presenting features, disease comorbidities, treatment interventions, and were collected. **Results:** Fifty-one patients were identified using CCI/ICD-10 codes and IGF-1 levels. Similar to other centers, the majority of patients had a macroadenoma (78.4% vs 11.8%) with a high percentage invading the cavernous sinus (57.5%). While surgical intervention was performed in 90% of patients, only 23.3% of patient achieved surgical cure (IGF-1 normalization within reference range). Approximately 30% of patients were controlled with adjuvant medical therapy while more than 40 % had elevated IGF-1 levels at last follow-up. Radiotherapy was less commonly used. **Conclusions:** Despite a multi-modal treatment approach for acromegaly, outcomes are variable. This study highlights the need for further research to better understand factors associated with surgical cure, response to medical therapy and the role of radiotherapy.

P.055

Epidemiologic features of pituitary adenoma patients requiring surgical treatment: large North American patient population based study

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doi: 10.1017/cjn.2018.157

Background: The surgical treatment of pituitary adenoma has evolved greatly over the decades. In order to better understand the patient population and their surgical treatment, we conducted an institutional review for pituitary adenoma surgery using the endoscopic endonasal trans-sphenoidal (EETS) approach. **Methods:** A retrospective review of all EETS cases for pituitary tumor resection was performed between November 2009 and June 2016. Patient characteristics, tumor type, endocrine data, operation characteristics were extracted from medical records. Preoperative MRI images were reviewed. The SIPAP classification was applied to the pituitary tumors. Postoperative patient data were extracted for the available follow-up period. **Results:** 232 cases were identified. Functional tumors were present in 29% of the cohort. Complete excision was most common for functioning tumors (49%) compared to nonfunctioning tumors (26%). There were no major vascular injuries. Hormone replacement with cortisol was required transiently in 70% of patients, with thyroid hormone replacement occurring in 40% of the cohort. **Conclusions:** From this large North American cohort nearly 30% of operated pituitary tumors were functioning. More commonly, these tumors were completely resected compared to the nonfunctioning group. The most commonly replaced hormone following EETS surgery was cortisol and this was largely transient.

P.056

Predictability of pituitary tumor resection and recurrence following endoscopic endonasal trans-sphenoidal surgery

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doi: 10.1017/cjn.2018.158

Background: The surgical treatment of pituitary tumour has undergone substantial changes over time. In this study we evaluated our institutional results for pituitary tumour surgery using the endoscopic endonasal trans-sphenoidal (EETS) approach. **Methods:** Patient demographic, clinical and surgical data were extracted from medical records. Preoperative MRI images were reviewed. The SIPAP classification was applied to the pituitary tumors. Chi2 test and t test were used for statistical analysis. **Results:** 202 cases were identified. Functional tumors were present in 29% of the cohort. Patients with a suprasellar or parasellar SIPAP score of 0 or 1 had complete resection of their tumor in 66.6% of cases, compared to 29% with a suprasellar or parasellar SIPAP score $\geq$ 2 (Risk Ratio 2.3 CI 1.58-3.39, p=0.0005). When the tumor was completely resected radiologically, the mean time to recurrence was not different for the SIPAP 0 or 1 group which was 27 months in comparison to 34 months for the group with a SIPAP score 2 (p=0.13). **Conclusions:** Our study results showed that the preoperative MRI SIPAP score can be used to better inform patients about their expected outcomes of EETS.

P.057

A systematic review of the prophylactic antibiotic use in endoscopic endonasal transsphenoidal surgery for pituitary lesions

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doi: 10.1017/cjn.2018.159

Background: The benefit of prophylactic antibiotic use in endoscopic endonasal transsphenoidal surgery (EETS) for pituitary lesions is controversial. Many surgeons administer antibiotics perioperatively not based on clear guidelines but “to be safe”. **Methods:** A systematic review using PRISMA guidelines was performed to assess the efficacy of perioperative antibiotic use to prevent infectious complications in patients undergoing EETS. Inclusion criteria: randomized controlled trials, systematic reviews, observational studies, and case series. Data extracted: study design, year of publication, sample size, surgery type, perioperative antibacterial treatment (antibiotic, dose, and duration), number of patients with 30-days post-operative meningitis and/or sinusitis. End points: rates of meningitis and sinusitis post-EETS. **Results:** A total of 280 articles were identified. Four observational studies met inclusion criteria. Based on GRADE score these studies were considered low in quality. 633 patients were

included in those studies. The most common antibiotics used were cefazolin and ceftazidime. The rate of infection ranged from 0.5% to 3.1 % for meningitis as the most common infection. **Conclusions:** The need to use antibiotic(s) perioperatively is not clear in patients with pituitary lesions undergoing EETS. Randomized control trials are needed to evaluate the efficacy of prophylactic antibiotic use in patients with pituitary lesions undergoing EETS.

Neurocritical care

P.058

Introduction of continuous video EEG monitoring into two different NICU models by training neonatal nurses

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doi: 10.1017/cjn.2018.160

Background: Continuous video-EEG (cvEEG) monitoring is the standard of care for diagnosis and management of neonatal seizures. However, it is labour-intensive. We aimed to establish consistency in monitoring of newborns utilising NICU nurses. **Methods:** Neonatal nurses were trained to apply scalp electrodes, troubleshoot technical issues. Guidelines, checklists and visual training modules were developed. A central network system allowed remote access to the cvEEGs by the epileptologist for timely interpretation and feedback. We compared 100 infants with moderate to severe HIE before and after the training program. **Results:** 192 cvEEGs were performed. Of the 100 infants compared; time to initiate brain monitoring decreased by average of 31.5 hours, in electrographic seizure detection increased(20% compared to 34% a), seizure clinical misdiagnosis decreased (65% compared to 36%), and Anti-Seizure burden decreased. **Conclusions:** Training experienced NICU nurses to set-up, start and monitor cvEEG can decrease the time to initiate cvEEG which may lead to better seizure diagnosis and management.

P.059

A systematically conducted review of the Full Outline of UnResponsiveness (FOUR) score and its use in outcome prediction

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doi: 10.1017/cjn.2018.161

Background: Our goal was to perform a scoping systematic review of the literature on the application of the FOUR score within critically ill patients. **Methods:** 6 databases were searched. Two reviewers independently screened the results. Inclusion and exclusion criteria were applied to each article to obtain final articles for review. **Results:** The initial search yielded 1709 citations. Of those used, 49 were based on adult and 6 on pediatric populations. All but 8 retrospective adult studies were performed prospectively. Patient categories included traumatic brain injury, intraventricular hemorrhage, intracerebral hemorrhage, subarachnoid hemorrhage, ischemic stroke, general/combined neurology and neurosurgery, post-cardiac arrest, medicine/general critical illness, and patients in the emergency department. A total of 9092 adult patients were studied. 14 studies demonstrated good inter-observer reliability of the FOUR score. 9 studies demonstrated prognostic value of the FOUR score in predicting mortality and functional outcomes. 31 studies demonstrated equivalency or superiority of the FOUR score compared to GCS in prediction of mortality and functional outcomes. Similar results were seen for the pediatric population. **Conclusions:** The FOUR score has been shown to be a useful outcome predictor in many patients with depressed level of consciousness. It displays good inter-rater reliability among physicians and nurses.

P.060

Utility analysis of continuous video EEG (cvEEG) monitoring during the treatment of hypoxic ischemic encephalopathy (HIE) in the NICU

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doi: 10.1017/cjn.2018.162

Background: Therapeutic hypothermia (TH) improves the outcome in HIE but cvEEG is vital to detect any seizures that occur. Unfortunately, the costs associated with cvEEG can make it impractical. We studied outcomes in TH with the objective of optimizing the length of cvEEG required. **Methods:** Term infants with HIE were treated with 72 h of TH followed by 6 h of rewarming. cvEEG reports were quantified (background, sharp transients, seizures) and compared with pre and post-cooling variables to determine whether risk stratification was possible. **Results:** 25/78 infants had seizures during the TH, however, most seizures occurred early, with 7 infants seizing prior to cooling and 15 having their first seizure within 24h. Only 3 infants had their first seizure between 24-48h and none were recorded after. Novel seizures after 24h were brief and did not require treatment. EEG variables such as frequent sharp transients and first seizures within 24h were correlated with MRI abnormalities. **Conclusions:** For the majority of infants undergoing TH, 24h of cvEEG may be sufficient with few infants requiring longer than 48h. A combination of clinical variables (abnormal neurological exam) and EEG traits (frequency of discharges, seizures) can help to decide on the likelihood of seizures and length of EEG recording needed.

P.061

Reliability of EEG reactivity in assessement of comatose patients under standardized protocol

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doi: 10.1017/cjn.2018.163

Background: Electroencephalography (EEG) is a routine clinical tool that is used to evaluate thalamocortical function in comatose patients. The presence or absence of reactivity in background EEG patterns to afferent stimuli is believed to be an important indicator of clinical outcome. At present, there are no guidelines or standardized testing protocols for the assessment of EEG reactivity in critically ill patients. Moreover, the inter-rater reliability of subjectively identifying

presence or absence of reactivity is known to be poor. **Methods:** Here we report the implementation of a clinical protocol formalizing the use of afferent stimuli – name-calling, clapping, nasal tickle, central painful stimuli and tracheal suction – administered during the routine EEG evaluation of behaviourally unresponsive patients in the critical care units at London Health Sciences Centre. EEGs were evaluated by qualified electroencephalographers. **Results:** This retrospective observational study of consecutive patients describes the inter-rater reliability of detecting presence or absence of EEG reactivity since implementation of the clinical protocol. Moreover it evaluates the relationship between EEG reactivity and clinical outcome to determine its reliability as a prognostic tool. **Conclusions:** The implementation of clinical protocols to standardize testing parameters may improve the ability to provide a reliable neurologic prognosis for critically ill patients in a comatose and behaviourally unresponsive state.

NEUROIMAGING

P.062

MR Venography predicts increased intracranial hypertension in children with hydrocephalus

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doi: 10.1017/cjn.2018.164

Background: We investigated whether the presence of dural sinus narrowing is a more reliable marker of intracranial hypertension / shunt failure in children than the imaging finding of hydrocephalus. **Methods:** Cranial MRIs of n=12 children were included when being well and when there was definitive intracranial hypertension as per follow-up and intraoperative results (gold standard). Images werde assessed for hydrocephalus on T2w images and narrowing of dural sinuses on MR vengraphy (diameter of <50%). **Results:** Dural sinuses narrowing was detected with a sensitivity of 0.67, a specificity of 1.0, PPV of 1.0 and NPV of 0.75 (Table 1). Hydrocephalus was detected with a sensitivity of 0.5, a specificity of 0.83, PPV of 0.75 and NPV of 0.63. Results differed between the test methods (p = 0.01, Cochrane Q test). **Conclusions:** Dural sinus narrowing more reliably predicted intracranial hypertension, a sign which might significantly improve care in critically ill children.

Patient #	Age at MRI	Shuntfailure as per clinical follow-up (Goldstandard)	Hydro cephalus	Dural Sinus Narrowing
	Years	1 = yes 2 = no	1 = yes 2 = no	1 = yes 2 = no
1	1	1	1	0
	4	0	0	0
2	6	1	1	1
	6	0	0	0
3	12	1	0	1
	12	0	0	0
4	18	1	0	1
	19	0	0	0
5	0	1	1	0
	1	0	1	0
6	0	0	1	0
	0	1	1	0
7	17	1	0	1
	17	0	0	0
8	10	1	1	1
	10	0	0	0
9	0	1	1	1
	1	0	0	0
10	8	1	0	1
	8	0	0	0
11	14	1	0	1
	14	0	0	0
12	18	1	0	0
	18	0	0	0

		Shuntfailure(Goldstandard)		
		Affected	Non-affected	total
Hydrocephalus	Positive	6	1	8
	Negative	6	10	16
		12	12	24

		Shuntfailure(Goldstandard)		
		Affected	Non-affected	total
Dural Sinus Narrowing	Positive	8	0	8
	Negative	4	12	16
		12	12	

P.063

Stereotactic targeting of hippocampal substructures using ultra-high field magnetic resonance imaging: Feasibility study in patients with epilepsy

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doi: 10.1017/cjn.2018.165

Background: The hippocampus can be divided longitudinally into the head, body, and tail; and unfolded medial-to-laterally into the subiculum, cornu ammonis (CA) sectors, and the dentate gyrus. Ultra-high field (≥ 7 Tesla; 7T) magnetic resonance imaging (MRI) enables submillimetric visualization of these hippocampal substructures which could be valuable for surgical targeting. Here, we assess the feasibility of using 7T MRI in conjunction with a novel computational unfolding method for image-based stereotactic targeting of hippocampal substructures. **Methods:** 53 patients with drug-resistant epilepsy were identified undergoing first-time implantation of the hippocampus. An image processing pipeline was created for computationally transforming post-operative electrode contact locations into our hippocampal coordinate system. **Results:** Of 178 implanted hippocampal electrodes (88 left; 49.4%), 25 (14.0%) were predominantly in the subiculum, 85 (47.8%) were in CA1, 23 (12.9%) were

in CA2, 18 (10.1%) were in CA3/CA4, and 27 (15.2%) were in dentate gyrus. Along the longitudinal axis, hippocampal electrodes were most commonly implanted in the body (92; 51.7%) followed by the head (86; 48.3%). **Conclusions:** 7T MRI enables high-resolution anatomical imaging on the submillimeter scale in *in vivo* subjects. Here, we demonstrate the utility of 7T imaging for identifying the relative location of SEEG electrode implantations within hippocampal substructures for the invasive investigation of epilepsy.

P.064

Preoperative mapping using fMRI and DTI: a multimodal approach to assessing language dominance

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doi: 10.1017/cjn.2018.166

Background: Language mapping is a key goal in neurosurgical planning. With the discontinuation of the Wada test in Canada, neurosurgeons often rely on fMRI and intraoperative techniques for determining language lateralization. Recent studies have also evaluated the utility of diffusion tensor imaging (DTI) for preoperative language lateralization, but further research is needed to confirm its efficacy. We report a patient with a left frontal AVM. fMRI and DTI was used to localize language and motor functioning. **Methods:** The tasks included word reading, picture naming, pseudohomophones (e.g., dawg) and semantic questions. All fMRI analyses were performed using BrainVoyager. Tensors were tracked from 30-direction diffusion MR images using DSI-Studio. **Results:** The fMRI results revealed consistent Broca's and Wernicke's areas, confirming left hemisphere dominance. There was also a region of activation in the precentral gyrus near the surgical resection. The results were loaded onto the neuronavigation system to help determine safe surgical margins. The DTI results revealed that the left arcuate and uncinate fasciculus had three times more tracts than the right hemisphere, further supporting left hemisphere dominance. **Conclusions:** This case highlights the value of a combined, multimodal approach for preoperative language localization, which will further enhance surgical safety by helping preserve regions for essential brain functions.

