THE DEPARTMENT OF CLINICAL NEUROLOGICAL SCIENCES, WESTERN UNIVERSITY PRESENTS

2023 CNS RESEARCH DAY

TUESDAY, MAY 16, 2023
8:00 AM TO 4:00 PM

KING'S UNIVERSITY COLLEGE, LONDON, ONTARIO

WELCOME

On behalf of Department of Clinical Neurological Sciences and the CNS Research Committee, I am pleased to welcome you to the 2023 CNS Research Day on Tuesday, May 16th at King's University College in London Ontario.

Research Day was established in 2004 with the goal of promoting research, collaboration and continuing education within the Department, institution and beyond. Our event allows members of the Department to share their passion for research and present their current research. Attendees have the opportunity to learn about clinical and basic research advances that push forward topics in the neurosciences, specifically in neurology and neurosurgery.

This year, we have over 50 abstracts submitted by clinical fellows, post-graduate students, residents, medical students and other undergraduate students. We have planned an exciting and interactive day that exemplifies the great research within our Department. The event will include a blend of oral and poster presentations, Q&A periods and our Keynote Address by Dr. Christopher Honey.

I would like to take a moment to highlight our industry sponsors; Roche and Surgi-One for their generous contribution. We are very thankful of your continued support of our research initiatives and Department in general. We welcome some of our industry members here today and hope you have a great time.

Lastly, I would like to thank our Judges for their commitment, Amanda at King's University, Michelle at Aramark and Adam our AV Support. Thank you to Dr. Elizabeth Finger, Director of Research and the CNS Research Committee for their design of this year's program, and to Alexandra Kylindris for her incredible planning of today's events.

I hope you have an enjoyable experience and I am looking forward to a great event.

Sincerely,

David A. Steven, MD, MPH, FRCSC, FACS
Professor of Neurosurgery
Richard and Beryl Ivey Chair
Department of Clinical Neurological Sciences
London Health Sciences Centre and
Schulich School of Medicine & Dentistry
Western University

EVENT ITINERARY

8:00 to 8:20 a.m.	**Registration and Continental Breakfast**	**Garron/Spriet Lounge**
8:25 to 8:35 a.m.	**Opening Remarks** Dr. David Steven, Richard and Beryl Ivey Chair, Department of Clinical Neurological Sciences	**Kenny Theatre**
8:40 to 9:35 a.m.	**Keynote presentation** *The Vagal Rhizopathies: 2 new diseases that bridge ENT and Neurosurgery"* Dr. Christopher Honey, Professor and Head of the Division of Neurosurgery, University of British Columbia	**Kenny Theatre**
9:35 to 9:50 a.m.	**Refreshment Break**	**Garron/Spriet Lounge**
9:55 to 11:05 a.m.	**Oral Presentation Session #1** *A series of 5-minute presentations. Each presenter will be allotted 3 minutes for questions.* *PLAT-1 to PLAT-7*	**Kenny Theatre**
11:10 to 11:35 a.m.	**Oral Parallel Poster Session #1** *A series of 2-minute presentations.* *Q&A will commence during refreshment break* *POST-1 to POST-15*	**Basement Classrooms KC 005 & KC 006**
11:35 to 11:50 a.m.	**Refreshment Break** (continued) *Poster presentation Q&A*	**Garron/Spriet Lounge**
11:55 a.m. to 1:05 p.m.	**Oral Presentation Session #2** *A series of 5-minute presentations. Each presenter will be allotted 3 minutes for questions.* *PLAT-8 to PLAT-14*	**Kenny Theatre**

EVENT ITINERARY *(continued)*

1:05 to 1:50 p.m.	**Lunch**	**Garron/Spriet Lounge**
1:55 to 3:00 p.m.	**Oral presentation Session #3** *A series of 5-minute presentations. Each presenter will be allotted 3 minutes for questions.* *PLAT-15 to PLAT-20*	**Kenny Theatre**
3:05 to 3:30 p.m.	**Oral Parallel Poster Session #2** *A series of 2-minute presentations.* *Q&A will commence during refreshment break.* *POST-16 to POST-31*	**Basement Classrooms KC 005 & KC 006**
3:30 to 3:50 p.m.	**Refreshment Break** *Poster presentation Q&A*	**Garron/Spriet Lounge**
3:55 to 4:00 p.m.	**Closing Remarks and Awards** Dr. Elizabeth Finger, Research Director, Department of Clinical Neurological Sciences	**Kenny Theatre**

*During the refreshment breaks, poster presenters will be asked to stay beside their poster board for questions and discussion

KEYNOTE ADDRESS
DR. CHRISTOPHER HONEY

Dr. Christopher Honey is Professor and Head of the Division of Neurosurgery at the University of British Columbia. He obtained his medical degree from the University of Toronto and his doctoral degree from Oxford University as a Canadian Rhodes Scholar. He completed his Royal College training in neurosurgery in Vancouver in 1995 and became a diplomat of the American Board of Neurological Surgeons in 2000. He has completed an additional year of training at Harvard Medical School and is a Scholar in Surgical Leadership.

His research is focused on the treatment of movement disorders and pain. He headed the world's first trial of DBS for spasmodic dysphonia and published the results in 2021. He was the first physician to recognize and successfully treat hemi-laryngopharyngeal spasm (HELPS syndrome) in 2014. He discovered and successfully treated the first person in the world with VANCOUVER syndrome in 2019. He has made fundamental changes to the understanding of human pain pathways.

In 2016, Dr. Honey was elected the President of the Canadian Neuromodulation Society (2016-2019) and elected President of the British Columbia Section of Neurosurgeons (2016-2019). In 2018, Dr. Honey was elected President of the World Neurosurgical Federation for Cranial Nerve Disorders. This group studies conditions such as Trigemnial Neuralgia, Hemifacial Spasm, Glossopharyngeal Neuralgia and the newly described Hemi-Laryngopharyngeal Spasm (HeLPS) and has a major interest in Microvascular Decompression (MVD) neurosurgery.

Dr. Honey continues to work with the Canadian Football League Players Association and is their Neurological Director.

Dr. Honey has been invited to lecture at Universities and Meetings around the world (over 200 presentations on 6 continents). He has a strong commitment to teaching and has had the pleasure to train 25 neurosurgeons from around the world during their one-year fellowship with him in Vancouver. He has provided pro bono, humanitarian surgical care in Liberia (performing the first successful brain tumor removal, the first spine operation, and the first pediatric shunt) and in Ghana. He has been invited to operate in China, Indonesia, and performed the first DBS in Kuwait.

Dr. Honey's book, The Tenth Nerve, published by Penguin Random House Canada, is now available at Indigo, local bookstores and drchrishoney.com. It is an homage to seven patients who taught him more about medicine than a lecture or textbook.

JUDGES

In addition to having our esteemed Keynote Dr. Christopher Honey we are thrilled to announce our 2023 judges;

DEEPA DASH, MBBS, MD, DM (NEUROLOGY)

Dr. Deepa Dash completed her neurology residency at All India Institute of Medical Sciences, New Delhi and was an academic faculty in the same institute up till 2019. She subsequently completed a fellowship in movement disorders at the University of Ottawa. She has expertise in diagnosis and clinical management of patients with complex movement disorders and also in implementation of advanced therapies like deep brain stimulation and continuous infusion of levodopa/carbidopa intestinal gel. During her fellowship, she was awarded grant from Parkinson's Society of Canada to pursue research in understanding the impact of an integrated care program on people with Parkinson's disease. She has also gained training in clinical epidemiology and completed Graduate Diploma in Clinical Epidemiology from McMaster's University. She has authored over 50 peer-reviewed publications and is a reviewer in many reputed journals.
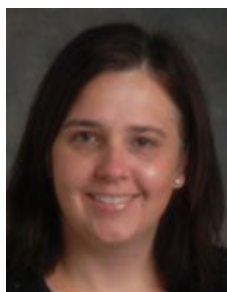
JENNIFER MANDZIA, MD, PHD, FRCPC

Dr. Jennifer Mandzia completed her PhD training in Neuroscience with Dr. Sandra Black at the University of Toronto. Her doctoral thesis was on functional MRI (fMRI) in patients with Mild Cognitive Impairment (MCI) and structural neuroimaging correlates. She then received her MD from the University of Ottawa and completed her Neurology training at Western University. After residency, Dr. Mandzia undertook a year of fellowship in Cerebrovascular Disease, at the University of Calgary Stroke Program, before returning to London to join the Department as a staff neurologist specializing in Stroke in 2013.

JOSEPH MEGYESI, MD, PHD, FRSCS

Dr. Joseph Megyesi received his MD from Western University in 1985. He then completed a comprehensive surgical internship and a Master's degree in Biochemistry, also at Western University. He did his neurosurgical residency at the University of Alberta in Edmonton, where he also received his PhD degree in Experimental Surgery. As part of his training, Dr. Megyesi completed a fellowship at Harvard University. Dr. Megyesi joined the Clinical Neurological Sciences Department at Western University in 1998 and specializes in neurosurgical oncology. He is chairman of the Scientific Program Committee at the Canadian Neurological Sciences Federation, sits on the Continuing Professional Development Committee at the Royal College of Physicians and Surgeons of Canada and is past-chairman of the board of the Brain Tumour Foundation of Canada. He is currently Professor in the Division of Neurosurgery at Western University.

EVENT SPONSORS

We would like to thank our event sponsors for their contribution to the 2023 CNS Research Day. We are appreciative of your continued support of this event and our Department. We look forward to future collaboration!

ORAL PRESENTATIONS

Implementing a Fatigue Risk Management (FRM) Strategic Plan – Pilot on the Stroke CTU

A. Gibson, M. Anello, A. Branch, R. Bessemer, C. Hue, R. Sawaya, P. Shah, L. Mai, J. Mandzia, M. Jenkins, L. Baker-Spiller, T. Taylor, A. Florendo-Cumbermack

Importance: Fatigue is a feeling of physical and mental tiredness, resulting in reduced alertness, cognitive processing, and impaired task performance. "Fatigue is an occupational risk in medical education that impacts residency training and workplace health and safety, with potential implications for patient safety." Duration of continuous work is directly related to physical fatigue and working 24 consecutive hours is likened to functioning with a blood alcohol level above the legal limit. 5-36% of resident errors are attributable to fatigue while 20% of fatal motor vehicle collisions are attributable to driver fatigue. FRM will soon be part of Royal College residency program accreditation, and the 2021 Neurology Residency Program evaluation identified fatigue as an issue most noticeable on the Stroke CTU and the holiday block.

Objective(s): To pilot implementation of a multifaceted FRM framework to reduce fatigue and its impact on neurology residents and patients.

Design and Participants: Quality improvement methodology was used to identify root causes, and potential solutions for each. 'Reason's Hazard Control Model' applying the principles of defences-in-depth and error management theory was used to stratify causes and solutions into fatigue-reduction and fatigue-proofing strategies.

Surveys of faculty, residents, and nurses and focus groups with residents were conducted:

- Root causes were grouped into categories and a Pareto chart used to identify PDSA targets.
- Perception of fatigue and existing fatigue-proofing strategies were identified.
- For the holiday block, resident:patient ratios were tracked and perceived impact on resident wellbeing and patient care was quantified.

Results:

- Human resources, workload, and communication systems identified as primary contributors to fatigue.
- Resident to patient ratios during the holiday block improved to 1:6 from >1:8 resulting in perceived improvement in resident wellbeing and patient care.
- Residents recognized fatigue in themselves when they experienced cognitive and attention issues while nurses noted resident fatigue when they recognized safety concerns.
- A number of specific fatigue proofing strategies identified by residents and nurses were implemented by participants

Conclusion and Relevance: The FRM strategies implemented have resulted in improved resident:patient ratios and perception of improved resident wellness and patient care. The group will continue to refine strategies and implement additional changes.

Mental Health in Epilepsy Patients After Neuromodulation Therapy

T. Newman, K. MacDougall, J. Lau, J. Burneo, A. Suller Marti

Importance: Epilepsy has direct consequences on psychological well-being with about 20-30% of patients with epilepsy experiencing symptoms of depression. Although vagus nerve stimulation (VNS) is used for medically resistant epilepsy (MRE) and deep brain stimulation (DBS) for different psychiatric diseases, the real effect of these therapies remains unknown, along with the potential benefits these therapies may have on mental health outcomes.

Objective(s): The objective of this study is to analyse the effect on mood in patients who receive VNS or DBS as therapies for MRE.

Design and Participants: A prospective study collecting patients with MRE who underwent VNS or DBS. NDDI-E questionnaires are completed before implantation and at 6 months. The inclusion criterion is to be implanted with VNS or DBS in our Epilepsy Program at Western University since January 2020. Additionally, patients must have filled out both the baseline and 6-month questionnaires to be included in this study. A total of 32 out of 46 patients had completed the 6-month questionnaires, with the mean age of 35 and 50% females. From those patients, 26 were implanted with VNS and 6 with DBS.

Results: A total of 32 patients were implanted with the mean age of 35 and 50% were females. From those patients, 26 were implanted with VNS and 6 with DBS. 21 patients were diagnosed with depression in the VNS group and 5 in the DBS group. The average baseline NDDI-E score in the VNS group was 16 and 18 in the DBS. The 6-month NDDI-E score in the VNS group was 15 and 14 in the DBS. Therefore, the NDDI-E scores decreased by 6.25% for VNS and 22% for the DBS. Although the DBS group was smaller, the NDDI-E results were better in the DBS compared to the VNS.

Conclusions and Relevance: Depression is a concern among patients with epilepsy. DBS is associated with better depression results at follow-ups. Longer follow-ups and larger data sets are needed to further understand the impact of neuromodulation devices in mental health.

Predicting outcome of acutely brain injured patients using movies in the intensive care unit: a functional near-infrared spectroscopy study

M. Kolisnyk, S. Novi, A. Abdalmalak, K. Kazazian, R.M. Ardakani, G. Laforge, L. Norton, T.E. Gofton

Importance: Predicting the functional outcomes of patients following an acute brain injury remains a substantial clinical challenge. In the absence of reliable measures of recovery, clinicians and families must make life-altering decisions about the withdrawal of care with suboptimal information.

Objective(s): This study measures the effectiveness of task-based neural measures obtained from functional near-infrared spectroscopy (fNIRS), a portable neuroimaging modality that can be acquired at the bedside, for predicting functional recovery in unresponsive and acutely brain-injured patients.

Design and Participants: In this cohort study, a consecutive sample of acutely brain-injured patients in the intensive care unit were enrolled from University Hospital (London, Canada). Each patient listened to a 5.5-minute (intact) movie clip as well as a scrambled version of that clip. The use of movie clips has been used previously to observe for residual cognition in unresponsive patients outside of the ICU, as it can index the preservation of attention, language comprehension, plot following, and suspense. Indeed, by observing whether changes in oxy- and deoxygenated hemoglobin observed during the movie clips synchronize with controls (n = 21), we can estimate preserved neural functioning that is associated with higher-order cognition. To measure whether patients' neural synchrony is similar to controls, we first trained 20 machine-learning algorithms to identify synchronization patterns in controls. Then the algorithms were then tested on individual patient's data. Patients whose intact and scrambled conditions could be significantly predicted from healthy control data were hypothesized to be more likely to experience neurologic recovery. Functional recovery is measured with the Glasgow Outcome Scale (GOS).

Results: Eleven patients (Mean Age=61.67, Range=41-78) participated in this study. Six of eleven patients showed synchronization similar to controls (all $p < .001$). Since patient testing and data analysis is ongoing, we are blinded to the GOS scores with the exception of two patients (both of whom were correctly predicted). One patient who was highly synchronized with controls regained consciousness and confirmed participating in the task, whereas the second did not recover.

Conclusion and Relevance: This tool shows initial promise as a tool for prognosis of acutely-brain injured patients, which might aid in the discussion surrounding the withdrawal of life-sustaining measures.

The Primate Lateral Prefrontal Cortex as a Brain Machine Interface Target

M. Abbass, B. Corrigan, R. Johnston, R. Gulli, A. Sachs, J. Lau, J. Martinez-Trujillo

Importance: The primate lateral prefrontal cortex (LPFC) is involved in context dependent goal directed behaviour, and processes multimodal visuospatial information related to gaze direction. The role of the LPFC as a potential target for brain-machine interfaces (BMI) to provide salient goal-related information remains to be explored.

Objective(s): To determine whether the LPFC can provide real-time salient information during a naturalistic navigation task which can be incorporated into a BMI.

Design and Participants: Two rhesus macaques were trained to navigate a virtual reality environment using a joystick while learning a context-target association rule. We implanted each monkey with two 96-channel Utah arrays (Blackrock Microsystems) in the LPFC (areas 9/46 and 8a) to simultaneously record from multiple single neurons. Single neuron responses to task features were assessed using multivariate linear regressions, and task features were classified from neural data using support vector machines.

Results: We recorded from 813 neurons in the LPFC as the macaques navigated through the maze. Neurons in the LPFC robustly encoded relevant features, including eye position and task features such as the context and target. Neurons in the dorsal and ventral LPFC had different tuning profiles and temporal dynamics (Chi-Square, $\chi = 26.18$, $p < 0.001$), with the ventral LPFC preferentially representing visual task-features. Task features could be decoded with accuracies significantly above chance, with the following accuracies (± 95% CI): chosen side 88.1% (84.8%-91.4%), chosen target 75.5% (70.9%-80.0%) and context 70.3% (66.2%-74.4%).

Conclusions and Relevance: The LPFC robustly encoded relevant visuospatial features in a complex and naturalistic environment. This work also further emphasizes functional differences between the dorsal and ventral LPFC and is the first study to examine anatomical differences in function during a naturalistic task. This suggests that relevant task features could be decoded from neural activity in the LPFC, and this area may serve as a useful target for BMIs.

Using fNIRS to Quantify Resting State Functional Connectivity in Critically Brain Injured Patients

I. Gupta, A. Abdalmalak, S. L. Novi, M. Kolisnyk, K. Kazazian, L. Norton, D. B. Debicki, A. M. Owen

Importance: Up to 15% of unresponsive patients with critical brain injuries in the ICU that are believed to be unconscious show some signs of awareness. Innovative neuroimaging techniques have been developed to aid in patient diagnosis and prognosis in this population, however, there remains a need to develop objective and robust tools that can be used to predict patient prognosis and outcome.

Objective(s): By applying graph-theoretical analyses, this study quantifies resting-state functional connectivity using functional near-infrared spectroscopy (fNIRS) in patients with ischemic brain injuries. Mathematically calculated global network parameters (GNPs) were used to objectively describe whole brain network connectivity.

Design and Participants: Resting-state data was collected using a full head coverage, 129-channel fNIRS system. Data was collected for 6 minutes from a consecutive sampling group of unresponsive patients in the ICU with critical brain injuries and a convenience sampling group of healthy controls. Patients were tested within the first 10 days after ICU admission. Eligibility included patients between the ages of 18-75 with brain injuries that rendered them unresponsive (Glasgow Coma Scale score ≤ 8). Patients that were medically unstable, had pre-existing neurological disorders, craniotomies, or hemorrhages were excluded due to risk of deterioration during imaging. To date, data has been collected for 14 patients (ages 55-78) and 25 healthy controls (ages 20-31). It is expected that patients will have graphs that differ significantly when compared to healthy controls.

Results: The average clustering coefficient, a GNP that describes the local connectivity and information flow within the brain, for the patient group is 0.5766 (± 0.0893) and for the healthy control group is 0.5836 (± 0.0845). Surprisingly, both groups have similar patterns of connectivity, despite differing states of consciousness.

Conclusions and Relevance: So far, graph theory looks promising for quantifying brain network connectivity and research will continue to investigate additional global and local network parameters for brain connectivity differences. This study will enhance the understanding of brain connectivity in patient populations, ultimately helping clinicians and family members make more informed and scientifically supported decisions when it comes to patient care.

Investigation of changes in cortical thickness in First Time Unprovoked Seizure Subjects

K. Motlana, E. Pendragon, A. Khan, S. Mirsattari

Importance: An epilepsy diagnosis after a First Time Unprovoked Seizure (FTUS) could help to alleviate the anxiety brought on by epilepsy uncertainty and allow for quicker medical intervention, reducing subsequent seizure occurrence. Establishing an additional epilepsy diagnosis method will also identify any cases of epilepsy the established methods, electroencephalogram (EEG) identified epileptiform discharges and epileptogenic lesion detection, might miss.

Objective(s): This research aims to determine if changes in cortical thickness can be used as a potential biomarker for epilepsy in FTUS patients.

Design and Participants: This cross-sectional study compared the 7T Magnetic Resonance Imaging (MRI) scans of FTUS patients with those of age-matched and sex-matched healthy controls. Adult patients were referred to this study from the London Health Sciences Centre after having experienced their first unprovoked seizure and receiving a clinical 1.5T or 3T MRI scan. Upon acceptance into the study, the subjects underwent a 7T MRI scan. Participants were excluded from the study if they experienced a second seizure before the 7T MRI scan or received a formal epilepsy diagnosis during their initial clinical visit or via additional testing before the 7T scan. One FTUS subject was rejected due to epileptogenic lesion detection in a 7T MRI scan. The cortex was parcellated using the Schafer 200 parcel, 17 network map and cortical thickness was measured via FreeSurfer software.

Results: 17 FTUS participants and 17 healthy controls were recruited. The data was analyzed by comparing the cortical thicknesses of the two subject groups using a two-tail t-test comparison and the false discovery rate (FDR) multiple comparison correction. There were no statistically significant differences between the participant groups. However, the data showed a trend indicating that the FTUS patients displayed slight cortical thickening in the pre-frontal, somatosensory, parietal and temporal areas.