P.066

Cortical autonomic patterns in Neurogenic Orthostatic Hypotension

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doi: 10.1017/cjn.2018.168

Background: Neurogenic orthostatic hypotension (NOH), defined as a drop in systolic blood pressure (SBP) ≥30mmHg on standing or head-up tilt, is associated with autonomic dysfunction. The cortical autonomic network (CAN) is a network of brain regions associated with autonomic function. Our aim was to investigate CAN activation patterns in NOH patients during autonomic testing. **Methods:** Fifteen controls (61±14 years) and 13 NOH patients (68±6 years;p=0.1) completed: 1)Deep Breathing (DB), 2) Valsalva maneuver (VM) and 3)Lower-body negative pressure (LBNP) during a functional MRI. Blood-oxygen level dependent (BOLD) contrasts were obtained and contrasted. **Results:** Compared to controls (C), patients (NOH) had significantly smaller heart rate (HR) responses to DB (C:15.3±9.6 vs.NOH:6.0±2.2) and VR's (C:2.1±0.47 vs.NOH:1.2±0.1;p<0.001). Patients had larger SBP drops during LBNP (C: -22.3±6 vs.NOH: -61±22) with significantly smaller compensatory tachycardias (19±8.5 vs.7.6±4.3)(p<0.001). BOLD response: During VM, controls had greater activation in the right (R) hippocampus (T-value:7.34), left (L) posterior cingulate (T-value:7.22) bilateral mid-cingulate (TR-value:5.76; TL-value:6.84) and bilateral thalamus (TR-value:7.23, TL-value:8.16) (pFWE<0.001). Following subtraction analysis, brain activation patterns showed no significant differences in the regions of interest in response to DB and LBNP. **Conclusions:** During tests of autonomic function, NOH patient had different cortical activation patterns during VM only. Cortical activation pattern during DB and LBNP showed similar patterns to that of controls.

P.067

Phosphoserine aminotransferase (PSAT) deficiency: Imaging findings in a child with congenital microcephaly

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doi: 10.1017/cjn.2018.169

Background: Serine deficiency disorders can result from deficiency in one of three enzymes. Deficiency of the second enzyme in the serine biosynthesis pathway, 3-phosphoserine aminotransferase (PSAT), has been reported in two siblings when the eldest was investigated for acquired microcephaly, progressive spasticity and intractable epilepsy. **Methods:** Our patient had neurological symptoms apparent at birth. Fetal magnetic resonance imaging (MRI) at 35 weeks gestation demonstrated microencephaly and simplification of the the gyration (anterior>posterior) which was confirmed upon subsequent post-natal MRI. Congenital microcephaly was apparent at birth. **Results:** PSAT deficiency was confirmed when exome sequencing identified biallelic mutations in *PSAT1*; c.44C>T, p.Ala15Val and; c.432delA, p.Pro144fs and biochemical testing noted low plasma serine 22 mcmol/L (normal 83-212 mcmol/L) and low CSF serine 10 mcmol/L (normal 22-61 mcmol/L). Despite oral serine and glycine supplementation at 4 months old the patient showed little neurodevelopmental progress and developed epileptic spasms at 10 months old. Serological testing for TORCH infections was negative. **Conclusions:** PSAT deficiency should be considered for patients with congenital microcephaly. Although further characterization of MRI findings in other patients is required, microencephaly with simplified gyral pattern could provide imaging clues for this rare metabolic disorder.

P.068

Hippocampal volume may predict early non-response to surgery in Trigeminal Neuralgia

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doi: 10.1017/cjn.2018.170

Background: Surgical treatment of trigeminal neuralgia (TN) can be highly effective, but durability of pain relief varies and factors influencing surgical failure are poorly understood. We hypothesized that structural brain differences—assessed using magnetic resonance

imaging (MRI)—might distinguish surgical responders from early non-responders. **Methods:** We retrospectively identified 35 TN patients treated surgically from 2005-2017 with high-resolution, pre-operative MRI scans adequate for quantitative structural analysis. Patients were classified as *non-responders* if, within 12-months after surgery, they: 1) underwent or were offered another surgical procedure; or 2) reported persistent, inadequately-controlled pain. Volumes of pain-relevant subcortical structures (amygdala, thalamus, and hippocampus) were measured on T1-weighted MRI scans using an automated approach (FSL-FIRST). **Results:** Surgical responders had significantly larger hippocampi bilaterally compared to early non-responders. Thalamus and amygdala volumes did not differ between groups. **Conclusions:** Pre-operative differences in brain structure, notably in the hippocampus, may predict durability of response to surgery in patients with TN.

Table 1: Demographic and Clinical Characteristics of TN Patients:

	Responders	**Non-Responders**	**P-value (2-tailed)**
Outcome Group	23	12	N/A
Sex (Female/Male)	9/14	6/6	0.5591
Age, years	4.35 ± 11.36	53.75 ± 16.33	0.9111
Affected Side (Left/Right)	5/18	5/7	0.2630
# of Previous treatments	0.13 ± 0.34	1.42 ± 1.40	0.0105*
Surgery Performed (MVD/PRR)	21/2	10/2	0.9722
Volumetric Assessment:			
	Responders (mm3)	**Non-Responders (mm3)**	**P-value (2-tailed)**
Hippocampus:			
Ipsilateral	3440 ± 365	697 ± 318	0.0415*
Contralateral	3381 ± 375	3727 ± 215	0.0015*
Left	3357 ± 373	3669 ± 231	0.0046*
Right	3464 ± 361	3754 ± 301	0.0178*
* p<0.05			
MVD – microvascular decompression surgery PRR – percutaneous retrogasserian rhizotomy			
Values are mean +/- standard deviation where appropriate			

Neuromuscular Disease and EMG

P.069

Respiratory dysfunction and sleep disordered breathing in children with Myasthenia Gravis

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doi: 10.1017/cjn.2018.171

Background: Myasthenia Gravis (MG) is an autoimmune disease that affects the neuromuscular junction. It typically presents with fluctuating muscle weakness which can affect respiratory muscles. Data about the prevalence of sleep disordered breathing in children with MG and the benefits of non-invasive ventilation outside the setting of MG crisis has not been studied so far. **Methods:** Eleven children between 3 and 18 years old with confirmed MG were recruited from the The Hospital for Sick Children Neuromuscular clinic in a prospective observational study. Informed consent was obtained and patients underwent PFTs, MIP/MEP, SNIP, FVC and standard polysomnography testing's. **Results:** In our study, we found that 2/11 children had abnormal Apnea Hypopnea index (AHI) and were diagnosed with obstructive sleep apnea (OSA). One of them has juvenile ocular MG with mild to moderate OSA and the second child has congenital MG with mild OSA. CPAP therapy was initiated for both patients. **Conclusions:** In our cohort, obstructive sleep apnea rate was significantly higher in children with MG than the known prevalence in general pediatric population (18% vs 2-3%). Early diagnosis and management of OSA can have great impact on children's health and quality of life. A larger study is needed to validate our findings.

P.070

Autosomal dominant MARS mutation linked to severe early onset CMT2U

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doi: 10.1017/cjn.2018.172

Background: Methionyl-tRNA synthetase (MARS) links methionine to its cognate tRNA required for translation. MARS mutations have been linked to adult-onset CMT2U. **Methods:** The proband had weakness in her first year of life, sitting at 11 months and walking at 20 months old. At 4 years old she was areflexic with distal > proximal weakness. Nerve conduction studies showed normal median and sural sensory responses with absent common peroneal, low median and tibial motor amplitudes. EMG noted denervation and quadriceps biopsy revealed neurogenic atrophy. Genetic testing for spinal muscular atrophy and sequencing of *MNF2, RAB7A, LMNA, MPZ, HSPB1, NEFL, GADP1, TRPV4, HSPB8, GJB1* and *PLEK8G5* were negative. She stopped walking at 9 years old and could not raise her arms above her head at 11 years old. **Results:** Exome sequencing identified *MARS*: c.1189G>A; p.Ala397Thr. To determine the functional consequences of p.A397T-*MARS*, yeast complementation assays were performed. Wild type or mutant *MARS* were cloned into yeast lacking the endogenous *MARS* ortholog. Wild-type *MARS*

supported robust cellular growth, while the p.A397T-*MARS* insert did not support cellular growth confirming deleterious effect of this variant. **Conclusions:** Our patient's phenotype was similar to children with motor-predominant *GARS* mutations. Functional data notes this *MARS* variant to be damaging and predictive of a severe, early-onset phenotype.

P.071

Novel mutations in SPG7 identified from patients with late-onset spasticity

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doi: 10.1017/cjn.2018.173

Background: Hereditary spastic paraplegia (HSP) is a group of genetic diseases that cause progressive degeneration of the corticospinal tract. Historically, this disease was divided into two types:the classic subtype, with leg weakness and hypertonic bladder, and the complicated subtype, with features such as cerebellar ataxia or optic atrophy.Mutations in *SPG7 (*encoding paraplegin) leads to complicated HSP causing cerebellar ataxia, progressive external ophthalmoplegia in addition to the classical symptoms. AFG3L2 is a binding partner of paraplegin and mutations in *AFG3L2* cause a similar syndrome **Methods:** From a neurogenetic clinic , we identified 11 patients with late-onset HSP. Sequencing of *SPG7* and *AFG3L2* was performed using a customised assay, and/or clinical diagnostic sequencing panels.*SPG7* transcript level quantification was performed from whole blood RNA on a digital droplet qPCR system. **Results:** We identified 4 patients with pathogenic variants or variants of unknown significance in *SPG7*. No *AFG3L2* mutations were identified. We provide evidence for pathogenicity for three mutations that were not previously associated with SPG7-related disease, based on their occurrence in context of the correct phenotype, and the reduction of transcript levels measured with RT-qPCR.A curious association of the heterozygous p.Gly349Ser mutation in association with an ALS-like syndrome is reported. **Conclusions:** *SPG7* mutations sequencing has high diagnostic yield in late onset paraparesis

P.072

Agreement between children and their parents' ratings of the health-related quality of life of children with Duchenne Muscular Dystrophy

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doi: 10.1017/cjn.2018.174

Background: When measuring young Duchenne Muscular Dystrophy (DMD) patients' health-related quality of life (HRQoL), parent-proxy reports are heavily relied on. Therefore, it is imperative that the relationship between parent-proxy and child self-report HRQoL is understood. This study examined the level of agreement between children and their parent-proxy rating of the child's HRQoL. **Methods:** We used FOR-DMD clinical trial baseline data. HRQoL, measured using the PedsQL inventory, was reported by 178 parent and child (ages 4 to 7 years) dyads. Intracorrelation coefficients (ICC) measured absolute agreement while paired t-tests determined differences in the average HRQoL ratings between groups. **Results:** The level of agreement between child and parent-proxy ratings of HRQoL was poor for the generic PedsQL scale (ICC: 0.29) and its subscales; and, similarly low for the neuromuscular disease module (ICC:0.16). On average, parents rated their child's HRQoL as poorer than the children rated themselves in all scales except for psychosocial and school functioning. **Conclusions:** Child and parent-proxy HRQoL ratings are discordant in this study sample, as occurs in other chronic pediatric diseases. This should be taken into account when interpreting clinical and research HRQoL findings in this population. Future studies should examine reasons for parents' perception of poorer HRQoL than that reported by their children.

P.073

Cardiac dysfunction in mitochondrial disease: systematic review and metaanalysis

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doi: 10.1017/cjn.2018.175

Background: Cardiac dysfunction has significant impact on morbidity and mortality in patients with mitochondrial disorders. Cardiac screening tests are generally recommended because cardiac dysfunction can occur at any point in the disease course, and is amenable to treatment. However there is no clear evidence indicating the best screening strategy in patients with mitochondrial myopathy. **Methods:** Systematic review of the literature for cardiac investigations in adult patients with mitochondrial myopathy. We considered 1303 relevant abstracts, from which 58 full-length articles were reviewed. Seventeen articles including 701 total participants met inclusion criteria. Data extracted included age, diagnosis, and results from ECG, echocardiogram, cardiac MRI, nuclear medicine studies, and Holter monitor. **Results:** We identified echocardiogram and ECG as the principal screening modalities, that identify cardiac structural (26%) and conduction abnormalities (37%) in patients from various mitochondrial myopathy syndromes. Holter monitor was not a high yield investigation and limited studies were identified using cardiac MRI or nuclear medicine. **Conclusions:** We recommend screening with ECG and echocardiogram every 1-2 years in MERRF/MELAS, and every 3-5 years in milder syndromes when cardiac symptoms are not present. Only five of the included studies provided any follow-up data. We recommend studies of natural history, therapeutic response, and of cardiac MRI as areas for future study.

P.074

Clinical features of a family with distal myopathy and rimmed vacuoles due to a digenic interaction

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doi: 10.1017/cjn.2018.176

Background: The interaction between mutations in two or more genes is increasingly recognised as an important contributor to the phenotypic variability in genetic disorders. Co-occurrence of variants in SQSTM1 and TIA1 is reported as a cause of myopathy

in 3 prior cases, but limited clinical data were presented. We present detailed clinical features of a family with two siblings having a distal myopathy with rimmed vacuoles (DMRV), and genetic variants in SQSTM1 and TIA1. **Methods:** Clinicopathologic study of a family with DMRV to describe clinical features, laboratory and neurophysiology studies, neuroimaging, and genetic sequencing. **Results:** Two siblings with variants in SQSTM1 and TIA1 developed myopathy in their early 60's, with early involvement of ankle dorsiflexors and finger extensors. A decade after onset, patients remain ambulatory and have not developed cardiac or respiratory complications. MRI of the legs showed selective involvement of adductor magnus, vastus lateralis, and in lower legs the anterior compartment and medial gastrocnemius. Muscle pathology demonstrated rimmed vacuoles, disrupted myofibrillar architecture, and mislocalised TDP43. Two unaffected family members had one genetic variant but not both. **Conclusions:** We describe a fourth family with co-occurrence of TIA1 and SQSTM1 genetic variants and describe their detailed phenotype. Future study should address the mechanism of the interaction between these two variants.

P.075

Inflammatory Myositis associated with Myasthenia Gravis with and without thymic pathology: case series and literature review

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doi: 10.1017/cjn.2018.177

Background: The association of myasthenia gravis (MG) and inflammatory myositis (IM) is rare and often only one of the diseases is diagnosed. **Methods:** In this study, we reviewed medical records of patients seen at NMDU from 2004 to 2017 who had diagnosis of concurrent MG and IM. The data is presented descriptively. **Results:** We identified 7 patients with MG-IM overlap. Clinical features, laboratory and pathology data of the patients are summarized in Table 1. **Conclusions:** This is one of the largest case series with MG-IM overlap. It is very important to recognize such association and the different pattern of muscle involvement because therapies may be adjusted to treat both conditions. In patients with thymic pathology, conventional disease modifying agents, IVIG and glucocorticoid in addition to thymoma resection appear to be effective. In patients with refractory MG and myositis who were AChR negative, rituximab may be effective.