Conclusions: While there is a slight trend of differences in cortical thickness between FTUS subjects and healthy controls, the difference is not significant. Future research should focus on pairwise comparisons of FTUS subjects and their matched controls, network-based comparisons and comparisons of only confirmed epilepsy subjects and their control counterparts to establish further and potentially eliminate cortical thickness as a potential biomarker for epilepsy.

An fMRI assessment of the effects of GPi and STN stimulation on brain networks.

B. Santyr, J. Germann, A. Ajala, J. Qiu, A. Boutet, A. Lozano

Importance: Stimulation at the globus pallidus internus (GPi) in Parkinson's disease (PD), results in similar motor benefits, however without the decline in mental speed, attention, and language that can be seen following subthalamic nucleus (STN) DBS. The mechanism of action and the consequences of stimulating at these different sites on brain network activity is not well understood.

Objective(s): Functional magnetic resonance imaging (fMRI) has been proposed as a personalized biomarker of treatment efficacy in PD-DBS. Here, we use post-DBS implantation fMRI to investigate differences in stimulation blood oxygen level-dependent (BOLD) response between STN and GPi stimulation. We assess differences at 16 ROIs previously used in building an optimal stimulation classification model and determine its suitability for use in GPi-DBS.

Design and Participants: PD patients (n=66) who underwent DBS surgery (STN=51, GPi=15) were recruited. For each subject, 3 Tesla fMRI was acquired for a duration of 6.5 minutes with a 30-second DBS-ON/OFF cycling paradigm. Scans were performed on the patient's clinically optimal stimulation settings. Statistical parametric maps (t-maps) were estimated for each subject from the preprocessed DBS-fMRI data using the designed 30-second cycling paradigm. These t-maps represent the difference in BOLD response between the DBS-ON and OFF states. DBS-fMRI BOLD response intensities at the 16 ROIs were assessed in STN and GPI-DBS subjects. The mean BOLD response t-value within each ROI was determined and compared between groups. Statistical comparisons were made using Student's T-test and Bonferroni correction for multiple comparisons (α = 0.003125).

Results: Of the 16 ROIs assessed, 15 demonstrate no significant differences between STN and GPI stimulation. The left frontal operculum was the only region significantly different between groups ($p = 0.00036$).

Conclusions and Relevance: The close similarity in BOLD response to GPi and STN stimulation suggests a similar effect on brain network activity and similar mechanism for motor improvement. This finding supports the use of the previously published ML algorithm in predicting optimal stimulation settings for GPi-DBS, although further validation is necessary. BOLD response difference at the left frontal operculum may represent a biomarker of cognitive outcome following DBS

New insights into the use of High Dose of Steroids and Plasmaphersis in MOGAD and NMOSD patients.

N. Kosior, R.L. Perrier, C. Casserly, S.A. Morrow, J.M. Racosta

Importance: Treatment for acute attacks of NMOSD are based on studies for other demyelinating diseases. High dose corticosteroids (HDS) are first line therapy, however studies have shown a role for plasmapheresis (PLEX) in acute steroid resistant NMOSD. Since the discovery of MOGAD treatment of acute attacks is unknown.

Objective(s): Assess the efficacy of treatment regimens (no treatment vs. HDS vs. PLEX) on disability outcome of patients with NMOSD and MOGAD optic neuritis and myelitis.

Design and Participants: We extracted data from the MuSicaL-Nemo database using a mixed Natural Language Processing plus human verification method. We assessed the change in EDSS in patients with MOGAD and NMOSD following myelitis and optic neuritis (ON) episodes, by calculating Wilcoxon-Mann-Whitney Odds (WMW-Odds). We corrected the measurements by disease severity, demographics and other variables of interest.

Results: 11 myelitis and 12 optic neuritis in patients with MOGAD and 30 myelitis and 12 optic neuritis in patients with NMOSD were included. In patients with MOGAD-myelitis receiving high dose of steroids (HDS) the number needed to treat (NNT) was 1.32 ($p=0.002$), while those not receiving any treatment tended to worsen (number needed to harm=3.6, p=NS). In patients with MOGAD-Optic Neuritis the group receiving HDS had an NNT=1.02($p=<0.001$), however those not receiving treatment also tended to improve (NNT=2.08, $p=0.09$). Patients with NMOSD-myelitis treated with HDS had an NNT of 2.29 ($p=0.002$) and those treated with plasma exchange plus HDS(PLEX+), had similar NNT of 2.33($p=0.03$). When correcting for disease severity, both treatments showed lower NNT, however NNT was lower in the group receiving HDS (NNT=1.73, $p=0.002$) than in the PLEX+ group (NNT=1.98, $p=0.02$).

Conclusion: Our study suggests that patients with MOGAD-Optic Neuritis improve without treatment, however they have improvement when using HDS. Patient with MOGAD-myelitis are also responsive to steroids, however, as opposed to MOGAD-Optic Neuritis, they worsened if not treated. In the NMOSD group the use of PLEX in addition to HDS did not demonstrate any significant difference. Contrarily to previous suggestions, when adjusting for groups differences (such as severity), the use of HDS had higher chances to improve as compared to the group using PLEX.

Self-reported cognitive function influences the relationship between vocation and mood on cognitive functioning in persons with multiple sclerosis

Y. Soliman, J. Santo, M. Blair, C. Casserly, J. Racosta, S. Morrow

Background: Cognitive impairment (CI) is common in persons with MS (PwMS). Studies demonstrate CI leads to decreased work responsibility/reprimands or leaving the workforce completely. One previous study suggested that employers may be a mediator in the ability to self-identify CI by acting as a gauge for CI. Additionally, other studies with design/sample size limitations showed mood impacts self-reported CI.

Objective(s): To explore if employment and mood status affects the self-assessment of CI.

Methodology: A retrospective study identifying PwMS who completed the: self-report Multiple Sclerosis Neuropsychological Questionnaire (MSNQ); Hospital Anxiety and Depression Scale-depression scale (HADS-D); Minimal Assessment of Cognitive Function in MS, and had data regarding employment status, classified as employed or unemployed; students and stay-at-home parents were excluded. A structural equation modeling (SEM) approach was taken due to the advantage of examining multiple cognitive outcomes simultaneously while accounting for shared associations. First, a latent factor of memory and executive functioning modeled the error-free associations between both factors and a processing speed task (SDMT). Next, the model tested for the indirect effect of self-reported cognition (MSNQ) on vocation differences in each outcome (memory, speed, and executive functioning). Finally, we tested interactions between MSNQ and HADS-D on each of the outcomes.

Results: We included 590 PwMS: 72.5% female, mean age 49.0 years (SD 10.6), mean disease duration 8.6 years (SD 9.0). The majority (455, 77.1%) had relapsing MS; 357 (60.5%) were employed. About half (301, 51%) did not report CI on the MSNQ; of those, 213 (70.8%) were employed. The mean MSNQ for employed PwMS was 24.5 (SD 10.7) and 29.8 (SD 11.2) for unemployed PwMS. The latent factors of memory and executive functioning were a good fit for the data and were positively related to each other and processing speed. Employed PwMS had significantly better memory, speed, and executive functioning. MSNQ partially mediated the effect of vocation differences on processing speed and executive functioning but not memory. The association between MSNQ with both memory and executive functioning was moderated by depression, meaning that in PwMS with high HADS-D scores, MSNQ was more strongly related to worse memory and executive functioning. The final model was an acceptable fit to the data ($\chi2(84) = 462.45$, p<0.05; CFI = .90, RMSEA = .08, 90%CI [.06, .09], SRMR = .03) explaining 40.7%, 32.5% and 38.7% of the variability in memory, speed and executive functioning respectively.

Conclusion: Employed PwMS more accurately rated their cognition in areas of processing speed and executive function, whereas depressed PwMS with low self-rated cognition displayed poor memory and executive function. Thus, employment and mood may guide the interpretation of self-reported cognition.

Deep brain stimulation targeting using anatomical landmarks and machine learning

A. Taha, G. Gilmore, C. Zajner, A. Ahmed, A. Hadi, S. Wong, M. Abbass, A.R. Khan, J.C. Lau

Importance: A deviation of 2 millimeters (mm) in deep brain stimulation (DBS) electrode positioning could cause more than 60% variability in clinical improvement and may require reimplantation, posing additional risk for patients. The ability to localize DBS targets in the clinic is not always possible because of their small size, lack of contrast due to low magnetic resonance imaging (MRI) scanner field strengths, and patient motion.

Objective(s): We develop a machine learning model that can localize the subthalamic nucleus (STN), the most common DBS target, solely from x, y, and z coordinates of salient and clinically reproducible anatomical landmarks.

Design and Participants: Study Participants. Two locally acquired imaging datasets were used for this study: 1) Stereotactic Neurosurgery (SNSX; 7-T) and 2) London Health Sciences Center (LHSC; 1.5-T). These datasets consisted of Parkinson's disease (PD) patients and age-matched controls. Anatomical Landmarks. Thirty-two validated anatomical landmarks (also called AFIDs) were placed via 3DSlicer 4.10 on T1w images. These AFIDs include salient points in the human brain like the anterior and posterior commissures, and are shown to have inter-rater localization error of 1-2 mm across varying MRI field strengths and neurodegenerative disease. Ground-truth Target. The "ground-truth" STN center was computed from center of mass of segmentations derived from 7-T T2w MRI scans by three expert neurosurgeons and lead author. Model Development. Coordinates of AFIDs were used as features to predict the x, y, and z coordinates of the STN center. Linear (lin-reg) and support vector regression (SVR, linear kernel) models were trained using a leave-one-out strategy. Model Assessment. Euclidean distances (EDs) were used for assessment of model accuracy. We further compared our accuracy to conventional indirect consensus targeting of STN via Wilcoxon rank-sum test (α = 0.05).

Results: Training and Features. Training data consisted of 49 participants (age: 46.2 ± 13.5 years; 23 female) with 15 PD patients (age: 60.1 ± 8.2 years; 7 female) reserved for testing. Principal component analysis of the x, y, and z coordinates yielded a captured variation greater than 90% using top 5 principal components which were selected for subsequent model training. Accuracy. EDs from leave-one-out training strategy were: 1) 1.00 ± 0.47 (lin-reg) and 1.03 ± 0.56 mm (SVR). Meanwhile, ED predictions on the PD testing subset were: 1) 1.23 ± 0.56 (lin-reg) and 1.24 ± 0.60 (SVR). All model predictions were significantly more accurate ($p < 0.01$) than indirect consensus coordinate targeting predictions.

Conclusions and Relevance: We demonstrate a tool that localizes the STN with millimetric accuracy. This tool 1) can accommodate for inter-patient variability, 2) is agnostic to MRI field strength, and 3) uses robust landmarks on T1w scans. Future directions include prediction of challenging targets like the zona incerta.

PLAT-11

*Doesn't consent to having the abstract online

Express visuomotor responses are spared in Parkinson's disease, despite changes in volitional movement

M. Gilchrist, R. Kozak, M. Prenger, K. Van Hedger, B.D. Corneil, P.A. MacDonald

Importance: Parkinson's disease (PD) is a neurodegenerative disorder associated with depleted dopamine in the basal ganglia, causing rigidity, and slowed and reduced voluntary movement. However, recent evidence suggests that a separate, fast visuomotor pathway is preserved. These studies investigate whether the express visuomotor response (EVR) on arm muscles is generated, and modulated according to task instruction in a reaching paradigm, in PD.

Objective(s): The first study aims to determine the effect of PD on the generation of the EVR. We measured arm kinematics and muscle activity during randomly assorted pro-reach (reach towards) and anti-reach (reach-away) trials in patients with PD and healthy controls (HC). The second study aims to determine the effect of PD on the contextual modulation of EVRs by manipulating the timing of the pro- and anti-reach instructional cues to make the task more challenging.

Design: The first study includes 16 PD patients and 18 HC volunteers (M age = 68.5); the second study includes 14 PD patients and 16 HC volunteers (M age = 68.0). EVRs are measured with surface electrodes during a reaching task consisting of randomly assorted pro-reach and anti-reach trials. In study 2, the trial type (pro/anti-reach) is indicated by an instructional cue either 500ms or 1000ms before target onset.

Results: In both studies we found that patients with PD have a higher error rate than HC on anti-reach trials (Study 1: p = .037; Study 2: p < .001), indicating they have more difficulty suppressing stimulus-driven reaches when instructed to reach in the opposite direction. In study 2 we found that this deficit was exasperated with shorter instructional time (p < .001). As expected, in both studies, PD patients had significantly lower peak reach velocity (Study 1: p = .023; Study 2: p = .031) and longer reach duration (Study 1: p = .008; Study 2: p = .015) than HC due to bradykinesia. Despite this deficit in the reaching movements of patients with PD, EVRs were generated at equal prevalence and magnitude to HC on pro-reach trials, indicating that automatic stimulus-driven responses are preserved in PD. Interestingly, on anti-reach trials, PD patients generated EVRs more often (69% of PD participants vs 50% of HC) and of greater magnitude than HC, indicating a deficit in contextual modulation of the EVR in PD patients. In study 2, this deficit was worsened by shortening the instruction time (86% of PD participants vs 62% of HC).

Conclusion: The results of these studies indicate a differential effect of PD on different phases of stimulus-driven movement, suggesting two separate motor pathways are acting on the arm. Although volitional movements are slower and smaller in PD patients, automatic EVRs are preserved and unmodulated according to task instruction compared to HC. These results suggest that the basal ganglia might be involved in the contextual modulation, but not the generation of fast visuomotor responses.

Effect of Neuromodulation for the Treatment of Epilepsy on Sleep Quality

G. Zhai, J. Arts, A. Suller Marti

Importance: Vagus nerve stimulation (VNS) and deep brain stimulation (DBS) are neuromodulation techniques used to treat drug-resistant epilepsy (DRE) who need an alternative treatment to anti-seizure medications or epilepsy surgery. The impact of these devices on patients' sleep remains unknown.

Objective(s): This study examines whether VNS and DBS treatments improve sleep quality in adults with refractory epilepsy.

Design and Participants: Our prospective cohort study identified participants who were candidates for VNS or DBS implantation for the treatment of DRE at the Western Epilepsy Program. Participants completed a baseline (pre-implantation) as well as either a 6- or 12-month post-implantation self-reported evaluation of sleep quality using a standard questionnaire, the Pittsburgh Sleep Quality Index (PSQI). 30 individuals were included in this study; 27 and 14 of whom completed the 6- and 12-month follow-ups, respectively.

Results: 28 (93%) and 2 (7%) of the 30 participants were treated with VNS and DBS, respectively. 15 (50%) of the participants were female and the average age was 37 years (IQR 27 to 49). The average duration of epilepsy to date in the participants was 24 years (IQR 13 to 32). Seizure frequency significantly decreased with treatment over the course of six months by an average of 14.2 events per month (p = .003). The PSQI scores of participants averaged 8.3 at baseline, and 7.1 and 7.0 at 6- and 12-months post-implantation, respectively. There was no significant change in the PSQI scores of all participants after this length of treatment. Nine (33%) of VNS participants reported adverse side effects that necessitated reduction of stimulation parameters, 7 (23%) of whom reported airway constriction. Within participants who experienced no intolerable adverse effects, there was a significant improvement in sleep quality over six months, characterized by a PSQI score reduction of 2.5 points, (p = .002).

Conclusions and Relevance: Neuromodulation is an effective treatment for adults with drug resistant epilepsy. Our preliminary results show that VNS only improved sleep quality in those who did not experience intolerable adverse effects. More data is required through a greater number of participants and longer-term follow-ups to understand the potential impacts of neuromodulation.

The impact of Cortical Stimulation on the Surgical Decision Depending on Electrographic Patterns

H. Kreinter, E. Paredes-Aragon, J. Burneo, S. Mirsattari, M. Jones, D. Steven, J. Lau, D. Diosy, K. MacDougall, A. Suller-Marti

Importance: Cortical stimulation (CS) is increasingly used for functional mapping and seizure onset zone (SOZ) localization. However, it is not a routine practice in all comprehensive epilepsy centers.

Objective(s): To evaluate the impact of performing CS for mapping and seizure onset zone localization as part of the presurgical evaluation in patients with drug resistant epilepsy (DRE) implanted with depth electrodes (DE).

Design and participants: Patients with DRE who were admitted to our Epilepsy Monitoring Unit with DE from October 2018-December 2022 and underwent CS for surgical planning, were included in the study. Demographic data was collected, as well as history of epilepsy, presurgical investigations, results from DE evaluation, CS (time, frequency, location, duration, afterdischarges (ADs)), surgical decision, and outcomes after epilepsy surgery.

Results: 101 patients were implanted with DE and of the 44 that were analyzed, 33 met inclusion criteria. Mean age at implantation was 35 years (19-64 years; SD12), 52% were female(n=23). 22.7% patients(n=10) had their typical seizure during CS. The most frequent reason for SEEG implantation was having lesional epilepsy (n=12, 27.3%) followed by suspicion of more than one foci (n=10, 22.7%). Epilepsy surgery was recommended for 34% of patients included in the study (n= 15). The hypothesis of the epileptogenic zone was correct in 65.9% (n=29) of cases. Afterdischarges did not change the decision for surgery or the final hypothesis ($p > 0.05$). The preferred duration of pulse stimulation was 5 seconds in 56.8% (n=25) and the median CS duration was 90 minutes (10-240min, SD 60). The resection area changed in 29.5% (n=13) of cases after CS was concluded, when compared to initial SOZ hypothesis.

Conclusion and relevance: CS may have an impact on surgical decisions and outcomes of patients with DE implantation and should be encouraged as a part of presurgical planning in all cases.

Exploring the utility of the Western Aphasia Battery in distinguishing clinical phenotypes of primary progressive aphasia

S. Li, R. G. R. Garcia, M. Restrepo-Martinez, M. Berih, S. Yu, R. Mortuza, L. Richardson, A. Kertesz, E. Finger

Importance: There is an unmet clinical and research need for a method of reliably classifying primary progressive aphasia (PPA) into its variants. This would provide insight into the pathogenesis of PPA and associated neurodegenerative conditions such as frontotemporal dementia, and aid in the diagnosis, prognosis, and development of therapeutic or preventative strategies for these devastating conditions.

Objective(s): To explore differences in Western Aphasia Battery (WAB) scoring between the main clinical phenotypes of PPA, and to identify the most salient individual or combined sub-scores in distinguishing between these phenotypes.

Design and Participants: A retrospective chart review study was conducted for patients who presented with progressive language impairment to a Canadian cognitive neurology centre between 1982 and 2010. Clinical and neuropsychological assessments, including WAB scores, were reviewed. A total of 223 patients were included. Of these, patients with early assessment (between 2.5 to 5 years from symptom onset) and typical clinical features (as determined by an expert clinician reviewer) were identified for each major PPA phenotype, based on current diagnostic criteria. The WAB scores for these patients were analyzed by MANOVA and linear discriminant analysis, in order to identify the combination of WAB sub-scores leading to maximum separability of the three PPA phenotypes. These particular sub-scores will be assessed for diagnostic accuracy in distinguishing PPA phenotypes compared with conventional diagnosis by expert clinicians.

Results: Patients with typical presentations of each main PPA phenotype were identified, including 11 non-fluent (nfvPPA), 13 semantic (svPPA), and 18 logopenic (lvPPA). MANOVA revealed significant differences in WAB sub-scores between each of these groups. Linear discriminant analysis revealed that the fluency and object naming sub-scores were most strongly predictive of group differences. The fluency score was markedly reduced in nfvPPA compared with svPPA and lvPPA, whereas the object naming score was markedly reduced in svPPA compared with the other phenotypes.

Conclusions and Relevance: Preliminary results suggest that significant differences exist in WAB sub-scores between the three main clinical phenotypes of PPA. Further investigation is needed to verify these findings in a wider patient population and to evaluate their utility alongside conventional clinical diagnosis.

Anatomical features predicting outcome from stereotactic laser amygdalohippocampotomy

C. Zajner, F. Isbaine, N. Naxpati, R. Gross, J. Lau

Importance: Stereotactic laser amygdalohippocampotomy (SLAH) is a novel procedure which has recently been shown to effective and safe in the treatment of temporal lobe epilepsy. Optimal operative ablation location and extent is uncertain, however, as are the neuroanatomical features guiding successful ablations.

Objective(s): Advance the understanding of the potential role of SLAH for MTS, by investigating the morphometric features of pre and post surgical MRI scans in relation to post-surgical epilepsy freedom.

Design and Participants: Patients treated with SLAH for MTS at Emory University between 2011 and 2019 were considered in this retrospective study. Post-procedure T1 MRI scans of patients were used to create manual segmentations of the ablation region of each patient. Ablations were assessed in relation to 1) whether they crossed the coronal plane of the lateral mesencephalic sulcus (LMS), 2) the extent to which the ablation extended posterior to the LMS, and 3) the extent of ablation of the uncus. SLAH patients were analyzed with reference to their categorization with 12-month Engel classification score. Wilcoxon ranked-sign test was performed for each variable of interest between groups of patients with Engel score 1 versus Engel score 2-4.

Results: Distance of ablation past the coronal plane of the LMS was weakly associated with better surgical outcome, with Engel class 1 patients having an average of 6.32±4.16mm, and Engel class 2-4 with 7.93±3.75mm(p=0.099). Ratio of ablations extending posterior to the LMS was 0.82(SD=0.39) in Engel 1 patients, and 0.90(SD=0.30) in Engel 2-4 patients (p=0.370). Volume of ablation showed little correlation with 12-month seizure freedom average ablation of Engel class 1 =6064±2128mm3, Engel class 2-4 = 5828±3031mm3, and no significant difference with Wilcoxon ranked-sign test (p=0.239). Ablation of the uncus showed a strong association with better surgical outcome, with ratio of uncus ablation for Engel class 1 at 0.71(SD=0.31), and Engel class 2-4 at 0.37(SD=0.36);p<0.001).