P.076

Safety of Eteplirsen, a phosphorodiamidate morpholino oligomer, in Duchenne Muscular Dystrophy patients amenable to Exon 51 skipping

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doi: 10.1017/cjn.2018.178

Background: Duchenne muscular dystrophy (DMD) is an X-linked disorder affecting 1:3500-5000 live male births, causing a life-limiting form of muscular dystrophy. Whole exon deletions disrupting the reading frame result in near-absence of sarcolemmal dystrophin, essential for muscle function. Eteplirsen is a phosphorodiamidate morpholino oligomer (PMO) designed to induce production of internally-truncated dystrophin in certain patients. **Methods:** As of June 2016, 150 patients (4-19 years of age) with DMD received eteplirsen in 7 clinical trials. 143 patients received ≥1 intravenous infusion of eteplirsen (range: 0.5 - 50 mg/kg). 81 (54%) received treatment for ≥1 year (Range: 1-4+ years). **Results:** Common (≥15%) adverse events (AEs) were cough, headache, vomiting, back pain, extremity pain, contusion, nasopharyngitis, upper respiratory tract infection, nasal congestion, arthralgia and rash. Non-serious facial flushing, erythema and mild transient temperature elevation occurred with eteplirsen. 10 (6.7%) patients experienced severe AEs; 12 (8%) patients experienced serious AEs. All serious and all but 1 severe AEs were considered unrelated to eteplirsen by the treating physicians. Serial echocardiograms in 12 treated patients demonstrated no functional decline over 4+ years. **Conclusions:** Eteplirsen's tolerability will continue to be assessed in ongoing clinical trials.

An updated data summary will be presented.

P.077

Utility of a next generation sequencing in the diagnosis of Congenital Myasthenic Syndromes

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doi: 10.1017/cjn.2018.179

Background: Congenital Myasthenic Syndromes (CMS) are heterogeneous disorders caused by genetically determined structural or functional differences in proteins involved with the neuromuscular junctions. Clinical and molecular genetics studies of CMS patients have revealed significant locus heterogeneity; there are 21 known genes related to CMS, but other genes may mimic the phenotype, justifying the use of a multi-gene panel for genetic testing **Methods:** Our group developed custom sequence capture probes designed to flank 27 different genes associated with CMS, including enrichment for all coding exons as well the flanking intronic regions. We enrolled 20 patients from the paediatric and adult neuromuscular clinic with a clinical phenotype of CMS. Using custom analytical, we assessed the sequence variants and exon-level CNVs for each patient. **Results:** Thirteen male and seven female patients with median age of 12.25 years (range 1.5-39y) were assessed. We identified missense and CNVs in 17 patients, including established pathogenic mutations confirming the diagnosis in 5 patients **Conclusions:** The use of Next Generation Sequence with CNV for CMS can help determine the underlying causes of most CMS disorders and allow appropriate medical treatment, refined genetic counseling, and improved understanding of prognosis, justifying the implementation in the standard clinical screening of CMS.

P.078

Health-related quality of life and fatigue in children with Duchenne muscular dystrophy: A three-year longitudinal study

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doi: 10.1017/cjn.2018.180

Background: Longitudinal data on health-related quality of life (HRQOL) and fatigue in paediatric Duchenne muscular dystrophy (DMD) are limited. Recently, fatigue was reported to be the greatest predictor of poor HRQOL in paediatric DMD. Understanding the trajectory of HRQOL and its relationship with fatigue may facilitate the development of improved therapeutic strategies. Our objective was to describe three-year changes in HRQOL and fatigue in children with DMD. **Methods:** Patients identified via the Canadian Neuromuscular Disease Registry received mailed questionnaires (2013–2016). HRQOL was assessed using the PedsQL™ GCS and NMM domains, and fatigue was assessed using the MFS domain (patient- and parent-report). Mean three-year change in scores were computed. Pearson correlations were computed between three-year change in HRQOL and fatigue. **Results:** Mean decline in MFS scores for patient- and parent-reports were 1.03 and 1.19, respectively. Mean decline in GCS scores for patient- and parent-report were 1.75 and 4.13, respectively. Mean change in NMM scores for patient- and parent-report were 0.72 and -8.36, respectively. Change in MFS score was associated with changes in GCS (r=0.72, p<0.001) and NMM scores (r=0.84, p<0.001) by patient-report. **Conclusions:** Children with DMD experience worse fatigue and HRQOL over time. Parents perceive a greater decline in HRQOL over time compared to patients.

Neuroscience education

P.079

Development of a performance model for virtual reality tumor resections

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doi: 10.1017/cjn.2018.181

Background: This work proposes a hypothetical model that integrates human factors (e.g. inherent ability and acquired expertise) and task factors (e.g. pre-procedural data, visual and haptic information) to better understand the hand ergonomics adaptation needed for optimal safety and efficiency during simulated brain tumor resections. **Methods:** Hand ergonomics of neurosurgeons, residents and medical students were assessed during simulated brain tumors resection on the NeuroVR virtual reality neurosurgical simulation platform. Spatial distribution of time expended, force applied, and tumor volume removed, and other metrics were analyzed in each tumor quadrant (Q1 to Q4). **Results:** Significant differences were observed between the most favorable hand ergonomics condition (Q2) and the unfavorable hand ergonomics condition (Q4). Neurosurgeons applied more total force, more mean force, and removed less tumor per unit of force applied in Q4. However, total volume removed was not significant between the two quadrants indicating hand ergonomics adaptation in order to maximize tumor removal. In comparison, hand ergonomics of medical students remained unchanged in all quadrants, indicating a learning phenomenon. **Conclusions:** Neurosurgeons are more capable of adapting their hand ergonomics during simulated brain tumor resections. Our proposed hypothetical model integrates our findings with the literature and highlights the importance of experience in the acquisition of adaptive hand ergonomics.

P.080

Neurosurgery Residency Program at the Faculty of Medicine, Universitas Gadjah Mada, Indonesia: a unique approach and strategy for an archipelago country

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doi: 10.1017/cjn.2018.182

Background: Indonesia is a vast archipelago country with over 17,000 islands. Many of the islands are in underdeveloped provinces with no neurosurgeon. Neurosurgery is often considered an expensive and sophisticated field to fund. Our neurosurgery department used the vision and mission of the medical faculty, which is "globally respected and locally rooted" to make a difference in many of the islands. **Methods:** Careful selection of provinces and candidates that involve local governments and hospitals within the province. This includes resident recruitment, planning and developing neurosurgical infrastructure in the province. Our program uses innovative neurosurgical techniques that are standardized to be applicable in underdeveloped areas. The residents are exposed to their province and hospital during the training. We optimize IT interaction, including teleconference, videoconference and telemedicine **Results:** At the fifth year of our program, we have sixteen residents from 8 underdeveloped provinces and have established MoU with 4 local hospitals around Indonesia. We have also sent residents to rural areas. We routinely participate in international teleconferences and videoconferences, including those with the Saskatchewan team. **Conclusions:** A well planned and structured neurosurgical program, with standardized processes and involvement of local officials, combined with extensive use of IT, is effective in preparing neurosurgeons who can provide quality care in underdeveloped regions.

P.081

Popularity of online multimedia educational resources in neurosurgery: Insights from The Neurosurgical Atlas project

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doi: 10.1017/cjn.2018.183

Background: *The Neurosurgical Atlas* is a neurosurgical website with informative chapters and videos to promote excellence and safety in neurosurgical techniques. Here, we present our analysis of this website's viewing data and describe how online neurosurgical resources are being utilized. We hope this will be a useful guide for neurosurgeons interested in online multimedia education. **Methods:** We analyzed Google Analytics data from *The Neurosurgical Atlas* between June 2016 and August 2017 which tracked

user demographics, geographical location, and the videos watched. Views were also analyzed categorically by dividing videos into six neurosurgical topics and into basic and advanced levels as per their surgical complexity. **Results:** There were 246,259 website visits and 143,868 video plays. The most frequent age groups were 25-34 (44%) and 35-44 (24%). 71% of visitors were male. Most visitors were from the US (29.52%) and Brazil (6.43%). Website visits and video plays increased over time, with multiple peaks corresponding to promotional email updates. The six neurosurgical topics were all similarly popular. **Conclusions:** Our study presents the first piece of evidence demonstrating the feasibility and popularity of a free online resource in neurosurgical education. Our experience highlights the growing demand for free-access online chapters, anatomical illustrations, and operative videos.

P.082

An evidence-based supportive and palliative care curriculum for Canadian neurology residents

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doi: 10.1017/cjn.2018.184

Background: Graduating residents require general palliative care skills. In Canada, there is no standardized palliative care curriculum for specialty trained residents. The objective of this research is to develop an evidence-based palliative care curriculum designed to provide neurology residents with the general palliative care skills required for providing patient care along the continuum of life. **Methods:** A needs assessment was performed in Neurology at Western University using qualitative analysis techniques. Residents completed the following:. A curricular outline was developed based on the Kolb learning style inventory (LSI), a knowledge pretest, the Palliative Medicine Comfort and Confidence Survey and a review of the literature. Two iterations of the curriculum have been developed. **Results:** Residents identified a need for additional training in supportive and palliative care skills. Based on the Kolb LSI, 9/16 (56.3%) of neurology residents are "accommodators". General principles identified for inclusion included: symptom management, communication, psychosocial aspects of care, care coordination and access, and myths and pitfalls in palliative care. **Conclusions:** This project is designed to identify the current palliative educational needs for Neurology residents. The results suggest that specialty trained residents are receptive to embedding training in the principles of palliative care within their training programs.

P.083

Effective video technology for teaching the neurological exam

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doi: 10.1017/cjn.2018.185

Background: With advancements in technology, the use of video as a pedagogical method in medical education has gained in popularity, and may aid in teaching clinical skills. In the UBC MD program, videos have been used to assist in teaching the neurological exam for several decades, but the currently available videos are outdated and not of contemporary quality. **Methods:** Drawing upon the cognitive theory of multimedia learning from Mayer and Moreno (2003) which describes methods to maximize learning by minimizing cognitive load, we developed a tool to systematically assess pedagogical videos. We inventoried twelve existing neurology videos and analyzed their use of methods such as weeding (removing extraneous information), signalling (visually highlighting important information), and chunking (grouping similar information together). **Results:** Generally, older videos had poor audiovisual quality that introduced extraneous load, while more current videos had higher production value, albeit inconsistent with the depth of their content. We therefore produced a new three-part neurological exam video series. We wrote storyboards, filmed with a focus on visually depicting the exam and findings, and edited to elucidate relevant physiological concepts. **Conclusions:** The end product has been adopted by the UBC MD program, and can be shared with other programs who may wish to adopt them.

P.085

Hot seat concept in neurosurgical exam simulation adopted by the Comprehensive Clinical Neurosurgery Review

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doi: 10.1017/cjn.2018.187

Background: Neurosurgical education is one of the most exciting topics in contemporary neurosurgery. Passing the final boards is a real challenge. **Methods:** We conducted a prospective study of 48 candidates who attended the hot-seat sessions during CCN review over three years. Detailed statistical analysis was conducted. Those who attended the Hot seats (Group 1) and those who didn't (Group 2). The neurosurgery exam simulation was conducted using both MCQ and Oral simulated exams with clinical cases led by world expert faculty in a lecture format for the MCQ and 15-minute mock oral sessions which was video-taped scoring candidates in a standardized fashion for their performance. **Results:** Group 1 had a better MCQ performance (83 %) compared to group 2 (61 %). Candidates were better in data gathering, differential diagnosis and management. They were worst in simulating surgical techniques and follow-up plans. Geographical characterization showed a big range of intra and inter variability in performances. Interestingly, candidates with excellent MCQ performance had moderate hot seat performance while those with moderate MCQ performance did much better during the hot seat session. **Conclusions:** Our preliminary results showed that simulation of board exams is a method that will help neurosurgery residents not only pass their board exams, but also achieve the best marks.

P.086

A randomized trial of a simple intervention to improve neurosurgery rotation experience for senior medical students

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doi: 10.1017/cjn.2018.188

Background: High volumes, ill patients, and steep learning curves can make neurosurgical rotations challenging for medical students. Furthermore, existing rotations often lack neurosurgery-specific orientation materials and level-appropriate pre-reading resources reducing the educational yield of short rotations. This is compounded by the lack of mandatory neurosurgical rotations across medical schools. We hypothesized that a "Neurosurgery Clerkship Manual" covering key orientation, knowledge, and practical topics would enhance educational experiences and generate sustained knowledge retention. **Methods:** Students rotating through neurosurgery at three hospitals were randomized to receive(intervention) or not receive(control) free access to the manual before their rotation. Participants completed surveys before, immediately after, and 4-weeks after the rotation assessing expectations, experiences, and clinically-relevant knowledge. **Results:** 61 participants were randomized between 2014 and 2017 with 43(70.5%) completing all three questionnaires. Baseline demographics, characteristics, and experiences were not significantly different. Those receiving the manual reported increased rotation enjoyment(p=0.02), decreased stress levels (p=0.05), and a greater feeling of being "part of the team"(p=0.01). There were also reductions in feeling like they were "not learning" (p=0.01). Finally, those receiving the manual demonstrated significantly better knowledge after the rotation (91.6%vs80.9%;p=0.04) which was sustained at 4-weeks post-rotation (89.2%vs79.0%;p=0.05). **Conclusions:** A simple and inexpensive clerkship manual can improve the neurosurgery rotation experience and knowledge retention for medical students.

NEUROTRAUMA

P.087

"Reported Brain Injury" Time trends within two Canadian health surveys over two decades

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doi: 10.1017/cjn.2018.189

Background: An "epidemic" of concussions has been widely reported. We explored the annual incidence of reported concussion or other brain injury, over 20 years within Canada in order to explore the magnitude of this reported epidemic. **Methods:** Two Canadian nationally representative health surveys have serially collected injury data associated with disability. The National Population Health Survey (NPHS) (1994-9) collected data on "concussion", and the Canadian Community Health Survey (CCHS) (2000-current) has collected data on "concussion or other brain injury". Data on respondents 12 years and older reporting concussion with or without other brain injury within the past year were examined in order to produce serial incidence data. **Results:** Nationally representative data were available biennially from 1994/95 through 2013/14 with the exception of 2007/08 and 2011/12. The incidence of reported concussions, or concussions and other brain injury has been stable until 2005/06 when the reported annual incidence started an upward slope to levels 250% higher ($p<0.001$) without any apparent stabilization by 2013/14, when approximately 1 in 200 Canadians 12 years and older report concussion or other brain injury as their most significant injury associated with disability in the previous 12 months. **Conclusions:** There is currently a pandemic of reported brain injury in Canada.

P.088

Antithrombotic agents and traumatic brain injury in the elderly population: hemorrhage patterns and outcomes

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doi: 10.1017/cjn.2018.190

Background: In the elderly population, use of antithrombotic therapy (AT), antiplatelets (AP – aspirin, clopidogrel) and/or anticoagulants (AC – warfarin, DoAC – Dabigatran, Rivaroxaban, Apixaban), to prevent thrombo-embolic events must be carefully weighed against the risk of intracranial hemorrhage (ICH) with trauma. We hypothesize that for all patients 65yro+ with head trauma, those on AT will be more likely to sustain a traumatic brain injury, ICH, and poorer outcomes. **Methods:** Data was collected from all head trauma patients 65yo+ presenting to our tertiary trauma center (level 1) over a 24-month period; age, gender, injury mechanism, medications, International Normalized Ratio, reversal therapy, Glasgow Coma Scale (GCS), ICH, surgery, Extended Glasgow Outcome Scale score (GOSE) and mortality. **Results:** 1365 patients were identified; 724 on AT (413 AP, 151 AC, 59 DoAC, 48 2AP, 38 AP+AC, 15 AP+DoAC) and 474 not (non-AT). When adjusted for covariates, AT patients were more likely to have ICH (p=0.0004), more invasive surgical interventions (p=0.0188), functional dependency ($GOSE \leq 4$; $p<0.0001$) and mortality ($p<0.0001$). Risk of mortality is notably high with 2AP (OR 5.74; p=0.0003) and AC+AP (OR 4.12; p=0.0118). **Conclusions:** Elderly trauma patients on AT, especially combination therapy, have higher risks of ICH and poorer outcomes compared to those who are not.

P.089

AMPA receptor modulation as a therapeutic strategy to enhance survival of spinal cord neural stem cells

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doi: 10.1017/cjn.2018.191

Background: Transplantation of neural stem/progenitor cells (NSPCs) following spinal cord injury (SCI) is a promising strategy to enhance regeneration but is limited by poor survival of grafted cells. Recently, we demonstrated for the first time that the excitatory neurotransmitter glutamate, which is released after SCI, promotes survival/proliferation of spinal cord NSPCs via the AMPA subtype of glutamate receptors. Here, we examine the therapeutic potential of selective AMPA receptor modulation on NSPC survival using allosteric AMPA receptor modulators known as ampakines. **Methods:**

NSPCs from the periventricular region of the adult rat spinal cord were treated with ampakines CX614 and CX546 for 72h either alone or in the presence of low-dose glutamate (50uM). **Results:** Treatment with CX-546 or CX-614 in the presence of glutamate led to a significant increase in live cell numbers. This was due to both a reduction in cell death and increase in cellular proliferation. Ampakine/glutamate treatment led to a significant increase in cell survival compared to controls in the setting of oxidative stress. **Conclusions:** We present the first examination of the effect of allosteric AMPA receptor modulators on adult spinal cord--derived NSPCs. Positive modulation of AMPA receptors may be a promising therapeutic strategy in the subacute/chronic phases after SCI to increase survival of endogenous or transplanted NSPCs.

Neurovascular, stroke and neurointerventional

P.090

Risk factors and etiology of stroke in young adults: a 6-years retrospective hospital-based study, OMAN

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doi: 10.1017/cjn.2018.192

Background: Stroke in the young is particularly tragic because of its potential for life time disability. Although a large number of studies have been published Worldwide. Very few have looked at etiologies in the youth of the Middle East,and none have focused on Oman. **Methods:** Retrospective,single center study,carried out at the Royal Hospital in Muscat. Chart review identifying all patients under 50 years of age admitted for acute stroke from 2009-2014. We analyzed the detailed history,examination and brain imaging (CT or MRI) for each case. We identified 588 young patients,163 of these were excluded due to other diagnosis or absence of neuroimaging (CT or MRI). **Results:** Out of the 425 stroke cases,67.3% were men. IS occurred in 69.6% compared to 30.4% for HS. Hypertension was the number one risk factor for both IS and HS,with a prevalence 50.7% and 60.5% respectively. DM was the second leading risk factor,with a prevalence of 32.1% in IS and 27.1% in HS. Underlying etiologies were identified in only 35.5% of cases in IS and 29.5% in HS.Cardiac etiology and vasculopathy were commonest for IS. Aneurysm was the main underlying etiology for HS. **Conclusions:** IS was more frequent than HS.Hypertension and DM were the leading risk factors for both stroke subtypes. Cardioembolism and vasculopathy were the main etiologies for IS.Cerebral aneurysm for HS.

P.091

Small unruptured intracranial aneurysms: the natural history in Saskatchewan

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doi: 10.1017/cjn.2018.193

Background: The natural history of small unruptured intracranial aneurysms (UIAs) <7mm is 0 to 1.3% per year. Our centre provides cerebrovascular care for the entire province allowing for long-term follow-up. We studied the safety of observation for aneurysms <7mm. **Methods:** We performed a retrospective chart review of patients with intracranial aneurysm referred to our centre between July 2008 and April 2015. Aneurysm characteristics and current status (followed, treated, not followed), were collected along with patient factors. Follow-up duration for each aneurysm was used to calculate total follow-up in aneurysm-years. Statistical evaluation consisted of multivariate analysis and logistic regression analysis. **Results:** 428 patients harbouring 497 aneurysms <7mm were identified. 67 presented with rupture. Of the remaining 430 aneurysms, there was a 9.3% treatment rate. 2 cases of rupture occurred in those patients who were followed, creating a 0.5% rupture rate. 325 aneurysms were followed for 631.3 total cumulative aneurysm-years, an average of 1.9 aneurysm-years. Smoking status and hypertension associated with presence of aneurysm ($p \approx 0.009, 0.026$, respectively). **Conclusions:** In our selected patient group there is a low yearly rate of aneurysm rupture, and observation of aneurysms <7mm is safe. Hypertension and smoking were associated with the development of aneurysm. 9.3% of patients were treated, likely leading to a reduced natural history risk.

P.092

Eagles and Talons: A case of cervical artery dissection from Eagle syndrome and fibromuscular dysplasia

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doi: 10.1017/cjn.2018.194

Background: Eagle syndrome (also known as stylohyoid syndrome) and fibromuscular dysplasia (FMD) are rare conditions that have both been shown to be associated with cervical artery dissections (CAD). Direct mechanical injury from a neighboring bony fragement can produce arterial dissections and is the proposed mechanism in Eagle syndrome. The etiology of FMD remains unclear, however, similar shearing stresses have been proposed. We present a case in which both of these conditions were present. **Methods:** Case report **Results:** A previously healthy 52 year old male presented with an acute left MCA syndrome with computer tomography angiography followed by convensional angiography confirming a complete occlusion of the left ICA at the carotid bifurcation with evidence of a dissection of the proximal cervical carotid artery. Luminal irregularities proximal to the dissection and also of the right ICA were in keeping with fibromuscular dysplasia. A carotid stent was placed and a thrombectomy was performed for a proximal left M2 occlusion. On further review of the CT, the patient had markedly elongated styloid processes bilaterally, meeting criteria for Eagle syndrome. **Conclusions:** Previous literature has not described these two conditions coexisiting. We question whether chronic mechanical stress from an elongated styloid process could lead to arteries having an irregular or beading appearance resembling fibromuscular dysplasia.

P.093

Hemoglobin values, fluctuations from baseline, and transfusion as predictors of outcome following aneurysmal subarachnoid hemorrhage

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doi: 10.1017/cjn.2018.195

Background: Anemia following aneurysmal subarachnoid hemorrhage (aSAH) has been associated with poor outcome, but complications from transfusion have limited aggressive management of anemic patients. This study examined the relationship between hemoglobin levels, transfusion and outcome following aSAH. **Methods:** We performed a post-hoc analysis of the CONSCIOUS-1 trial. Poor outcome was defined as a 3-month modified Rankin Scale > 2. Minimum hemoglobin levels were evaluated as predictors of outcome using logistic regression analysis, ROC curve analysis, and LOWESS curves. Propensity score matching was used to assess the effect of transfusion on poor outcome in patients with minimum hemoglobin levels between 70-90 and 80-100 g/L. **Results:** Lower minimum hemoglobin levels were associated with poor outcome on both univariate ($p<0.001$) and multivariate ($p=0.012$) analysis. Area under the ROC curve for minimum hemoglobin was 0.673. Youden index analysis found a minimum hemoglobin threshold of 91.5 g/L maximally predictive for good functional outcome. Propensity score matching showed a trend towards poor outcome in transfused patients with minimum hemoglobin levels between 70-90 and 80-100 g/L ($p=0.052$ and 0.09). **Conclusions:** This work suggests that decreasing hemoglobin is an independent predictor of poor outcome following aSAH. However, there was a trend towards poor outcome in transfused patients. The optimal transfusion threshold should be evaluated by prospective trials.

P.094

Characterizing post-stroke autonomic functioning. sub-study protocol of the clinical arm of PARADISE study

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doi: 10.1017/cjn.2018.196

Background: Strokes can cause a variety of cardiovascular complications. The underlying mechanisms are largely unknown but there is evidence that dysautonomia plays a role in stroke induced-heart injury (SIHI) and arrhythmias triggered by damage of specific brain regions involved in the autonomic regulation of cardiac functions. Understanding these mechanisms could aid in preventing these cardiovascular consequences. We hypothesize that compared to patients with sinus rhythm (SR) or with cardiogenic atrial fibrillation known before the stroke (cKAF) or diagnosed after the stroke (cAF-DAS), those with neurogenic AFDAS (nAFDAS) will show a specific pattern of autonomic functioning. **Methods:** We will prospectively evaluate 200 ischemic stroke patients at the London Health Sciences Center University Hospital. Participants will undergo continuous electrocardiographic monitoring during 14 days. Based on pre-specified criteria, patients with AFDAS will be classified into presumably neurogenic vs cardiogenic. We will assess autonomic function within 14 days after stroke onset by using the Autonomic Reflex Screening. We will compare markers of cardiac dysfunction with autonomic changes, as well as specific stroke topographies for SR, cKAF, cAF-DAS, and nAFDAS. **Results:** We are currently performing an interim analysis. **Conclusions:** Characterizing the autonomic changes that occur after ischemic stroke and their relationship with heart injury will help to advance knowledge on the pathophysiology of SIHI.

P.095

Holey Spinal Cord - A case of spinal cord stroke secondary to fibrocartilaginous embolism

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doi: 10.1017/cjn.2018.197

Background: Fibrocartilaginous embolism (FCE) is a rare reported cause of spinal cord infarction and likely underdiagnosed due to clinical unfamiliarity. FCE can present after a mild trauma and is characterized by back or neck pain along and a rapidly progressive myelopathy. We present a case of FCE and discuss how this clinical entity can break the typical rules of stroke. **Methods:** Case presentation **Results:** An otherwise healthy, 56-year-old professional sports coach presented a couple day history of progressive leg paresthesias and mild back pain, followed by unsteady gait and then inability to void. The left leg demonstrated mild weakness, hyperreflexivity, ataxia and an upgoing plantar response. The right leg became spastic and he then developed bilateral impairment of vibration and proprioception at the toes. An initial limited MRI lumbar spine was negative. A repeat MRI spine showed mild diffusion restriction of T10-11 and T11-12 and evidence of a bone infarct L2. He was diagnosed with a spinal cord infarct secondary to FCE. **Conclusions:** FCE should be considered in the differential for acute myelopathy. It can present with a progressive nature like transverse myelitis and MRI may be non-diagnostic. As more cases are being reported, FCE is becoming better defined and recognized.

P.096

Iatrogenic pseudoaneurysm of the MCA secondary to VP shunt insertion

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doi: 10.1017/cjn.2018.198

Background: Ventriculoperitoneal (VP) shunting is a common treatment for hydrocephalus. Complications of VP shunt include infection, malfunction, and hemorrhage. Vascular complications such as pseudoaneurysm are rare, and usually involve the choroid plexus or branches of the external carotid artery. We present the case of a fusiform pseudoaneurysm of the middle cerebral artery arising due to VP shunt insertion. **Methods:** A 36-year-old female presented with a hypertensive cerebellar hemorrhage and hydrocephalus. This was treated with VP shunt placement with limited dural opening. Three weeks afterward there developed a diffuse intraventricular hemorrhage associated with hemorrhage at the cortical insertion site of the ventricular catheter. CT and catheter angiography revealed a fusiform pseudoaneurysm of the M4 segment of the MCA immediately adjacent to the ventricular catheter. **Results:** The VP shunt was removed, and the aneurysmal segment was coagulated and occluded. Delayed repeat VP shunt insertion was performed through the same entry point and trajectory via a larger dural opening. **Conclusions:** Pseudoaneurysm formation secondary to catheter insertion is a rare

complication. To our knowledge, this is the second reported case of a cortical branch pseudoaneurysm in an adult. Careful consideration should be given to vascular anatomy when planning shunt insertions, and cruciate dural opening for local cortex visualization may help avoid this complication.

P.097

Subarachnoid hemorrhage associated with a thromboembolic ischemic stroke- an unexpected observation

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doi: 10.1017/cjn.2018.199

Atherosclerosis is a significant risk factor for ischemic stroke, and is a frequent cause for extra- and intra-cranial vessels stenosis. Here, we present an unusual case of ischemic stroke associated with intra-cranial vessel stenosis and subarachnoid hemorrhage (SAH) secondary to carotid artery atheroma. A 64-year old female known for hypertension and dyslipidemia presented with a three-day history of three transient episodes (< 30 minutes) of dysarthria and right hand weakness. An initial brain CT scan revealed left frontal SAH. She was admitted to our Stroke Unit for observation and management. CT-angiogram revealed 90% ICAs stenosis bilaterally with several short focal stenotic lesions, involving several left MCA branches. Brain MRI revealed acute infarcts in the left insula, external capsule and inferior frontal gyrus. The clinical picture was attributed to a thromboembolic left MCA ischemic stroke. She was managed with maximum medical therapy, and later underwent successful left carotid endarterectomy. The presence of SAH on our patient's presenting CT scan lead to an initial radiological diagnosis of RCVS. However, subsequent imaging studies indicated that SAH had occurred in association with a thromboembolic ischemic stroke. Despite its rarity, this clinical association is important to recognize to avoid diagnostic confusion and guide appropriate management.

P.098

Primary closure versus expansile patch angioplasty for carotid endarterectomy: a single center series

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doi: 10.1017/cjn.2018.200

Background: Carotid endarterectomy (CEA) is a common treatment option for patients presenting with carotid stenosis; however, the optimal method for arterial closure remains unclear. Therefore, we examined our single center series to compare primary closure versus patch angioplasty for carotid endarterectomy. **Methods:** We reviewed all patients who underwent CEA from 2008 to 2016. Closure method was entirely based on the surgeon style (i.e., all patients treated by vascular surgeons underwent patch angioplasty and all individuals managed by neurosurgeons undergone primary closure). Data were reported as frequencies and outcomes as odds ratios (ORs) with corresponding 95% confidence intervals (CIs). **Results:** A total of 713 patients were included (349 in the primary closure group and 364 in the patch group). Underlying baseline characteristics were similar between both groups. The risk of transient ischemic attack (OR, 7.08; 95%CI, 0.41-2.84; P=0.872), stroke (OR, 1.14; 95%CI, 0.58-2.22; P=0.697), myocardial infarction (OR, 1.10; 95% CI, 0.39-3.07; P=0.851), cranial nerve palsy (OR, 1.79; 95%CI, 0.65-4.91; P=0.248), and post-operative neck hematoma (OR, 1.04; 95%CI, 0.48-2.24; P=0.923) didn't differ significantly between the two closure options. **Conclusions:** Our findings suggest that primary closure and expansile angioplasty have similar safety and efficacy profiles as treatment closure options among patients undergoing CEA.