Conclusions: Larger ablation alone was not associated with better surgical outcomes. Ablation of the uncus was shown to result in better outcomes. Contrary to current practice, extension of SLAH ablation posterior to the lateral mesencephalic sulcus did not demonstrate improved post-operative outcomes. Further investigation of the anatomical features predictive of successful SLAH is warranted to improve future outcomes.

Diffusion tensor imaging reveals post-acute alterations in brain white matter microstructure in elderly adults within six months following stroke

S. Poirier, J. Thiessen, U. Anazodo, A. Khaw

Importance: Macroscopic white matter (WM) injury in the brain is linked to post-stroke cognitive impairment; however, less is known regarding changes to the brain's underlying WM microstructure and influence on cognition following stroke. Diffusion tensor imaging (DTI) is a promising imaging technique for assessing post-stroke WM microstructure and WM-related cognitive decline.

Objective(s): To demonstrate the utility of DTI in probing post-acute WM microstructural changes in brains of elderly adults within 6-months following an ischemic stroke.

Design and Participants: Elderly patients of age 65-85 years with confirmed acute ischemic stroke had a brain diffusion-weighting imaging (DWI) scan acquired at 4-weeks post-stroke using a 3T hybrid PET/MRI scanner. Patients were re-scanned at 6-months post-stroke to investigate longitudinal changes in WM microstructure following stroke. Each patient's DWI images were preprocessed using an in-house image analysis pipeline to generate fractional anisotropy (FA), mean diffusivity (MD), axial diffusivity (AD), and radial diffusivity (RD) maps. Voxel-wise and along-tract analyses (alpha = 0.05, family-wise error corrected) were used to conduct a within-group comparison of DTI parameters (FA, MD, AD, RD) in WM regions of patients at 4-weeks versus 6-months post-stroke.

Results: This study included twelve stroke patients (4 females; mean age = 75 ± 5 yr). Voxel-wise DTI analysis revealed diffuse patterns of increased MD ($p = 0.01$), increased AD ($p = 0.02$), and increased RD ($p = 0.04$) in WM clusters comprising the left anterior thalamic radiation and left superior longitudinal fasciculus (SLF) in patients at 6-months relative to 4-weeks post-stroke. There were significant along-tract differences showing evidence of WM microstructural breakdown in all four DTI indices (decreased FA, increased MD, increased AD, and increased RD) in rostrum of corpus callosum and right SLF III (min $p < 0.0001$) of patients at 6-months post-stroke.

Conclusions and Relevance: These findings demonstrate that DTI can reveal delayed brain WM microstructural disruptions related to cerebrovascular damage within 6-months following stroke, but beyond the acute phase. Future work will implement advanced DTI-based WM lesion analyses including cognitive assessment to shed further insight into the pathophysiological link between delayed post-ischemic WM injury and cognitive decline in stroke patients.

Improving epilepsy care in Ontario, Canada: the impact of the Provincial Strategy for Epilepsy Care

T. Antaya, B. Carter, S. Shariff, L. Boissé Lomax, E. Donner, K. Nylen, O.C. Snead III, J. Burneo

Importance: Between 2001 and 2010, just 1.2% of patients received epilepsy surgery within two years of drug-resistant epilepsy diagnosis in Ontario, indicating that many were not receiving appropriate epilepsy care. In 2016, the Ontario Ministry of Health and Long-Term Care implemented the Provincial Strategy for Epilepsy Care to increase epilepsy surgery use. The effectiveness of this initiative has not yet been evaluated.

Objective(s): To assess whether the use of (1) epilepsy surgery, including (a) its receipt and (b) assessment for candidacy, and (2) other healthcare for epilepsy, including (a) neurological consultations, (b) emergency department visits, and (c) hospital admissions, has changed since the Provincial Strategy was implemented.

Design and Participants: We used administrative health data and an interrupted time series design to address these objectives. Annual cohorts were created for July 1st to June 30th of each year between 2007 and 2019, comprising patients with drug-resistant epilepsy who were eligible for the Ontario Drug Benefit program and had no history of cancer. We used segmented Poisson regression models to assess whether the annual incidence of each outcome changed between the period before the Provincial Strategy was initiated (July 2007 to June 2016) and the period after (July 2016 to June 2019).

Results: The level and trend changes for the incidence of epilepsy surgery and assessment for candidacy were non-significant between the two periods. However, the lower 95% confidence limits for the level changes were close to the null value (epilepsy surgery: 48% [95% CI: 0%, 118%] increase; surgical candidacy: 41% [95% CI: -1%, 99%] increase). Statistically significant trend decreases were observed for neurological consultations (-10%, 95% CI: -15%, -10%) and hospital admissions for epilepsy (-7%, 95% CI: -12%, -15%).

Conclusions and Relevance: These findings suggest that the Provincial Strategy may not have increased the use of epilepsy surgery and assessments for candidacy; however, power was likely insufficient. Alternatively, the lack of effect could have resulted from limited neurosurgeon and surgical facilities availability, which were not increased as part of the program. However, the program appears to be associated with a declining incidence of neurological consultations and hospital admissions for epilepsy.

Quantitative magnetic resonance imaging of Parkinson's disease and rapid eye movement sleep behaviour disorder

E. Alushaj, D. Hemachandra, N. Handfield-Jones, A. Kuurstra, R.S. Menon, A.M. Owen, A.R. Khan

Importance: Rapid eye movement sleep behaviour disorder (RBD) is a strong, specific predictor for Parkinson's disease (PD). Neuroimaging similarities may uncover the first preclinical biomarkers of PD, a clinical and research priority.

Objective(s): To identify features of RBD and PD for clinical use by applying magnetic resonance imaging (MRI) techniques: quantitative susceptibility mapping (QSM) and diffusion MRI (dMRI). Emphasis will be placed on the substantia nigra pars compacta (SNc) and striatum, particularly in their caudal motor subregions based on previous work in the lab (Khan et al., 2019).

Design and Participants: In a case-control study, 21 RBD patients, 21 early-stage PD patients, and 46 age-matched healthy controls were scanned using 3T MRI. T1-weighted anatomicals and dMRI were collected for segmenting the SNc/ventral tegmental area (VTA) and striatum. Subcortical regions were then parcellated through probabilistic tractography with the Tziortzi cortical atlas (Pauli et al., 2019; Tziortzi et al., 2014). Fractional anisotropy (FA) and mean diffusivity (MD) were calculated for the SNc/VTA and striatal sub-regions and compared across groups while controlling for age and sex. QSM images were generated and mean susceptibility, a proxy for brain iron, was determined for traditional striatum (ie. caudate nucleus, putamen, ventral striatum/nucleus accumbens) and parcellated striatum for group comparison.

Results: dMRI revealed increased average surface mean diffusivity in the caudal motor SNc subregion, RBD patients compared to controls (P < .01). This suggests altered microstructural integrity in RBD in a region that overlaps with the ventrolateral SNc—the earliest and most affected sub-region in PD. We also detected lower striatal iron in the caudal motor striatum of PD patients relative to healthy controls (P = .02). dMRI and QSM features were used in separate models that revealed good diagnostic accuracy for RBD and PD, respectively.

Conclusions and Relevance: These findings suggest that dMRI and QSM in the SNc and striatum could function as diagnostic biomarkers of RBD and PD. Similarities between RBD and PD patients also support the notion that RBD is prodromal PD. Focusing on sub-regions of the SNc and striatum, most affected by PD, increase the sensitivity of MRI measures to detect disease and disease progression.

Improving tPA Door-To-Needle-Time for Acute Stroke Patients at LHSC

J. Aghili, E. Gao, S. Mahesh, J. Nguyen, A. Florendo-Cumbermack, J. Mandzia

Importance: Canadian Stroke Best Practice Guidelines recommend a 30-minute median door-to-needle-time (DTNT) for thrombolysis for 90% of patients with acute ischemic strokes arriving directly to comprehensive stroke centres. In Canada, stroke is the leading cause of disability. The earlier treatment is implemented the better the chances that the patient will be discharged home and have less resulting disability. Nearly 40% of tPA-treated patients return to prestroke level of function within 90 days and treatment with tPA increased quality adjusted life years (QALYs) by 0.39 and decreased costs by $25,000.

Objective(s): Reduce tPA median DTNT from 39-minutes to 30-minutes for acute ischemic stroke at LHSC by April 2023.

Design and Participants: Quality improvement (QI) methodology was used for root cause analysis, identification and prioritization interventions and of plan-do-study-act (PDSA) cycles. PDSA1 targeted staff neurologist (SN) awareness of performance and sharing of experiences. Process measure: Change in awareness of SN about group and individual performance after intervention. Outcome measure: DTNTs from the stroke dashboard and run charts to track change. Balancing measure: Track any increases in adverse outcomes with improved efficiency of DTNT.

Results: SN awareness of performance increased from 50% to 100%.

PDSA1: Pre-intervention median DTNT was 39-minutes and post-intervention was 32-minutes.

Run chart identified a run in DTNT following intervention.

Conclusion and Relevance: Awareness of physician performance led to improvement in median DTNT

POSTER PRESENTATIONS

Surgical Management of Temporal Long Term Epilepsy Associated Tumors (LEATs)

A. Chalil, D. A. Steven, A. Suller-Marti, S. DeRibaupierre

Importance: Seizure is a common presentation of gliomas and occur in 50% of all gliomas, and up to 88% in low-grade gliomas. Long term epilepsy associated tumors (LEATs) such as dysembryoplastic neuroepithelial tumours (DNET) and gangliogliomas are commonly associated with epilepsy, and can account for up to 18% of all epilepsy surgery in adults. The extent of surgical resection is the main predictor of post-operative surgical freedom. However, even within patients who undergo a total tumour resection, some continue to have uncontrollable seizures, since the focus of epilepsy may lie in peritumoural tissue.

Objective(s): This is a retrospective analysis of patients with temporal low grade gliomas including ganaglogliomas DNET, and PXA treated at Western University in the last 20 years. The aim of this study is to determine the effect of the extent of resection in temporal low grade gliomas in adults, specifically gangliogliomas, dysembroyplastic neuroepithelial tumours (DNET), and pleomorphic xanthoastrocytomas (PXA), on post-operative seizure control.

Design and Participants: The main comparison is the extent of surgical resection divided into four groups: lesionectomy, lesionectomy + mesial structure resection, anterior temporal lobectomy, or anterior temporal lobectomy + mesial structures resection. This study aims to define a resection strategy for optimal seizure control in patients with temporal low grade lesions through a multi-center retrospective analysis. Due to the effect of temporal lobe gliomas on peritumoural brain, we hypothesize that extended surgical resection, i.e. lesionectomy, anterior temporal lobectomy, and amygdalohippocampectomy produces the best long term seizure control in patients with temporal low grade tumours.

Results: Seizure freedom is more likely to be achieved with more extensive surgical resection (ATL+ mesial structures) compared to lesionectomy or neocortical resection alone (ATL). More extensive surgical resection is associated with successful reduction of AED doses at 1 year post op; however, this difference disappears at 2 years post op. More extensive surgical resection is associated with higher risk of cognitive, memory, and psychological side effects

Conclusions: LEATs are rare entities with variable clinical course. We present initial data from a multi-center national retrospective analysis of LEATs treated in Canada between the year 2000 and 2022.