P.099

Specialty centres for MVD surgery

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doi: 10.1017/cjn.2018.201

Background: The aim of this study is comparing the waiting time and patient's satisfaction of microvascular decompression (MVD) surgery between local Manitoba (MB) and out of province (OOP) patients, treated at our Centre for Cranial Nerve Disorder (CCND). **Methods:** Data from 100 consecutive patients (average age: 56.8±10.6 years), undergoing MVD surgery for Trigeminal Neuralgia (TN) and Hemifacial Spasm (HFS) were reviewed. The outcome measures included the time intervals between disease onset, diagnosis and referral to CCND, postoperative discharge, satisfaction with surgical outcome and referral process. **Results:** The preoperative time leading to CCND referral were longer for OOP patients, (onset to diagnosis/diagnosis to referral: 2.6±3.8/4.2±4.7 (OOP) versus 1.2±2.1/2.5±4.1 (MB) years; p=0.04/0.04), and referrals were more likely self-directed in OOP patients (62% (OOP), 21% (MB); p=0.007). Postoperative satisfaction with MVD outcome were 8.6/10 for OOP and 8.3/10 for MB patients. There was no significant difference in postoperative length of stay (38±*50* (OOP)/43±42 (MB) hours); however, OOP patients were more likely discharged on the first postoperative day (58% (OOP), 31% (MB); p=0.17). **Conclusions:** Delays in diagnosis and surgical referral of TN/HFS are common, and many patients seek specialist's opinion in high volume surgical centers. For those OOP patients, travelling for treatment, MVD outcome were at least as good as for local patients.

P.100

Endovascular Thrombectomy (EVT) for stroke: experience in a Canadian teaching hospital

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doi: 10.1017/cjn.2018.202

Background: EVT is now recommended as standard of care for stroke in Canada, but its implementation still poses challenges. We studied the delivery of EVT in our hospital, a participanting site in the ESCAPE trial, which serves the province of Nova Scotia. **Methods:** Patients who underwent EVT December 2011 – December 2016 were identified prospectively. Demographics, process measures, imaging characteristics (Alberta Stroke Program Early CT Score [ASPECTS], collateral score, Thrombolysis in Cerebral Infarction [TICI] score), and outcomes, including modified Rankin score [mRS] ~ 90 days post-EVT, were collected retrospectively. Effectiveness was assessed by comparison with outcomes in the ESCAPE trial. **Results:**

91 patients (M:F= 48:43; mean age 64 years) presented to hospital after 194 min ± 230 min from last seen normal. In 58%, the ASPECTS was ≥7. 80% had good/intermediate collaterals. Alteplase was administered to 72% (75% in ESCAPE, p=0.97). EVT mean duration was 70 min ± 62 min. Successful recanalization (≥TICI 2b) was achieved in 76% (vs 72.4% in ESCAPE, p= 0.97). Among the 54 patients recanalized, mRS scores of 0-2, 3-5 and 6 were seen in 57.4, 24.1 and 14.8% respectively; ESCAPE comparators 53, 37 and 10%, p=0.96, 0.86 and 0.91. **Conclusions:** EVT at our hospital yielded results similar to the ESCAPE trial.

P.101

Lateral medullary syndrome due to left vertebral artery occlusion in a boy post flexion neck injury

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doi: 10.1017/cjn.2018.203

Background: Wallenberg's syndrome (WS), or lateral medullary syndrome is rare in pediatrics, but is not uncommon in adults. It is characterized by neurological deficits due to an ischemic lesion in the lateral medulla. **Methods:** Case report **Results:** We describe a 17-year-old boy who developed WS in the context of hyperflexion injury to the neck while diving in shallow water with vertebral dissection as a presumed etiology. He had 'crossed' neurological deficits above and below the neck. His MRA showed intra and extracranial left vertebral artery occlusion and his MRI showed T2W/FLAIR signal abnormality involving the left lateral medulla and inferomedial aspect of the cerebellum in keeping with infarcts secondary to the left vertebral artery thrombosis and occlusion of the left posterior inferior cerebellar artery. He was started on anti-coagulation after spinal surgery. On discharge, he had persistent dysphagia which prompt a gastrostomy tube placement prior to transfer to a rehabilitation center. **Conclusions:** Our case demonstrates that WS can occur post flexion injury in the pediatric population. The presence of crossed neurological findings above and below the neck in the context of neck injury is an important diagnostic clue that should prompt imaging study focusing on the brain stem and the posterior fossa vascular structures.

P.102

Endoscopic harvesting of a saphenous vein graft for EC-IC bypass followed by proximal artery occlusion of a pediatric giant fusiform MCA aneurysm

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doi: 10.1017/cjn.2018.204

Background: Minimally invasive techniques for graft procurement are the norm in cardiac surgery and yet their use in neurosurgery is only in its infancy. We present the case of a 10-year-old boy presenting with fluctuating right facial and upper extremity weakness who was found to have a giant, partially thrombosed, fusiform aneurysm of the M1 segment of the left MCA. **Methods:** Endoscopic harvesting of the saphenous vein was performed with a procedure time of 30 minutes. The graft was used as an interposition graft between the common carotid artery and the superior M2 division of the MCA, which was tunneled subcutaneously. Once Doppler ultrasound confirmed good flow through the graft, an aneurysm clip was then secured on the M1, proximal to the saccular component of the fusiform aneurysm and just distal to the anterior temporal branch. **Results:** Intraoperative 2D and 3D angiogram confirmed a patent extracranial to intracranial bypass with thrombosis of the giant fusiform M1 aneurysm. By 1-month post-operatively, he had returned to school and routine activities. He continues to do well 6 months post-operatively with a minimal and well-healed donor site scar. **Conclusions:** Endoscopic graft harvesting is an emerging option in the pediatric population undergoing extracranial to intracranial bypass, associated with lower wound complications and improved cosmesis.

P.103

Persistent primitive hypoglossal artery with an associated posterior circulation aneurysm

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doi: 10.1017/cjn.2018.205

Background: Persistent fetal carotid-vertebrobasilar anastomoses are rare, with an incidence of <1%. The most common anomaly seen in this group is a persistent primitive trigeminal artery; others such as a persistent hypoglossal artery account for less than 15% of all persistent fetal anastomoses, making this finding exceedingly rare. **Methods:** We present the case of a 32-year-old-female with Poland syndrome (right-sided), who presented with thunderclap headache and reduced level of consciousness secondary to diffuse subarachnoid hemorrhage and hydrocephalus. CT and catheter angiography demonstrated an aneurysm of the V4 segment of the right vertebral artery arising from a persistent right hypoglossal artery, with an absent ipsilateral vertebral artery proximal to the anomaly. **Results:** Hydrocephalus was treated with an EVD, followed by a successful embolization of the V4 aneurysm with Axium coils. Subsequent MR studies demonstrated minimal recanalization of the aneurysm, and small foci of possible infarcts in the hippocampi. Four months later, the patient has some persistent short term memory difficulties but is otherwise neurologically intact. **Conclusions:** We present a rare finding of a persistent fetal hypoglossal artery with an associated vertebral aneurysm. The aneurysm was successfully treated endovascularly through coil embolization with minimal residual neurological deficit. This vascular anomaly was ipsilateral to her Poland Syndrome defects.

P.104

Peri-cavity atrophy after minimally invasive evacuation of intracerebral hemorrhage

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doi: 10.1017/cjn.2018.206

Background: Intracerebral hemorrhage (ICH) remains a significant cause of morbidity and mortality. While traditional surgical techniques have shown marginal clinical benefit of ICH evacuation, minimally invasive techniques have shown some promise. Endoscopic evacuation of the hemorrhage may reduce the peri-hematoma edema and subsequent atrophy around the hemorrhage cavity. This study aims to quantify the changes in cavity volume following hematoma evacuation. **Methods:** Patients from the INVEST registry of

minimally invasive ICH evacuation were included retrospectively if follow-up computed tomography (CT) scans were available for analysis. Hematoma cavity volumes were calculated from the immediate post-procedural and three-month follow-up CT scans using the Analyze Pro software. **Results:** Twenty patients had follow-up CT scans at a mean time of 93 days from hematoma evacuation. The average cavity size at follow-up was 11938.12 mm^3 (SD: 6996.49). The change in cavity size compared to the prior CT was 6396.74 mm^3 (median 2542; range: -1030-27543; SD: 8472.45). This represented mean growth in cavity volume of 54%. **Conclusions:** This study provides preliminary data describing increase in cavity size after endoscopic minimally invasive evacuation of ICH. Comparison to atrophy in conservatively-managed patients is a further planned avenue of research.

P.105

Missed vertebral artery dissection: a case series

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doi: 10.1017/cjn.2018.207

Background: Vertebral artery dissections are the second most common cause of posterior circulation stroke. Particularly in young people, they must be considered as causes of acute infarction, especially with a history of cervical trauma. Here, we present three cases of vertebral artery dissection that were initially not diagnosed as such. All were caused by uncommon mechanisms; one by self-inflicted neck manipulation, and one as a sequela of falling from a trampoline, and one from minor trauma to the head while standing. **Methods:** This is a series of three cases seen by the authors of posterior circulation stroke secondary to vertebral artery dissection caused by uncommon mechanisms. **Results:** N/A **Conclusions:** Vertebral artery dissection should be considered as a differential diagnosis in patients presenting with acute head and/or neck pain and any neurological findings in relation to acute neck trauma.

P.106

Functional approach using intraoperative brain mapping and neurophysiological monitoring for surgery of arteriovenous malformations in eloquent areas

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doi: 10.1017/cjn.2018.208

Background: Surgical resection of arteriovenous malformations (AVMs) in eloquent areas is significantly associated with greater surgical morbidity. We describe a functional approach for surgical treatment of these lesions **Methods:** A total of 20 patients with AVMs in eloquent areas were surgically treated and retrospectively analyzed. Individualized functional approach, using brain mapping and/or neurophysiological monitoring was performed in each case according to every case specific features and location. Seventeen patients underwent surgery under assleep conditions and 3 patients underwent awake intraoperative mapping **Results:** There was no mortality. Four patients had hemorrhagic complications (20%). Ten (50%) presented neurological immediate postoperative worsening. Eight of them achieved complete recovery in follow up and 2 showed a permanent deficit. At 6 months follow up all the patients (100%) had good clinical outcome (mRS less than 2). There were no intraoperative seizures but 5 patients (26.3%) developed postoperative seizures. Fifteen patients (75%) had total AVM resection. Language and/or motor function were identified in all but one patient (95%). Each case required changes in surgical strategy to preserve the motor and/or language functions during surgery. **Conclusions:** Intraoperative monitoring and brain mapping are valuable and safe for the treatment of eloquent AVMs by indentifying and protecting motor and language function during resection.

P.107

Acute thrombectomy in patients of 80 years and older: a retrospective analysis of radiological and clinical outcomes with an intention to treat analysis

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doi: 10.1017/cjn.2018.209

Background: The safety and clinical outcomes of thrombectomy in the 80 years or older age group are not yet clear. Our aim is to provide data from clinical practice to assess the safety and efficacy of endovascular thrombectomy in this age group. **Methods:** We retrospectively reviewed consecutive patients of age ≥80 referred for thrombectomy procedures at our institutions from 01/01/2015 to 01/09/2015. We collected demographic data, risk factors, clinical and radiological findings, treatment details, clinical and radiological outcomes. **Results:** Data for 75 patients was included. Baseline clinical characteristics are similar to previous trials. There were MCA occlusions in 49% (37/75) and tandem occlusions in 15% (11/75) patients. 67% (50/75) patients received IVtPA. Good reperfusion (mTICI 2b/3) was achieved in 60% (45/75) patients within 224 minutes. Good clinical outcome (mRS 0-2) at 90 days was achieved in 31% (23/75) patients. Results are similar to HERMES data on patients of age ≥80 and differences will be discussed. **Conclusions:** Our study adds valuable evidence to the limited data on safety and clinical outcomes in patients 80 years of age and older who undergo thrombectomy. Our findings support the data from clinical trials and confirm that mechanical thrombectomy can be performed safely and in a timely fashion outside of trials with similar results.

Other Adult Neurology

P.108

Case report: listeria rhombencephalitis in a healthy 64 year old woman

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doi: 10.1017/cjn.2018.210

Background: Listeria rhombencephalitis is a rare and serious complication of Listeria monocytogenes infection. We present a case of presumed Listeria rhombencephalitis with dramatic recovery from a highly morbid state. **Methods:** A previously healthy 64 year old woman with a remote and stable history of a major depressive episode and no history to suggest immune compromise presented with nausea and vomiting followed by the acute onset of diplopia and gait disturbance 28 days after exposure to an identified infectious source of spring rolls and 21 days after a severe diarrheal illness from that exposure. Our patient was evaluated by emergency physicians and general internists over a period of 1 week after the onset of diplopia and gait disturbance and given a diagnosis of serotonin syndrome before receiving a consultation from Neurology. Her presentation featured a deep encephalopathy and an unusual hyperkinetic movement disorder with startle myoclonus, palatal myoclonus and diffuse tremor. **Results:** Her MRI scan showed FLAIR hyperintensities in the bilateral cerebellum and pons with adjacent pial enhancement, characteristic of Listeria rhombencephalitis. Her CSF showed a lymphocytic pleocytosis with normal chemistry. **Conclusions:** She recovered dramatically to treatment with IV ampicillin. This case report illustrates the importance of considering Listeria rhombencephalitis in immunocompetent patients with brainstem symptoms following a diarrheal illness.

P.109

Causes of albuminocytologic dissociation and the impact of an age-adjusted reference limit on review of 2,627 CSF samples

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doi: 10.1017/cjn.2018.211

Background: We set out to test the discriminative power of an age-adjusted upper reference limit (URL) for CSF total protein (CSF-TP) in identifying pathological causes of albuminocytologic dissociation (ACD). **Methods:** We reviewed the charts of 2,627 adult patients who underwent a lumbar puncture at a tertiary care center over a 20-year period. Samples with CSF-TP above 45 mg/dL (0.45 g/L) were included. Samples with white blood cell count > 5×10^9/L, red blood cell count > 50×10^9/L, and glucose < 2.5 mmol/L (45 mg/dL) were excluded. Patients with CSF-TP elevated above 45 mg/dL were considered to have 'pseudo' albuminocytologic dissociation (ACD) or 'true' ACD if their CSF-TP was in excess of age-adjusted norms. **Results:** Among all patients with ACD, a pathological source of CSF-TP elevation was identified in 57% (1490/2627) of cases, 51% of those with 'pseudo' ACD, and 75% with 'true' ACD ($p< 0.001$). Use of an age-adjusted upper reference limit favored the detection of polyneuropathy patients (13.5% proportionate increase) and excluded a larger number of patients with isolated headache (10.7% proportionate decrease; $p < 0.0001$). **Conclusions:** Elevated CSF-TP is a relatively common finding. Use of age-adjusted upper reference limits for CSF-TP values improve diagnostic specificity and help to avoid over-diagnosis of ACD.

P.110

Effects of hypoglycemia on sensitive brain structures in a patient with an insulinoma

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doi: 10.1017/cjn.2018.212

Background: A previously healthy 26 year-old male presented with confusion and recurrent hypoglycemia (blood glucose lows of 2.5 mmol/L) while on vacation in Las Vegas. He denied substance or heavy alcohol use and the toxicology screen was negative. He was transferred home to Winnipeg for further care and was found to have only patchy memories of his trip and the days leading up to the trip, consistent with mixed anterograde and retrograde amnesia. MoCA score at presentation was 16/30 with points lost on orientation, delayed recall and visuospatial-executive tasks. MRI revealed T2 hyperintensities and diffusion abnormalities in bilateral hippocampi and globus pallidi. Electroencephalography showed triphasic waves. The patient was found to have a pancreatic insulinoma, which was surgically resected. In follow-up nine weeks later he was near his cognitive baseline, though he had ongoing difficulties with delayed recall. Repeat MRI showed improvement but not resolution of hippocampal and pallidal signal change, with mild hippocampal atrophy.

Neuropathological and animal studies have shown that structures most sensitive to hypoglycemic neural injury include the hippocampus, basal ganglia, and neocortex. The clinical and radiographic findings in this case illustrate an unusual presentation of insulinoma and the effects of hypoglycemia on the brain. **Methods:** N/A **Results:** N/A **Conclusions:** N/A

P.111

Initial validation of symptom scores derived from the Orthostatic Discriminant and Severity Scale

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doi: 10.1017/cjn.2018.213

Background: To develop a scale to quantify and discriminate orthostatic from non-orthostatic symptoms. We present initial validation and reliability of orthostatic and non-orthostatic symptom scores taken from the Orthostatic Discriminate and Severity Scale (ODSS). **Methods:** Validity and reliability were assessed in participants with and without orthostatic intolerance. Convergent validity was assessed by correlating symptoms scores with previously validated tools (Autonomic Symptom Profile (ASP) and the Orthostatic Hypotension Questionnaire (OHQ)). Clinical validity was assessed by correlating scores against standardized autonomic testing. Test-retest reliability was calculated using an intra-class correlation coefficient. **Results:** Convergent Validity: Orthostatic (OS) and Non-Orthostatic (NS) Symptom Scores from 77 controls and 67 patients with orthostatic intolerance were highly correlated with both the Orthostatic Intolerance index of the ASP (OS:r=0.903;NS:r=0.651; $p<0.001$) and the OHQ: (OS:r=0.800;NS:r=0.574; $p<0.001$). Clinical Validity: Symptom

Scores were significantly correlated with the blood pressure change during head-up tilt (OS:r=-0.445;NS:r=-0.354; p<0.001). Patients with orthostatic intolerance had significantly higher symptom scores compared to controls (OS:66.5±18.1 vs. 17.4±12.9; NS:19.9±11.3 vs. 10.2±6.8; p<0.001, respectively). Test-retest reliability: Both symptom scores were highly reliable (OS:r=0.956;NS:r=0.574, respectively; p<0.001) with an internal consistency of 0.978 and 0.729, respectively. **Conclusions:** Our initial results demonstrate that the ODSS is capable of producing valid and reliable Orthostatic and Non-Orthostatic Symptom Scores.

P.112

Hospital readmission following neurology discharge: A systematic review

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doi: 10.1017/cjn.2018.214

Background: Unplanned hospital readmission is inconvenient for patients, puts them at risk of harm, and is a resource strain. We reviewed available literature on risk factors for readmission following discharge specifically from neurology inpatient services with a focus on factors unique to non-stroke neurology admissions. **Methods:** We conducted a systematic search using PRISMA methodology of MEDLINE, EMBASE, and CENTRAL databases up to January 1, 2018. Two independent reviewers screened articles for inclusion. English-language articles were included that identified factors related to hospital readmission after discharge from a neurology service. Admissions with stroke as the primary focus were excluded. **Results:** Of 9508 unique abstracts, 25 met inclusion criteria and were included for review. Multiple factors impacting probability of readmission were identified including age, living alone, history of nonepileptic seizure, length of stay, services consulted during hospital stay, hospital volume, and severity of illness. **Conclusions:** There are identifiable risk factors that influence likelihood of readmission to hospital following discharge from neurology inpatient services, although the non-stroke literature is sparse. There is a need for future prospective work to investigate modifiable risk factors and opportunities to reduce readmission rates and improve patient safety.

P.113

Down Syndrome: robust neurophysiological perspectives

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doi: 10.1017/cjn.2018.215

Background: Down Syndrome (DS) has a mosaicism of presentations, but a number of common features. Cerebral evoked potentials (somatosensory, visual and auditory) can be higher in amplitude in DS. The aim of this study is to explore the value of the neurophysiological amplitude of three different modalities in DS individuals undergoing spinal surgery, or epilepsy evaluation. **Methods:** Standard procedure of EEG evaluation was conducted. We routinely monitor somatosensory (SSEP) and motor evoked potentials (MEP), using peripheral nerves stimulation and transcranial electrical stimulation during surgery. We report findings from 14 DS individuals age-matched to 14 individuals with idiopathic scoliosis **Results:** The amplitude of the SSEP is significantly higher in DS individuals than in age-matched controls using the same parameters. SSEP;10.2±2.5μV vs 2.4±2.3μV (p<0.05, paired t-test). The threshold for eliciting MEPs was also significantly lower in DS in comparison to controls, 175±20V vs 629±100V, (p<0.05, paired t-test). Interictal EEG showed high amplitude spike and waves, and greater intracortical coherence in DS with epilepsy than non-DS patients **Conclusions:** Robust neurophysiological findings showed high amplitude sensory evoked potentials, low threshold motor evoked potentials, and high amplitude spikes and wave, all reflect a common process of increased neuronal synchronicity and oscillatory behaviour in Down Syndrome.

P.114

Twice negative PCR in a patient with HSV-1 Encephalitis

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doi: 10.1017/cjn.2018.216

Case Description: A 64 year-old male presented with left-sided weakness and altered level of consciousness after a suspected seizure. MR Brain demonstrated right mesial temporal lobe diffusion restriction. Empiric antiviral and antibiotic treatments were initiated despite CSF negative for HSV/VZV and enteroviruses. Lumbar puncture on admission day five was unchanged and empiric treatments were discontinued. On day 13 he deteriorated into status epilepticus necessitating ICU transfer. A third lumbar puncture demonstrated elevated protein and HSV-1 positive PCR. Acyclovir was restarted with guarded prognosis. **Discussion:** Detection of HSV-1 in CSF is considered the diagnostic gold standard for HSV-1 encephalitis. The validated multiplex assay used in Alberta, Canada has a 95% level of detection significantly better than the recommended threshold for HSV laboratory diagnosis. Previous reports have indicated that CSF PCR may be negative early in the disease course. Others have suggested that initially negative/follow up positive HSV PCR cases may represent secondary reactivation or release from underlying tissue damage. Consideration of the full clinical picture is crucial in patients with HSV negative PCR. Continuation of antiviral therapy may be appropriate in select HSV PCR negative patients.

P.115

Association of phantogeusia with Parkinson Disease

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doi: 10.1017/cjn.2018.217

Background: Phantogeusia associated with Parkinson Disease has not heretofore been reported. **Methods:** A 59 year old right handed female presented with a four year history of a bitter, sour and sweet taste on her entire tongue and roof of her mouth, 8/10 intensity, constant, persistent, without any external stimuli. Drinking water tasted bitter and sour. The phantogeusia was unresponsive to dietary changes, gabapentine, and allergy medications. **Results:** Abnormalities in Neurological examination: Decreased blink frequency. Hypokinetic. Hypomimetic face. Mood appears sad. Cranial Nerve (CN) examination: CN lll, lV, Vl: Saccadization of horizontal eye movements. Motor Examination: Pill rolling tremor in right hand. 1+ cogwheel rigidity in left upper extremity. Gait: 2+ retropulsion. Chemosensory testing: Olfactory: Alcohol Sniff Test: 6 (anosmia). SNAP Phenylethyl Alcohol Threshold Testing left -2.5 (hyposmia)

& right > -2.0 (anosmia). Gustatory testing: Propylthiouracil Disc Taste test: 10 (normogeusia). Taste Testing Threshold: normogeusia to NaCl, Sucrose, HCl, Urea, and PTC. Other: DOPAPET: positive for Parkinson disease. Upper endoscopy: normal. **Conclusions:** Investigation for the presence of parkinsonian features in those with phantogeusia is warranted and chemosensory dysfunction including phantogeusia in those who presents with Parkinson's disease is worthy of exploration.

Other Neurosurgery (Adult and Paediatric)

P.116

Orbital lymphaticovenous malformation with intradural extension: a rare case

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doi: 10.1017/cjn.2018.218

Orbital lymphaticovenous malformations (LVM) are congenital vascular lesions that are typically infiltrative in nature. There have been reports of orbital LVMs extending intracranially through orbital fissures, but there have been no reports of intradural extension that we are aware of. We present the case of an otherwise healthy 25-year-old female with an orbital LVM extending intradurally. Imaging revealed an intraorbital lesion extending through a bony defect in the medial orbital roof to the orbitofrontal cortex. A modified orbitozygomatic approach was used to obliterate this lesion. A durotomy was created to examine the intradural extension of the lesion, which appeared as a lobulated red vascular structure emanating from the dura along the roof of the orbit. This was gradually and comprehensively bipolar coagulated and subsequently obliterated. Neurosurgical and ophthalmological collaboration was used in the surgical management of this case. In summary, we report the first case of an orbital LVM extending intradurally, and provide pre and post-operative imaging as well as images captured through the intraoperative microscope. Through this case we highlight the importance of an interdisciplinary approach when managing orbital LVMs, as both ophthalmological and neurosurgical expertise were critical in the success of the surgery.

P.117

A systematic review on opioid free analgesic techniques for supratentorial craniotomies

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doi: 10.1017/cjn.2018.219

Background: Post-craniotomy pain can be severe and undermanaged. While opioids are the mainstay treatment, they have the potential to interfere with neurological monitoring. The objectives of this review are: 1) to identify measures to provide opioid-free analgesia 2) to compare the effectiveness of non-opioid to opioid analgesia in post-craniotomy pain. **Methods:** A comprehensive search of EMBASE, MEDLINE, and the Cochrane Central Registry of Controlled Trials (CENTRAL) databases was conducted for RCTs evaluating the effect of opioid vs non-opioid pain control strategies in patients undergoing supratentorial craniotomy. **Results:** The literature search yielded 462 citations, 5 RCTs that met the inclusion criteria for a total of 250 patients. Scalp infiltration/block was found to provide equivalent analgesia to morphine[1] and fentanyl.[2] Morphine was associated with slightly higher postoperative nausea and vomiting. Paracetamol was less likely to induce nausea and vomiting,[3,4] but provided inadequate pain relief compared to nalbuphine,[3] tramadol,[3] morphine[4] and sufentanil.[4] Dexmedetomidine[5] provided similar analgesia to remifentanil but did delay the time to first dose of rescue analgesia with similar side effects. **Conclusions:** Based on the limited number of RCTs comparing opioid to non-opioid techniques, no definite recommendations can be made with regards to the optimal management of post-craniotomy pain. Considerations should be made for use of multimodal analgesia-including adjuvant analgesics.

P.118

Trigemino-cardiac reflex: a case report of intra-operative asystole in response to manipulation of the temporalis muscle

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doi: 10.1017/cjn.2018.220

Background: The trigemino-cardiac reflex (TCR) is a sudden onset of bradycardia, hypotension, apnea or gastric hypermotility during stimulation of the trigeminal nerve. **Methods:** We conducted a MEDLINE search for surgical cases of TCR and herein describe a case seen recently at our institution. **Results:** A 60 year-old female underwent a left orbitozygomatic craniotomy for resection of a skull-base tumor. Pre-operative anesthesia evaluation was unremarkable and negative for a history of cardiovascular disease. Intra-operatively, retraction with moderate force of the temporalis muscle consistently produced asystole. Cessation of retraction resulted in immediate return of sinus rhythm. Otherwise, intra-operative heart rate was 60-90 BPM. Post-operatively, vital signs and clinical course were unremarkable. The patient experienced a similar phenomenon during an operation 6 years earlier, when manipulation of tumor near cranial nerves IX/X resulted in bradycardia. TCR is the result of a polysynaptic brainstem network involving the afferent trigeminal sensory nucleus, the reticular formation, and the efferent vagal motor nucleus. **Conclusions:** This is a case of exaggerated vagal response following manipulation of the temporalis muscle. Our report emphasizes the importance for neurosurgeons and anesthesiologists alike to be wary of TCR in order to avoid deleterious consequences when operating on structures associated with the trigeminal nerve.

P.119

Industry relationships with neurological surgery in the 2015 Open Payments Database

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doi: 10.1017/cjn.2018.221

Background: The 2013 Physician Payments Sunshine Act mandates that all US drug and device manufacturers disclose payments to physicians annually in the Open Payments Database (OPD).

We aimed to determine the prevalence, magnitude and nature of these payments to neurological surgery in 2015. **Methods:** Records of payments to physicians identified by the 'neurological surgery' taxonomy code in 2015 were accessed via the OPD. The data were analyzed in terms of the type and amounts of payments, companies making payments, and in comparison to previous studies. **Results:** In 2015, 330 companies made 83,690 payments ($99,048,607) to 7,613 physicians. The mean payment ($13,010) was substantially greater than the median ($114). Royalties and licensing accounted for the largest proportion of total payment value (74.2%), but only 1.7% of the total number. Food and beverage payments were the most commonly reported transaction (75%), but only 2.5% of the total value. Neurological surgery had the second highest average total payment per physician of any specialty. **Conclusions:** The overall value of payments to the neurological surgery specialty is driven by a small number of payments that may represent appropriate compensation for novel device development. The OPD provides an opportunity for increased transparency and for the interpretation of research in light of potential conflicts of interest.

P.120

Conflict of interest in neurosurgery: an analysis of disclosure policies in neurosurgical journals

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doi: 10.1017/cjn.2018.222

Background: Industry funding of neurosurgery research is on the rise and this creates a conflict of interest (COI) with the potential to bias results. The reporting and handling of COI is impacted by the variation in policies and definitions between journals. In this study we sought to evaluate the prevalence and comprehensiveness of COI policies amongst leading neurosurgical journals. **Methods:** We conducted a cross-sectional study of publicly available online disclosure policies in the 20 highest-ranking neurosurgical journals, as determined by Google Scholar Metrics, in July of 2016. **Results:** Eighteen (89.5%) of the top neurosurgical journals included COI policy statements. Ten journals requested declaration of non-financial conflicts, while two journals defined a time period of interest for conflicts. Sixteen journals required declaration from the corresponding author, 13 from all authors, six from reviewers and five from editors. Five journals included COI declaration verification, management or enforcement. Journals with more comprehensive COI policies were significantly more likely to have higher h5-indices (p=0.003) and higher impact factors (p=0.01). **Conclusions:** In 2016, the majority of high-impact neurosurgical journals had publicly available COI disclosure policies. Policies varied substantially across neurosurgical journals; but COI comprehensiveness was associated with impact factor and h5-index. More comprehensive and consistent COI policies will facilitate increased transparency in neurosurgery research.