POST-2

Doesn't consent to having the abstract online

Conceptual Development of an Implantable Transvenous Vagal Nerve Stimulator

B. Johnston

Vagal nerve stimulation through an implantable device was approved by the FDA in 1997. With the indication for medically and resection refractive epilepsy. Implantation is done through a neck incision with dissection to the carotid sheath with exposure of the Vagus nerve, with subsequent placement of 3 helical electrodes with a connection to an implantable pulse generator on the anterior chest or axilla. Additional clinical application of vagal nerve stimulation has also been proposed and implemented with FDA approved devices for a multitude of conditions including depression, obesity, and headache, and non approved application has targeted inflammatory mediated conditions including IBS, kidney injury, RA, heart failure, and stroke recovery. To date this wide array of clinical applicability has been achieved through open surgically implanted devices in the cervical or subdiaphragmatic region, or through transcutaneous stimulation of the auricular branch. This poses a trade-off between ease of stimulation and ease of use. The invasiveness of surgical implantation is offset by low demands on patients for regular device use once implanted, contrasted by the completely non-invasive transcutaneous stimulation that requires significant patient time for treatment administration.

The neurovascular relationship of the Vagus in the carotid sheath in the cervical neck opens a endovascular transvenous route that can be exploited for vagal nerve stimulation. Fan et al. have shown that use of a decapolar EP electrode can stimulate the Vagus nerve with comparable energy to currently existing stimulators transiently during electrophysiological studies. Opie et. Al have shown the potential of cortical stimulation and recording through a deployable endovascular stent. However, to date, there has not been a published implantable endovascular vagal nerve stimulator. This device would form an optimum of the existing trade-off minimizing both invasiveness and patient burden for utilization. As such this work details the conceptual design of an endovascular vagal nerve stimulator.

Design requirements are elucidated through literature review and include: Stimulation parameters (intensity, frequency and ,cycling), lead fixation,   confirmation of anatomical localization, vascular/thrombo-compatible lead for vessel wall safety, and device life cycle. Based on requirements concepts are generated. Generated concepts are evaluated with House of Quality (HoQ)assessment for function delivery and implementation feasibility. A conceptual endovascular vagal nerve stimulator is proposed as a basis for further prototyping and manufacturing for proof of concept.

Evaluating the Diagnostic Utility of Testing for Neural Antibodies including Anti-CASPR2 in Small Fiber Neuropathy: A Quality Improvement Study

A. Mirian, D. Moulin, C. Shoesmith, A. Florendo-Cumbermack, M. Nicolle

Importance: Reports of neural antibodies detected in patients with small fibre neuropathy (SFN), such as contactin-associated protein-like 2 (anti-CASPR2), has generated interest in testing for neural antibodies to diagnose treatable immune-mediated forms of SFN. To date, however, no systemic evaluations into which patients with SFN should be tested for neural antibodies including anti-CASPR2 have been completed.

Objective(s): To perform a quality improvement study evaluating the diagnostic utility of testing for neural antibodies including anti-CASPR2 in patients clinically suspected of having SFN.

Design and Participants: We included adult patients clinically suspected of having SFN who were assessed by neuromuscular and/or pain medicine specialists at London Health Sciences Centre (LHSC) from January 2022 - January 2023, and who had serum samples submitted to test for neural antibodies including anti-CASPR2 at LHSC Clinical Immunology laboratory. All samples underwent testing for neural antibodies by mouse tissue indirect immunofluorescence (TIIF), line blot for paraneoplastic antibodies, and cell-based assays for anti-LGI1 and anti-CASPR2.

Results: A total of 25 patients clinically suspected of having SFN who underwent testing for neural antibodies including anti-CASPR2 were identified. The average age of patients was 60 years old (range: 30-78) and 18/25 (70%) were women. Of these 25 patients, none had a true-positive neural antibody result, while 4 (16%) had neural results that were interpreted as likely false-positive (anti-amphiphysin, 2; anti-Ma2, 1; anti-recoverin, 1) based on only weak antibody positivity by line blot, lack of confirmatory assay positivity by TIIF, and atypical clinical phenotype.

Conclusion and Relevance: In this quality improvement study, we did not identify patients clinically suspected of having SFN who would benefit from testing for neural antibodies including anti-CASPR2. Furthermore, we found that this testing may generate false-positive neural antibody results. Taken together, our findings suggest that testing for neural antibodies including anti-CASPR2 lacks utility in patients clinically suspected of having SFN. Larger prospective studies may help in identifying which, if any, subsets of patients with SFN would benefit from this testing

Is the effect of the Vagus Nerve Stimulation effective in Lesional Drug Resistant Epilepsy?

R. Moshref, J. Burneo, M.L. Jones, D. Steven, K. Macdougall, A. SullerMarti

Importance: The incidence of drug resistant epilepsy (DRE) is around 30% patients with epilepsy. Vagus nerve stimulation (VNS) is offered to patients who are not candidates for epilepsy resective surgery, however the results of lesional cases has not been explored previously.

Methods: This study was a retrospective cohort study that involved patients with DRE implanted with VNS at the Epilepsy program at Western University, Ontario. We selected a cohort of patients with lesional epilepsy (VNS-L) implanted with VNS based on brain MRI findings, and we compared it to a control group, nonlesional epilepsy (VNS-NL) also implanted with VNS.

Results: The median age is 31.8 years, 70.69% were female. The VNS-L group average age was 31.8 years and the NL group average was 35.2 years. The most common abnormality was nodular heterotropias 31.34% (n=9). The median period of follow-up was 69.97 months. 62% of the VNS-L group had a seizure reduction of 50% or greater, compared to 41.38% in the VNS-NL group. Seizure freedom was 10.34% in VNS-L, compared to 6.99% in VNS-NL. In addition, 16 patients underwent palliative procedures before the VNS implantation, 12 in VNS-L and 4 in VNS-NL.

Conclusions: This is the first study reporting the outcome of VNS in lesional cases. Our results suggest that VNS in lesional cases is effective. However, a large multicenteric study is needed.

Quantifying the Severity of Epilepsy

L. Al Malouf, A. Suller Marti

Importance: Efficient epilepsy monitoring unit (EMU) triage allows harm reduction by promoting appropriate patient access to appropriate treatment therefore, the principle of prioritization allows for the allocation of scarce resources to the patients who require them most. However, determining patient status is not trivial, as it must quickly consider several neurological, clinical, and economic factors which demonstrates the necessity for a single comprehensive, and holistic scale to evaluate the quantitative clinical factors impacting the severity of epilepsy to optimize mediums to EMUs as well as in the outpatient setting.

Objective(s): The objective of this study is to assess the existing scales designed to measure the severity of epilepsy in order to determine areas of interest, importance, and improvement.

Design and Participants: A review was performed to assess the most relevant literature. We used Medline as a search platform, and the keywords used were 'seizure severity', 'epilepsy severity', and 'epilepsy severity scales'.

Results: 10 dominating scales emerged, dating back to 1991, which solely assessed the clinical determinants affiliated with epilepsy severity including frequency of seizures, seizure type, injuries etc. Following further classification, the items included in the scales were assessed for repetition of use with the most common being seizure frequency, seizure type and several features associated with pre and post ictal presentation.

Conclusion and Relevance: The currently existing epilepsy severity scales are limited in scope or do not reflect the multidimensional nature of epilepsy. Thus, a novel and comprehensive scale is needed to assess individual epilepsy severity which considers multiple determinants of severity.

In-vitro Validation of Spatiotemporally Dynamic Electric Fields for Brain Cancer Treatment

A. Elsaleh, E. Iredale, N. Fulcher, H. Xu, S. Schmid, M. Hebb, E. Wong

Importance: Treatment of brain tumours using locally delivered, low-energy, intermediate frequency (kHz range) electric fields, called Intratumoral Modulation Therapy (IMT), has shown promise preclinically as a standalone or adjuvant treatment modality. Past IMT approaches used a single bioelectrode, creating an inhomogeneous field, while we here investigate the use of multi-electrode IMT with spatiotemporally dynamic (rotating) electric fields.

Objective(s): To determine the optimal electrode configuration and electric field parameters to deliver IMT fields that result in maximal coverage and Glioblastoma (GBM) cell susceptibility.

Study Design: A custom printed circuit board (PCB) was fabricated to enable four-electrode IMT in a 24-well plate. We designed experiments to evaluate the efficacy of various spatiotemporally dynamic fields: (a) different rotating field magnitudes, (b) rotating vs. non-rotating fields, (c) 200 kHz vs. 10 kHz stimulation, and (d) constructive vs. destructive interference. Patient-derived GBM cells along with patient-derived organoids were treated and analyzed for viability using bioluminescence imaging and the MTT assay respectively.

Results: Spatiotemporally dynamic IMT fields at magnitudes of 1, 1.5, and 2 V/cm reduced GBM cell viability to 58%, 37% and 2% of sham controls respectively. Rotating vs. non-rotating electric fields, and 200 kHz vs. 10 kHz fields showed no statistical difference. The rotating configuration yielded a significant reduction ($p<0.01$) in cell viability (47 ± 4%) compared to the destructive interference cases with matching voltage (99 ± 2%) and matching power deposited (66 ± 3%). Early investigations using patient-derived organoids showed a differential effect where malignant brain neoplasms, and not healthy brain tissue, are impacted by IMT fields in vitro.

Conclusions and Relevance: We found the most important factors in GBM cell susceptibility to IMT are electric field strength and homogeneity. IMT fields were found to impact malignant brain tumour organoids and GBM cell lines, leaving healthy brain samples intact. Spatiotemporally dynamic electric fields have been evaluated, where improvements to electric field coverage with lower power consumption and minimal field cancellations have been demonstrated. The impact of this optimized paradigm on cell and whole-tissue susceptibility justifies its future use in preclinical investigations along the translational pipeline for IMT.

Intratumoral Modulation Therapy Response in 3D Models of Diffuse Intrinsic Pontine Glioma

E. Fenton, A. Elsaleh, N. Fulcher, H. Xu, E. Iredale, E. Wong, M. Hebb

Importance: Diffuse intrinsic pontine glioma (DIPG) is an aggressive brainstem cancer, which is the leading cause of brain-tumor associated deaths in children. With few effective therapies and a 2-year survival rate of 10%, DIPG prognosis remains dismal.

Background: Past studies demonstrate the success of a novel electrotherapy, called Intratumoral Modulation Therapy (IMT), in the treatment of high-grade gliomas. Akin to deep brain stimulation, IMT is an implantable device that targets tumors using low intensity electric fields. The therapeutic efficacy of IMT has been previously described in 2-dimensional cultures of DIPG. This project directly follows these results; assessing IMT response in 3D DIPG preparations, which presumably better resemble the tumor microenvironment.

Objective(s): To a) establish a reliable 3D spheroid DIPG model and using this model b) assess DIPG response to a spectrum of IMT parameters.

Study Design: Patient-derived DIPG cells (SU-DIPG25) were cultured in 3D preparations, using a hydrogel-based protocol previously described in glioblastoma. To facilitate four-electrode IMT in a 24-well plate, a printed circuit board (PCB) was fabricated, which functionally connects output from a programmable waveform generator to bioelectrodes. Using this set-up, DIPG 3D preparations were continuously subjected to IMT using a) 1V/cm, b) 1.5 V/cm, or c) 2 V/cm electric fields for 72 hours. Cell viability was assessed using the bioluminescence imaging (BLI) and MTT assays.

Results: When 1 V/cm IMT was delivered, BLI revealed that DIPG cell viability was reduced to 61.57 ± 7.613% of the control values (n=8, $p < 0.01$); however, no statistically significant result was observed on the MTT assay. For 1.5 V/cm IMT, DIPG cell viability was reduced to 5.52 ± 1.52% (n=6, $p < 0.001$) and 29.75 ± 9.293% (n=6, $p < 0.01$) of the control values on the BLI and MTT assays, respectively. Similarly, 2 V/cm IMT reduced DIPG cell viability to 0.912 ± 0.0776% (n=4, $p < 0.001$) and 30.01 ± 8.033% (n=4, $p < 0.01$) of the control values.

Conclusions and Relevance: Altogether, this study provides the first demonstration of IMT response in 3D DIPG spheroids and supports future studies to examine the mechanism of action in these cancer cells, and the efficacy of similar strategies using in vivo models.

The effect of Cortical Stimulation on Interictal Epileptiform Discharges

A, Ahmadi, N, Mortazavi, J, Martinez-Trujillo, J.C. Lau, A. Suller Marti

Importance: Finding robust biomarkers of epileptogenicity will help clinicians to accurately localize the Seizure Onset Zone (SOZ) in patients with focal drug resistant epilepsy (DRE). SOZ is one of the most important factors for obtaining a successful surgical outcome. Cortical stimulation (CS) is a tool used during phase II of the presurgical investigation.

Objective(s): We will evaluate the impact on interictal epileptiform discharges (IEDs) after the use of CS and find stimulation-dependent biomarkers of epileptogenicity.

Design and Participants: In our cross-sectional study, a 58-year-old female patient with DRE was implanted with depth electrodes for presurgical evaluation. Bipolar and high frequency (50 Hz) CS for functional mapping and SOZ localization was performed with a pulse width of 300 μs and current spanning 1–6 mA. After preprocessing the intracranial recordings, IEDs (interictal spikes) were automatically detected and their frequency and amplitude were compared before and after stimulation. We analyzed IEDs' changes in channels that generate seizures, after discharges (AD), and the ones that had less epileptic activity (normal).

Results: A 40-minute CS was performed and 12 contacts were stimulated. The frequency and amplitude of interictal spikes increased in channels in which CS triggered seizures. However, no significant changes were observed in channels with AD or the contacts that had no electrographic changes triggered after the CS.

Conclusions and Relevance: These data suggest that tracking the changes in IEDs' characteristics before and after electrical cortical stimulation would provide clinicians with insights into SOZ localization. Our preliminary results showed that the areas with an increased number and waveform feature changes of IED after CS are associated with areas where seizures were triggered and where spontaneous seizures were seen. On the other hand, no changes in IEDs' characteristics after CS were seen in channels where ADs were triggered. This information is another potential biomarker for epileptogencity and its relation with SOZ. More data is required to verify our results with a larger sample.

iEEGPrep: towards standard preprocessing for the analysis of intracranial EEG recordings

M. Cespedes, G. Gilmore, M. Abbass, A. Thurairajah, M.D. Yousif, Western Epilepsy Surgery Research Collaborative, J.G. Burneo, D.A. Steven, A. Suller-Marti, A.R. Khan, J.C. Lau

Importance: Preprocessing of intracranial electroencephalography (iEEG) recordings is variable from study to study. The automation of preprocessing steps in a single tool is a pathway towards standardized and reliable preprocessing of iEEG data, which can facilitate the localization of the seizure onset zone as well as an understanding of brain dynamics in health and disease.

Objective(s): To develop a preprocessing pipeline for the analysis of iEEG recordings.

Design and Participants: A literature review was conducted to determine common steps employed in the preprocessing of iEEG data. A pipeline is being developed following the Brain Imaging Data Structure (BIDS), a standard for structuring neuroimaging data with extensions to iEEG, which should facilitate adoption of this tool for open and reproducible analysis of iEEG.

Results: A dataset of 106 patients with epilepsy who underwent iEEG monitorization at the London Health Science Center's (LHSC) Epilepsy Monitoring Unit is being used as part of the quality control (QC) and testing. Before assembling the pipeline, the selected algorithms were evaluated using simulated EEG data, to confirm their proper operation and serve as an initial QC metric. A first version of this tool has been implemented, which includes the following preprocessing steps:

- Downsampling
- Power line interference removal
- Automatic artifact detection
- Re-referencing (e.g., bipolar and unipolar)
- Region identification for each channel/contact electrode

An initial evaluation of the process has been completed using the LHSC dataset, with each step working as expected. However, further analysis with clinical experts is required to assess the quality of the results of the steps available. We will also evaluate performance on other openly available iEEG datasets. Future directions include advanced tools for automatic detection of artifacts, and increasing the algorithms available for current steps. Quantitative QC of the results is also a future goal.

Conclusions and Relevance: To our knowledge, this is the first automated toolbox for preprocessing of iEEG data. This tool will allow easier and standardized preparation of iEEG data prior to experimental or clinical analysis, which will enhance the reproducibility and quality control in iEEG related studies

Preliminary Look at the Feasibility of Online Cognitive Testing in the Epilepsy Monitoring Unit

H. Gray, K. Kazazian, C. Wild, D. Debicki

Importance: Severe epilepsy patients are often admitted to an in-patient neurology clinic called the "Epilepsy Monitoring Unit" (EMU) for approximately two weeks to allow for further elucidation of their epilepsy and determine possible treatment options. People with epilepsy often have cognitive deficits, and understanding patients' unique deficits is important both for their care and for research purposes.

Objective(s): This study's objective is to assess the feasibility of using an online cognitive testing battery called Creyos Research (CR, formerly Cambridge Brain Sciences) for patients in the EMU.

Design and Participants: This is a pilot observational study where participants complete the CR battery while in the EMU at University Hospital in London. The CR platform involves 12 game--like tests, which each evaluate a different area of cognition, such as short-term memory and reasoning. Patients must have diagnosed epilepsy and be 18 to 80 years of age. Patients are excluded if they have any history of status epilepticus, neurologic conditions other than epilepsy, or developmental delays. The study began in December 2022 and uses consecutive sampling. In total, 62 patients in the EMU have been screened. Thus far, 39 patients have met exclusion criteria and four eligible non-enrolled patients were not interested in participating in any research or were discharged from the EMU before they could be approached by the research team.

Results: As of March 30th, 2023, 19 patients (mean age = 37; 14 females) have participated in the study. The most common reason for exclusion was not having a formal epilepsy diagnosis. All eligible patients that were approached completed the entire CR battery. Cognitive deficits were defined as 1.5 standard deviations below the CR norms and were in line with those reported by previous literature; the most up-to-date quantitative data on cognitive deficits identified with CR will be presented.

Conclusion and Relevance: Therefore, cognitive testing in the EMU using the CR platform is feasible and may ultimately be useful in the EMU for identifying targets for research and neuropsychological interventions. However, a greater sample size is still needed before conclusions can be fully drawn.

Investigating covert awareness in individuals with Alzheimer's Disease using functional near-infrared spectroscopy (fNIRS)

G. Gupta, K. Kazazian, M. Kolisynk, J. Huntley, S. Novi, A. Abdalmalak, D. Debicki, S. Pasternak, A. Owen

Clinician and caregiver accounts have indicated that in patients with Alzheimer's disease (AD), changes in the conscious experience of self, others and the environments are exceedingly distressing. Indeed, decline in conscious experiences of AD patients has been associated with clinical consequences, such as neglectful care. Nonetheless, within the standard descriptions of AD, alternations in consciousness remain neglected. Previous efforts invested in understanding the conscious experiences of AD patients have depended on unreliable self-report, uncertain clinical observations or task-based paradigms that do not inform about consciousness in real life. The present study aims to understand conscious experiences of AD patients using the naturalistic movie-viewing paradigm. Patients across the AD spectrum of severity, along with their age-matched and unmatched healthy controls, will be presented with scrambled and intact-plot versions of two movies while undergoing fNIRS imaging. For movies with an intact plot, all participants are expected to exhibit frontoparietal brain synchronization, which is indicative of plot-following, and by extension covert awareness. However, relative to healthy controls, frontoparietal synchronization is predicted to be graded among AD patients with the extent of unsynchronized activity aligning with disease severity. Findings from this study would have important implications for AD patients' care and quality of life and can provide insight into the nature of this neurodegenerative disease that potentially supports recognition of AD as a disorder of consciousness

Sex Differences in the Neurocognitive Outcomes of Cardiac Arrest and Myocardial Infarction

S. Kelly, L. Norton, A. Owen

Importance: Sex differences have been documented regarding the physical recovery of adults who have experienced adverse cardiac events, showing that women tend to experience poorer outcomes. To date, however, no research exists examining how men and women differ in their cognitive recovery after cardiac incidents.

Objective(s): The present study aimed to determine whether men and women hospitalized for cardiac arrest or myocardial infarction differed in their neurocognitive recovery. The primary objective was to examine whether women experience worse neurocognitive outcomes compared to men. The secondary objective was to determine rates of anxiety and depression for men and women. It was expected that women would perform worse on cognitive tests and have higher reported psychological symptoms compared to men.

Design and Participants: We recruited a convenience sample of individuals, aged 20 to 82, admitted to London Health Sciences Centre for out-of-hospital cardiac arrest or ST-segment elevation myocardial infarction. To be eligible, participants had to be 18 years or older, English-speaking, and have no neurological disorders. We identified 162 potential participants, using the hospital database. Of those, 71 patients died, 60 patients denied consent, and 31 patients consented. Participants completed the Creyos cognitive tests, assessing short-term memory, reasoning, and verbal fluency, and a survey measuring anxiety and depression. All participants completed the study. Age- and sex-matched healthy controls were included as a comparison group, whose data were obtained from previous studies that used the Creyos tests.

Results: 18 males (Mage=58.2) and 13 females (Mage=67.5) completed the study. Independent samples t-tests showed no significant differences between sexes on any of the cognitive domains. Further, there were no significant differences for depressive symptoms, however women reported significantly greater anxiety, $t(29) = -1.77$, $p < .01$.

Conclusion: Sex differences in cognitive function were not detected during the sub-acute phase of recovery. However, sex differences are consistently reported, suggesting that differences may arise in the post-acute phases. We therefore plan to re-assess participants at 3 and 6 months after their date of discharge. Lastly, these findings provide justification for psychological screening prior to hospital discharge for women who suffer cardiac incidents.