P.121

Preoperative predictors of poor postoperative pain control: systematic review and meta-analysis

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doi: 10.1017/cjn.2018.223

Background: Inadequate postoperative pain control is common and is associated with negative clinical outcomes. The objective is to identify preoperative predictors of poor postoperative pain control in the adult population undergoing inpatient surgery. **Methods:** Meta-analysis was performed according to MOOSE guidelines. Studies were included if they evaluated postoperative pain using a validated instrument in adults undergoing inpatient surgery and reported a measure of association between poor postoperative pain control and at least one preoperative predictor. Measures of association were pooled using random effects models. **Results:** A total of 33 studies representing 59,259 patients were included. Significant preoperative predictors of poor postoperative pain included sleeping difficulties (OR 2.32 [95% CI 1.46-3.69]), history of depressive symptoms (OR 1.71 [95% CI 1.32-2.22]), use of preoperative analgesia (OR 1.54 [95% CI 1.18-2.03]), smoking (OR 1.33 [95% CI 1.09-1.61]), female sex (OR 1.29 [95% CI 1.17-1.43]), presence of preoperative pain (OR 1.21 [95% CI 1.10-1.32]], history of anxiety symptoms (OR 1.22 [95% CI 1.09-1.36)], younger age (OR 1.18 [95% CI 1.05-1.32)], and higher BMI (OR 1.02 [95% CI 1.01-1.03]). **Conclusions:** Nine significant predictors of poor postoperative pain control were identified and these should be recognized as important factors when developing pre- and peri-operative strategies to improve pain outcomes.

P.122

Foramen magnum decompression of Chiari malformation using minimally invasive tubular retractors

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doi: 10.1017/cjn.2018.224

Background: A surgical technique for foramen magnum decompression of Chiari malformation I in 11 patients is described. **Methods:** We used minimally invasive tubular retractors (METRx Quadrant) attached to a flexible arm to keep the retractor in a fixed position, while allowing flexible angulation under fluoroscopic guidance. Despite the small surgical opening, this approach allowed access to a wide working area, minimized soft tissue exposure, and optimized extent of decompression. For some patients, only the outer layer of dura was opened, but in cases where clinically indicated, a duraplasty was performed. **Results:** Postoperative CT head demonstrated satisfactory bony removal, and MRI with CSF flow study showed restoration, or significant improvement to CSF flow around the foramen magnum. There was a low incidence of post-operative complications, and the average length of hospital stay was around 1 day (1.2). For 10 out of 11 patients; their symptoms completely resolved on last follow-up, and for those who had syringomyelia, they demonstrated a radiological evidence of syrinx reduction or resolution. **Conclusions:** Based on our experience with this technique in foramen magnum decompression of Chiari malformation I, minimally

invasive tubular retractor is a useful tool, providing the surgeon with enhanced visualization of the operative field, while reducing potential damage to tissue, and optimizing surgical outcomes.

P.123

Functional status in neurosurgery and out of hospital outcomes: insights from a 12 year, 2300 patient retrospective cohort study

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doi: 10.1017/cjn.2018.225

Background: Limited information exists in neurosurgery regarding the association between functional status at hospital discharge and adverse events following discharge. **Methods:** A retrospective cohort study included all adults in one Boston teaching hospital who underwent neurosurgery between 2000-2012, survived hospitalization and had a Physical Therapist functional status assessment within 48-hours of discharge. 90-day post-discharge all-cause mortality was obtained from the US Social Security Administration Death Master File. Logistic regression analysis was used. **Results:** 2,369 patients were included, comprising 65% cranial and 35% spinal. Malignancy and trauma was 47% and 13%, respectively. 238 patients had independent functional status. 90-day mortality and readmission was 8.3% and 28%, respectively. Second, third and lowest quartile of functional status was associated with a 3.16 (95%CI 1.08-9.24), 6.00 (2.11-17.04) and 6.26 (2.16-18.16) respective increased odds of 90-day post-discharge mortality compared to patients with independent functional status, adjusting for age, gender, race, length of stay, presence of malignancy and Deyo-Charlson comorbidity. Good discrimination (AUC 0.82) and calibration (Hosmer-Lemeshow $\chi 2$ P = 0.23) were demonstrated. Adjusted odds of 90-day readmission in patients with the lowest quartile of functional status was 1.89 (1.28-2.80) higher than patients with independent functional status. **Conclusions:** Lower functional status at hospital discharge following neurosurgery is associated with increased post-discharge mortality and hospital readmission.

P.125

Is idiopathic normal pressure hydrocephalus familial—what do we know thus far? Case report and critique of the literature

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doi: 10.1017/cjn.2018.227

Background: One aspect of idiopathic normal pressure hydrocephalus (iNPH) that has garnered interest is whether it can be familial. Thus far, the literature consists of several case reports, and two larger pedigree cohorts. Our objective is to highlight key deficiencies in such studies so far, illustrating them through a family case study of our own, and to propose a set of criteria that studies on familial iNPH should incorporate. **Methods:** Our case study is a retrospective chart review of three siblings, two male and one female, who were diagnosed with iNPH after the age of 60, and whose symptoms improved with cerebrospinal fluid (CSF) shunting. An interview with them revealed that their mother also exhibited symptoms of iNPH, but was never treated with a shunt. **Results:** Our family case is reflective of several deficiencies of familial iNPH research as a whole—unconfirmed diagnosis, especially confirmation with shunt responsiveness, and lack of measures of symptom improvement. **Conclusions:** Research on familial iNPH should focus on patients whose diagnosis is confirmed by shunt responsiveness, and should involve a system to objectively measure signs of NPH. Studies should also compare the prevalence of iNPH among first degree relatives of NPH patients to that in the general population.

P.126

A nation-wide prospective multi-centre study of external ventricular drainage accuracy, safety, and related complications: Interim analysis

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doi: 10.1017/cjn.2018.228

Background: External ventricular drain (EVD) insertion is a common neurosurgical procedure performed in patients with life-threatening conditions, but can be associated with complications. The objectives of this study are to evaluate data on national practice patterns and complications rates in order to optimize clinical care **Methods:** The Canadian Neurosurgery Research Collaborative conducted a prospective multi-centre registry of patients undergoing EVD insertions at Canadian residency programs **Results:** In this interim analysis, 4 sites had recruited 46 patients (mean age: 53.9 years, male:female 2:1). Most EVD insertions occurred outside of the operating theatre, using free-hand technique, and performed by junior neurosurgery residents (R1-R3). The catheter tip was in the ipsilateral frontal horn or body of the lateral ventricle in 76% of cases. Suboptimally placed catheters did not have higher rates of short-term occlusion. EVD-related hemorrhage occurred in 6.5% (3/45) with only 1 symptomatic patient. EVD-related infection occurred in 13% (6/46) at a mean of 6 days and was associated with longer duration of CSF drainage (P=0.039; OR: 1.13) **Conclusions:** Interim results indicate rates of EVD-related complications may be higher than previously thought. This study will continue to recruit patients to confirm these findings and determine specific risk factors associated with them

P.127

Single centre review of lumboperitoneal shunt outcomes

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doi: 10.1017/cjn.2018.229

Background: Ventriculoperitoneal (VP) shunts are an established treatment modality for CSF diversion. An alternative to VP shunting is lumboperitoneal (LP) shunting. There is a paucity of evidence on LP shunt use in the literature, but available studies demonstrate that it is a safer and similarly efficacious method for conditions such as normal pressure hydrocephalies (NPH) and idiopathic

intracranial hypertension (IIH). **Methods:** Ventriculoperitoneal (VP) shunts are an established treatment modality for CSF diversion. An alternative to VP shunting is lumboperitoneal (LP) shunting. There is a paucity of evidence on LP shunt use, but available studies demonstrate that it is a safer and similarly efficacious method for conditions such as normal pressure hydrocephalies (NPH) and idiopathic intracranial hypertension (IIH). **Results:** 95 patients were treated with lumboperitoneal shunt, 71 of which were for hydrocephalus and 24 for IIH. 39 male and 58 female patients were included with mean age 55 (range from 20 to 96 years old). 26 patients had laparoscopic placement of the peritoneal catheter. Mechanical issues with distal end was less with laparoscopic approach. **Conclusions:** We will review disease-specific scores for NPH and IIH, and compare laparoscopic with non-laparoscopic placement of peritoneal catheter. We will also compare outcomes and complications with rates for VP shunting.

Other Pediatric Neurology

P.128

Episodic ataxia and encephalitis: A novel presentation of RESLES in a 3-year-old girl

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doi: 10.1017/cjn.2018.230

Background: Reversible splenial lesion syndrome (RESLES) is a rare clinico-radiological entity associated with multiple etiologies including infection, metabolic, and epileptic disorders. We describe the case of a child with a reversible splenial lesion who presented with encephalopathy and prior history of episodic ataxia. **Methods:** A 3-year-old girl presented to the Stollery Children's hospital with three days of respiratory symptoms followed by acute onset ataxia and encephalopathy. Blood, respiratory samples, and cerebral spinal fluid (CSF) were drawn to investigate for infectious, autoimmune, and metabolic causes. Magnetic resonance imaging (MRI) brain was done and repeated. **Results:** A respiratory panel tested positive for respiratory syncytial virus (RSV), enterovirus, and rhinovirus. CSF analysis revealed elevated white blood cell count (283). MRI brain demonstrated diffusion restriction involving the posterior body and splenium of the corpus callosum and bilateral middle cerebral peduncles, which resolved nine days later. The patient received high-dose steroids with gradual improvement in the encephalopathy and ataxia. **Conclusions:** This report contributes to the complexities in clinical understanding of RESLES, as it highlights a novel presentation with ataxia and encephalopathy. The patient's diagnosis was complicated by previous ataxic episodes of unknown etiology, which allows further consideration of a metabolic or genetic ataxic syndrome and its relationship to encephalopathy.

P.129

Worster-Drought syndrome caused by LINS mutations

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doi: 10.1017/cjn.2018.231

Background: Worster-Drought syndrome (WDS) is a congenital, pseudobulbar paresis. Patients show oromotor apraxia causing impaired speech, drooling, dysphagia and varying degrees of cognitive impairment. Familial cases are reported although causative genes have not been identified. *LINS* mutations have recently been reported in patients with severe cognitive and language impairment. **Methods:** The proband was diagnosed with WDS at 8 years old because of longstanding drooling, dysphagia and impaired tongue movement. At 14 years old, he remains aphonic, using sign language and typing on a smart-tablet to communicate. Neurological examination including facial and extraocular movement was otherwise unremarkable. MRI brain revealed no heterotopia or atrophy. **Results:** An expanded intellectual disability panel at GeneDx identified nonsense mutations in LINS alleles: c.1096; p.Glu366X and c.1178 T>G, p.Lys393X. Neuropsychological testing at 14 years old noted nonverbal reasoning skills at 5 year old level with relative sparing of his receptive vocabulary and visual attention. Compared to prior testing at 9 years his receptive language improved from a 6 year old to an 8.5 year old level. **Conclusions:** Nonsense mutations of *LINS* have been identified in a patient with WDS. Despite his severe and persistent aphonia, improvements in receptive language were observed with global intellectual functioning better than expected.

P.130

Canadian physician attitudes towards long term EEG monitoring in the neonatal intensive care unit

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doi: 10.1017/cjn.2018.232

Background: Long-term EEG monitoring (LTEM), including amplitude-integrated (aEEG) or conventional EEG (cEEG), is increasingly being used in critically ill neonates. Despite an abundance of studies regarding the clinical utility of LTEM, much is unknown regarding provider attitudes toward this tool. We aimed to evaluate neurologist and neonatologist opinions regarding LTEM in the NICU and describe current Canadian practices. **Methods:** A 15-item questionnaire was developed with input from neonatologists and pediatric neurologists at two Canadian centres. The questionnaire was piloted at our hospital and subsequently distributed to Canadian neonatologists and pediatric neurologists. **Results:** All 16 local respondents use LTEM in the NICU. Neonatologists were more likely to combine aEEG and cEEG, and monitor for longer durations than pediatric neurologists. However, most pediatric neurologists would like to monitor more (71%), compared to neonatologists who were more likely to say that current monitoring practices are sufficient. High rates of neonatologists (88%) and neurologists (85%) are interested in attending an education session on LTEM. **Conclusions:** Preliminary data suggests neonatologists and pediatric neurologists differ in their approach to LTEM. Results from our national questionnaire will be analyzed shortly, and may inform the development of educational materials as well as future studies that involve multi-centre efforts.

P.131

De novo PIK3CB mutation associated with macrocephaly and diffuse polymicrogyria

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doi: 10.1017/cjn.2018.233

Background: Phosphatidylinositol-4,5-bisphosphate 3-kinase catalytic subunit beta (PIK3CB) is a member of the PI3K complex. This complex has two p110 members; PIK3CA (p110a) and PIK3CB (p110b) which are both ubiquitously expressed. PI3K complex functions to phosphorylate PIP2 to PIP3 which activates AKT and subsequently mTOR. PIK3CA mutations have been previously linked with macrocephaly and developmental delay. **Methods:** An 18 month old girl was investigated for severe hypotonia, developmental delay and macrocephaly. Head circumference was >97%ile at birth and 53.0 cm (>99%ile, +5.4 SD) at 13 months old. She had no hydrocephalus or epilepsy. MRI brain (18 months old) re-identified megalencephaly and diffuse polymicrogyria. Symmetric signal abnormality was noted in the periventricular white matter, unchanged between 8 and 18 month images. MR spectroscopy was unrevealing. At 18 months she remains unable to sit independently. Exome sequencing was performed and functional studies to further support variant pathogenicity. **Results:** Exome sequencing identified de novo variant in PIK3CB: c.1735G>T; p.Asp579Tyr. No mutations were noted in other genes known to cause developmental delay, macrocephaly or overgrowth syndromes. Functional studies in patient cells showed dysregulation of PIK3CB and downstream signalling, providing support for causality of this novel disease gene. **Conclusions:** We believe that our patient's macrocephaly (+5.4 SD) and diffuse polymicrogyria results from altered PIK3CB function.

P.132

Redesign of a neuropsychology service in a tertiary pediatric hospital (CHEO)

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doi: 10.1017/cjn.2018.234

Background: Neuropsychological assessments are used in hospitals to examine brain-behaviour relationships, and are an integral part of care for medically complex patients. Unfortunately, waitlists can be lengthy. We gathered information regarding best-practice guidelines and physician referral patterns in an effort to better manage the neuropsychology waitlist at a pediatric hospital. **Methods:** We conducted: 1) A semi-structured telephone survey with 4 Canadian, pediatric, hospital-based neuropsychology services; 2) An electronic survey distributed to referring physicians at CHEO; 3) A focus group for CHEO neurologists and neurosurgeons. **Results:** The telephone survey indicated that there are no clear, best-practice guidelines for pediatric neuropsychologists working in a tertiary, pediatric hospital. The electronic survey revealed some confusion about neuropsychology services and indicated the need for better communication between neuropsychology and referral sources. The focus group revealed that demand for neuropsychology services far outstrips supply and confirmed the need for better communication. **Conclusions:** The results confirmed the need for best-practice guidelines to be developed around delivering neuropsychology services within a pediatric tertiary care setting, as well as continuing to work closely with neurology and neurosurgery to ensure that the neuropsychological needs of their patients are met.

P.133

Expanding the phenotype of TRNT1 mutations to include Leigh syndrome

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doi: 10.1017/cjn.2018.235

Background: Children with biallelic mutations in *TRNT1* have multi-organ involvement with congenital sideroblastic anemia, B-cell immunodeficiency, periodic fevers, and developmental delay (SIFD) as well as seizures, ataxia and sensorineural hearing loss. The *TRNT1* gene encodes the CCA-adding enzyme essential for maturation of both nuclear and mitochondrial transfer RNAs accounting for phenotypic pleitropy. Neurodegenerative Leigh syndrome has not been previously reported. **Methods:** Case summary: A Portuguese boy presented with global developmental delay, 2 episodes of infantile Leigh encephalopathy at 8 mo and 4 yr responsive to high-dose steroids, slow neurodegeneration of cognitive, language and motor functions with optic atrophy, pigmentary retinopathy, spasticity, dystonia, and focal dyscognitive seizures, pancytopenia, transfusion dependent sideroblastic anemia, recurrent febrile infections (pulmonary, gastrointestinal), hypernatremia, with tracheostomy dependence at age 5 yr, malabsorption and TPN dependence at 9 yr, and survival to early adulthood. Neuroimaging showed symmetric hemorrhagic lesions in the thalamus, brain stem (periaqueductal grey) and cerebellum consistent with Leigh syndrome but no lactate peak on MRS. **Results:** Whole exome sequencing identified a homozygous missense pathogenic variant in *TRNT1*, c.668T>C (p.I223T) in the affected individual. **Conclusions:** This report expands the neurological phenotype of *TRNT1* mutations and highlights the importance of considering this gene in the evaluation of Leigh syndrome.

P.134

Infantile Onset Multisystem Neurologic, Endocrine and Pancreatic Disease: case series and review

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doi: 10.1017/cjn.2018.236

Background: We report three brothers born to consanguineous parents of Syrian descent with a novel homozygous c.324G>A (p.W108*) mutation in PTRH2 that encodes mitochondrial peptidyl-tRNA hydrolase 2. Mutations in PTRH2 have recently been identified in the autosomal recessive condition, Infantile Onset Multisystem Neurologic, Endocrine and Pancreatic Disease (IMNEPD). To our knowledge, this is the first case of IMNEPD described in a Canadian centre. **Methods:** Clinical phenotyping enabled a targeted approach in which all exons of PTRH2 were sequenced. We identified a novel mutation and compared our patients with those recently described. **Results:** We identified a homozygous nonsense mutation in PTRH2, c.324G>A (p.W108*). This G to A mutation results in a premature stop at codon 108 that produces a truncated protein, removing most of the amino acids at the enzymatic active site. This mutation is not

listed in the human Gene Mutation Database Cardiff, NCBI dbSNP, 1000 Genomes, Exome Variant Server or ClinVar and is a rare variant listed in gnomAD. **Conclusions:** In IMNEPD, nonsense mutations in PTRH2 appear to cause severe disease with postnatal microcephaly, neurodevelopmental regression, and ataxia with additional features of seizures, peripheral neuropathy, and pancreatic dysfunction, whereas missense mutations may produce a milder phenotype. The spectrum exhibited by our patients suggests variable expressivity with PTRH2 mutations.

P.135

Autism-associated mutations in SHANK2 increase synaptic connectivity and dendrite complexity in human neurons

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doi: 10.1017/cjn.2018.237

Background: Heterozygous loss-of-function mutations in the synaptic scaffolding gene *SHANK2* are strongly associated with autism spectrum disorder (ASD). However, their impact on the function of human neurons is unknown. Derivation of induced pluripotent stem cells (iPSC) from affected individuals permits generation of live neurons to answer this question. **Methods:** We generated iPSCs by reprogramming dermal fibroblasts of neurotypic and ASD-affected donors. To isolate the effect of *SHANK2*, we used CRISPR/Cas9 to knock out *SHANK2* in control iPSCs and correct a heterozygous nonsense mutation in ASD-affected donor iPSCs. We then derived cortical neurons from SOX1+ neural precursor cells differentiated from these iPSCs. Using a novel assay that overcomes line-to-line variability, we compared neuronal morphology, total synapse number, and electrophysiological properties between SHANK2 mutants and controls. **Results:** Relative to controls, *SHANK2* mutant neurons have increased dendrite complexity, dendrite length, total synapse number (1.5-2-fold), and spontaneous excitatory postsynaptic current (sEPSC) frequency (3-7.6-fold). **Conclusions:** ASD-associated heterozygous loss-of-function mutations in *SHANK2* increase synaptic connectivity among human neurons by increasing synapse number and sEPSC frequency. This is partially supported by increased dendrite length and complexity, providing evidence that SHANK2 functions as a suppressor of dendrite branching during neurodevelopment.

Spine and Peripheral Nerve surgery

P.136

Quantifying potential sources of delay in surgical management of cervical spondylotic myelopathy

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doi: 10.1017/cjn.2018.238

Background: Cervical spondylotic myelopathy is a degenerative condition with a variable clinical course. We aim to quantify the sources of potential delay in management and understand how the timing of these events may affect quality of life measures. **Methods:** The Canadian Spine Outcomes Research Network Registry was used to identify patients older than 18 years of age and have received cervical decompression surgery from January 1, 2013 to March 1, 2016. The primary outcome was the Short Form-12 Physical Component Score at 12-month follow-up. Four time groups were identified: 1) duration of symptoms, 2) time awaiting surgical consult, 3) time spent monitoring symptoms, and 4) time awaiting surgery. Multivariate regression was used for analysis. **Results:** A total of 208 patients were identified. The mean age was 59.5 years. 61.53% of patients had symptoms for >12 months at initial consult. Mean time awaiting surgical consult, monitoring symptoms, and awaiting surgery was 77.2, 60.9, and 46.9 days, respectively. Time awaiting surgery (β=-0.032, p=0.04) was a significant factor for change in Physical Component Score. **Conclusions:** We found time awaiting surgery to be a significant factor on PSC score at 12-month follow-up. Increased time awaiting surgery may result in negative impacts on quality of life outcomes.

P.137

Use of intravenous fluorescein for intra-operative localization of an intramedullary spinal cord tumour; a technical note

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doi: 10.1017/cjn.2018.239

Background: Localization of intramedullary spine tumors can be difficult. Various intraoperative aids have previously been described, but have limited use due to expense, complexity, and time. Intravenous fluorescein is an inexpensive and safe drug that may be useful in the localization of such tumors. We describe a technical description of the intra-operative use of fluorescein as an aid in the localization of a intramedullary spine tumour. **Methods:** In this technical report, the authors present a case example of a 56 year old man presenting with a intramedullary tumor at the level of C5/6. Intraoperatively intravenous Fluorescein was administered and the Pentero microscope BLUE™ 400 feature was used to accurately identify the lesion. Multiple biopsies of the fluorescent tissue were taken. **Results:** After 10 cardiac cycles the fluorescent coloring was isolated to what was thought to be the intramedullary lesion. Our myelotomy was made based on the uptake of this fluorescent coloring and multiple biopsies were taken. Final pathology confirmed this tissue was consistent with a high grade glioma. **Conclusions:** The use of intravenous fluorescein was a valuable aid in localizing the lesion and minimizing the size of our myelotomy. The use of intravenous

fluorescein to localize high grade intramedullary spinal cord tumours appears to be safe, accurate, and inexpensive.

P.138

Minimally invasive treatment of syringomyelia using tubular retractors

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doi: 10.1017/cjn.2018.240

Background: Multiple modalities have been used in the treatment of syringomyelia, including direct drainage, shunting into peritoneal, pleural and subarachnoid spaces. The authors report their experience of surgical treatment of syringomyelia in a minimally invasive fashion. **Methods:** We conducted a single-center retrospective chart review on our syringomyelia cases treated with minimally invasively using Metrx Quadrant retractor system since January 2011. Lateral fluoroscopy was used to guide the placement of the retractor onto the lamina of the corresponding level. This was followed by laminectomy and a small durotomy. Once the syrinx cavity was identified and the proximal end of the tubing was inserted into the syrinx cavity, the tubing was tunneled into the pleural incision subcutaneously. Insertion of the pleural end of the shunt was performed under the microscope, with removal of a small amount of the rib at its upper edge. **Results:** 10 procedures were performed in 7 patients by the senior author. Etiologies of syringomyelia included Chiari malformation, trauma, diastematomyelia and kyphoscoliosis. All patients improved neurologically. No patients had immediate postoperative complications. One patient underwent two revisions of syringopleural shunts due to multilobulated nature of syringomyelia. **Conclusions:** Our case series presents a novel, minimally invasive technique for shunting of syringomyelia with results comparable to open procedures.

P.139

Fixation of Type II Odontoid fractures with anterior single screw

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doi: 10.1017/cjn.2018.241

Background: More than 60% of spinal injuries affect the cervical spine,and approximately 20% of all cervical spine injuries involve the axis.The most common axis injury is odontoid fracture. The management of odontoid fractures became less controversial than before. **Methods:** Thirty consecutive patients(25 males and 5 females)who underwent anterior single screw fixation for recent Type II odontoid fractures at King Fahd Hospital,Al-Madina Al-Munawarah,in Saudi Arabia(SA) between January 2004 and December 2007 were included in this study.Data including clinical examination,imaging studies and operative technique were used to analyze the results of this surgical technique. **Results:** Single screw for fixation of type II odontoid fracture was found easier and simpler than double screws with the same advantages.This method resulted in immediate spinal stability and preserves normal rotation at C1–2 in all patients.Radiological evidence of bone union achieved in 22 patients(73% of cases);and nonunion in 8 patients(27% of cases). Complications related to surgical procedure and hardware failure were recorded in 4 patients(13% of cases). **Conclusions:** Direct anterior single screw fixation is an effective,simple,and safe method for treating type II odontoid fractures.It is associated with rapid patient mobilization,minimal postoperative pain,and shorter hospital stay.By this technique,the required anatomical and functional outcome can be obtained through immediate stability of the axis,preserves C1–2 rotatory motion,and achieved high union rate.

P.140

A new international nomenclature of far and extreme lateral approaches to the craniocervical junction

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doi: 10.1017/cjn.2018.242

Background: Far and extreme lateral approaches have become a mainstay treatment for lesions located at the anterolateral aspect of foramen magnum and its vicinity. However, there is a significant discrepancy between authors on what these approaches truly are, which leads to producing papers naming different techniques the same and same techniques differently. **Methods:** We performed literature search employing PubMed-MEDLINE and Scopus databases. The search terms referred to the nomenclature of far lateral approach (FLA), extreme lateral approach (ELA), and their variants. Finally, important papers on the topic from article references were also included, if deemed contributory. **Results:** In total, 37 articles were collected. Surprisingly, we found that not a single paper has addressed the confusing nomenclature directly yet. Nine truly separate variants of FLA and ELA were found. We implemented them intraoperatively depending on both patient and lesion characteristics. The essence about each is summarized. **Conclusions:** In the CNSF meeting, we will shortly discuss causes behind confusion and debate each FLA and ELA variants according to a number of authors and their unique yet sometimes confusing understanding of the approaches. Ultimately, a logical proposal for the unification is provided to stir up discussion

P.141

Is occipito-condylar screw a better alternative fixation point for occipitocervical stabilization? 1. Review of the literature

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doi: 10.1017/cjn.2018.243

Background: Occipitocervical fusion (OCF) using screws and rods offers immediate stability and an high fusion rates. However, multiple cranial fixation points are required in order to compensate for the poor bony purchase. **Methods:** The aim of this study was to compare the occipital condyle screw with the standard OCF techniques as well as to compare available techniques of the occipital condyle screw insertion. Materials and **Methods:** A comprehensive “Medline” and “Web of science” database search was performed. Cadaveric, radiographic and case studies were included. **Results:** The occipital condyle screw in comparison to the occipital plate enables an increased screw length, greater screw pullout strength, lower profile of the hardware and extended grafting surface. Both constructs have similar biomechanical properties (range of motion restriction, stiffness). Proximity of the vertebral artery and hypoglossal canal

presents the greatest technical challenge of occipital condyle screw. Four surgical techniques with different entry points, cranial-caudal and medial angulations were described. None of these techniques is superior to the other. **Conclusions:** Occipital condyle screw is a viable alternative to standard OCF techniques. Challenges exist due to the proximity of the vital anatomical structures. Choice between four available techniques depends on unique patient's anatomy

P.142

The effect of modern technology on cervical spine biomechanics. Literature review

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doi: 10.1017/cjn.2018.244

Background: The use of smartphones has increased drastically over the last decade. Improper posture, and excessive use have raised concerns about their effect on cervical spine health. **Methods:** MEDLINE database was searched for articles using the keywords: neck pain, musculoskeletal symptoms, cervical spine, cervical biomechanics, mobile phone, cell phone, smart phone, smartphone, mobile device, touchscreen phone. Full-text Articles from 1990 to 2017 were included. Statistical comparisons and tables are provided when appropriate. **Results:** 43 articles were included for review. First article was published in 2002. Majority of studies were published between 2010 – 2017 (36 vs. 5 in 2000-2010). Studies included were of cross-sectional, experimental, or systemic review design. No longitudinal studies were identified. We categorized articles into 5 subgroups; we found 14 biomechanical studies, 10 electromyographic studies, 5 ergonomical studies, 14 clinical studies, and no surgical studies. **Conclusions:** Text-neck posture leads to significant changes in cervical spine biomechanics. Increased compressive load, anteroposterior shear load, and high cervical extensor muscles activity were associated with forward flexed neck posture adapted by smartphones users. Neurosurgeons need to take the abnormal posture and load distribution into consideration when planning for surgical interventions, especially in young adults with history of excessive use of smartphones.

P.143

Spinal cord intramedullary malignant peripheral nerve sheath tumour: case report and review of literature

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doi: 10.1017/cjn.2018.245

Background: Malignant peripheral nerve sheath tumours (MPNST) are uncommon but aggressive neoplasia associated with radiation exposure and neurofibromatosis (NF). These tumours are often found in the trunk, extremities, head and neck, with capacity to metastasize. Only a handful of case reports have described intramedullary spinal cord MPNST. **Methods:** We report the case of a 35 year-old female who presented with progressive gait disturbance and paraparesis. MRI of the spine demonstrated an enhancing intramedullary mass at the C7 vertebra. Laminectomy with expansile duraplasty, and extended surgical biopsy were performed for cord decompression and tissue diagnosis. **Results:** Pathological sections demonstrated a spindle cell neoplasm with nuclear atypia, frequent mitotic figures, focal necrosis, and infiltration into adjacent neurological tissue. It was positive for S100, SOX10, p53 with partial loss of INI-1. Diagnosis of spinal intramedullary MPNST was confirmed, however given the prior history of remote trigeminal MPNST, it was unclear whether the mass represented a delayed metastasis, or a de novo neoplasm. **Conclusions:** Typically relegated to the periphery, our case represents a rare spinal medullary presentation of MPNST. While the differential for tumours in this location typically includes diffuse astrocytomas, ependymomas, and rarely schwannomas, we move that consideration of MPNST in select high risk cases advise surgical planning and subsequent therapy.