Biomarkers of Cognitive Impairment in Parkinson's Disease using Structural MRI

K. Patel, K. Van Hedger, P. MacDonald

Importance: Parkinson's disease (PD) is a progressive, neurodegenerative disorder with no disease modifying therapies. Cognitive impairment is a common non-motor symptom of PD experienced in the later disease stages. It can be greatly disabling, impacting patient quality of life, and posing a significant burden on caregivers and healthcare systems.

Objective(s): The aim of this study is to develop diagnostic biomarkers of cognitive impairment in PD using structural MRI. The goal is to uncover structural brain differences that distinguish PD patients with cognitive impairment relative to PD patients and healthy controls who are cognitively intact. Biomarkers are objective indicators of disease. Biomarkers can signal disease, clinical symptoms/signs, or disease progression and prognostication.

Design and participants: This project will collect structural MRI scans from a population-based sample of PD patients without cognitive impairment, with mild cognitive impairment (MCI), with dementia (PDD), relative to healthy age-matched controls. Patients will be recruited from the Movement Disorders Database and other physician referrals. Participants will complete standardized clinical, motor, and cognitive testing, as well as 3T structural MRI. Clinical cognitive testing data and demographic information such as PD signs, symptoms, and associated manifestations will be analyzed to control for heterogeneity and to investigate structural MRI differences related to PD sub-groups. MRI data will be analyzed using a novel and fully automated connectivity-driven approach for parcellating the striatum and midbrain into distinct sub-divisions. Quantitative analysis will assess a) volume, b) connectivity, and c) shape in each of these sub-regions to examine how they are impacted by cognitive impairment and PD in general.

Results: We predict that quantitative analysis of the striatal and midbrain sub-regions will elucidate a biomarker profile unique to PD-MCI and PDD that distinguishes them from typical PD and healthy controls. Initial studies reveal that this approach distinguishes patients with PD from controls with 95% accuracy in validation samples.

Conclusions and relevance: Overall, this research will contribute to the understanding of cognitive impairment in patients with PD, as well assist in more efficient and accurate diagnosis of cognitive impairment in PD that will facilitate development of first disease-modifying therapies in PD.

Women with Epilepsy Across the Lifespan

C. Redhead, J. Arts, P. Tryphonopoulos, M. Jones, D. Diosy, A. Suller Marti

Importance: Women with epilepsy (WWE) face difficulties with fertility and family planning, contraception, teratogenicity, management of care during and after pregnancy, safety while caring for children, hormonal influences on seizure frequency, and bone health. There is very little research on whether WWE receive the recommended care during these times.

Objective(s): To evaluate whether WWE receive the care for gender-specific and sex-specific health issues recommended in the guidelines.

Design and Participants: A Canadian cross-sectional anonymous survey open to anyone living with epilepsy who identifies as a woman or who was assigned female sex at birth was launched in December 2022. Participants must be 18 years old or older.

Results: Preliminary results of 64 participants, mean age of 36.04 (range 19-61). Of the WWE who reported menses affecting their seizure frequency, 86.7% (n=16) discussed this with their physician, with no treatment changes for 71.4% (n=14). Only 35.8% (n=11) use contraception, 47.3% (n= 34) use IUDs and 21% (n=34) use hormonal contraceptives. 39.2% (n=33) were advised to take folic acid, of which 36.4% (n=22) use 1mg and 45.5% (n=22) use 5mg. 50% (n=29) of pregnancies were unplanned. 93% (n=44) of participants were not diagnosed with a bone condition, 57.1% (n=43) were advised to take vitamin D, 23.3% (n=43) were advised to take calcium supplements, 37.2% (n=43) received no bone health counselling.

Conclusions and Relevance: Most WWE receive recommended counselling for some issues, e.g., bone health, but not for other issues, e.g., folic acid use. Continued research and training are needed to improve the care WWE receive.

MRI-degad: Conversion of Gadolinium-Enhanced T1w MRIs to Non-Contrast-Enhanced MRIs Using Neural Networks

F. Ogunsanya, A. Taha, G. Gilmore, J. Kai, A.R. Khan, J.C. Lau

Importance: T1w MRI scans with gadolinium (MRI-gad) may reduce the accuracy of outputs and increase processing times of neuroimaging workflows such as FreeSurfer, which is crucial for analyses and clinical treatment. An additional non-contrast MRI (MRI-nogad) is often acquired, but this increases scan time and healthcare costs.

Objective(s): To compare the implementation of a 3D convolutional neural network (3D-CNN) to a generative adversarial network (GAN) in our tool MRI-degad, which converts MRI-gad images to synthetically generated scans with gadolinium removed (MRI-degad).

Design and Participants: We retrospectively identified 55 patients who underwent neurological surgery at our centre, obtaining MRI-gad and MRI-nogad on a 1.5-T MRI (General Electric, Milwaukee, Wisconsin, USA) with a resolution of 1.25 × 1.25 × 1.50 mm. We ran the neuroimaging tool, fMRIPrep, on both scans, evaluating workflow completion time. Intra-subject rigid registration of MRI-nogad to MRI-gad was quality controlled, of which 47 subjects passed. In the MRI-degad-CNN model, subjects were separated into training (70%; n=33), validation (20%; n=9), and testing (10%; n=5) and in the MRI-degad-GAN model, subjects were separated into training (90%, n=39) and testing (10%, n=5). MONAI was used to generate 32x32x32mm patches and train both models. Training loss metric used for the MRI-degad-CNN model was root mean squared error (RMSE). For the MRI-degad-GAN, binary cross entropy and a sum of binary cross entropy and mean absolute error were implemented for the discriminator and the generator, respectively.

Results: MRI-gad and MRI-nogad scans of 55 patients (34 females and 21 males, mean age=42.6 years) were used for analysis in this study. All 55 (100%) of the MRI-nogad images completed with fMRIPrep, while only 37 (67%) MRI-gad scans completed (72-hour max limit on a compute cluster). Mean completion time of MRI-gad and MRI-nogad for fMRIPrep was 28.33 +/- 17.6 hours (n=37) and 6.873 +/- 1.229 hours (n=55), respectively (Z=-5.31, p < 0.001). MRI-degad-CNN trained on the GPU for 100 epochs, taking 8 hours, producing training and validation RMSE of 216.12 and 321.04. MRI-degad-GAN trained on the CPU for 12 epochs, taking 22 hours, producing generator and discriminator losses of 0.1808 and 1.146.

Conclusions and Relevance: We validate that MRI-gad scans are problematic for a common neuroimaging workflow resulting in extended or failed completions. Our findings indicate MRI-degad has the potential to generate visually comparable outputs to ground-truth MRI-nogad images. Re-training of the two models alongside quantitative comparisons of cortex-based and whole-brain measurements is still anticipated, alongside external validation.

Humor styles relate to disease outcomes in patients with Parkinson's disease

T. Stoat, P. Mangat (co-first authors), M. Prenger, K. Van Hedger, P. MacDonald

Importance: Parkinson's disease (PD) is typically characterized by motor dysfunction; however, it can also involve deficits in cognitive and socioemotional processes. Humor is a multidimensional concept that impacts socioemotional well-being, and humor styles might contribute to disease outcomes in patients with PD.

Objective(s): This study examines how humor styles affect disease outcomes, including feelings of anxiety, depression, apathy, and health-related quality of life in patients with PD. We hypothesized that positive humor styles would be associated with better disease outcomes, whereas negative humor styles would be associated with worse disease outcomes for patients with PD. Furthermore, we predicted that patients with PD might be more likely to use negative humor styles than healthy elderly controls.

Design and Participants: This study used a cross-sectional design with 26 patients with PD and 33 healthy elderly controls. A convenience sample was recruited for other studies within the MacDonald Lab where participants were screened with inclusion criteria for MRI studies and acute pharmacological manipulation of dopamine via medication abstention or administration. For this study, participants completed survey questionnaires assessing humor style, depression, anxiety, apathy, and health-related quality of life either during a study session or at home.

Results: The total sample contained 23 women and had a mean age = 68.7 (range = 52–79). Self-enhancing positive humor style was associated with poorer disease outcomes in terms of both anxiety, $r(25) = 0.45$, $p = .02$, and health-related quality of life (social isolation), $r(25) = 0.39$, $p = .05$, in patients with PD. Control participants reported significantly greater use of positive humor styles (self-enhancing: $t(57) = 3.10$, $p = .003$; affiliative: $t(57) = 2.31$, $p = .02$) compared to patients with PD.

Conclusions and Relevance: These findings suggest that positive humor styles might serve as a coping mechanism for patients with PD who have increased anxiety and poorer quality of life. Future research should continue investigating humor styles in patients with PD to develop treatment strategies aimed at decreasing the burden of disease and improving quality of life for patients with PD and their families.

Characterization of Postictal Depression Syndrome in Patients Admitted to an Epilepsy Monitoring Unit

G. Moscol, E. Paredes-Aragón, R. Ruiz, N. ALkhaldi , C. Le, R. Mejía

Importance: Depression is the most common psychiatric comorbidity in people with epilepsy (PWE). Postictal depression syndrome (PDS) is the development of depression symptoms following seizures. They are more likely to appear following a symptom-free period ranging from 12 to 72 hours. Although PDS has been associated to prior history of depression and drug-resistant epilepsy (DRE), it is still poorly understood.

Objective: To explore the presence of postictal depression syndrome (PDS) in patients with epilepsy admitted to an Epilepsy Monitoring Unit.

Design and Participants: Patients with epilepsy were evaluated prospectively when they were admitted to the Epilepsy Monitoring Unit at London Health Sciences Centre (LHSC) between May 2022 and February 2023. Two specific tests were used to evaluate neuropsychiatric manifestations. The Neurological Disorders Depression Inventory for Epilepsy (NDDI-E) is a validated screening tool for depression in PWE. The Neuropsychiatric Inventory (NPI) is a valid psychiatric profile tool in PWE.

Both were applied upon admission to the Epilepsy Monitoring Unit (EMU), 72 hours after admission and 72 hours after a seizure (only in the subgroup of patients who developed seizures during their admission).

Results: Fifty-five patients were recruited. Thirty-four patients (66%) were female. Forty patients (72.7%) had at least one seizure during their admission. Forty-eight (87.3%) patients had focal-onset epilepsy and all of them had DRE. 36.2% had premorbid psychiatric disease before epilepsy diagnosis; anxiety was most frequent (19.1%). Twenty-three (41.8%) patients received treatment with antidepressants with a previous diagnosis of depression. No significant statistical differences were found between NDDI-E and NPI total scores at admission and posterior to a seizure.

Conclusions: Although depression and epilepsy are frequently correlated, no significant changes in terms of psychiatric symptoms were seen in the postictal state. These findings suggest that the postictal depression syndrome could be a multifactorial process.

Levodopa decreases craving in alcohol use disorder

K. Van Hedger, S. Witt, N. Hiebert, I. Witt, K. Seergobin, P. MacDonald

Importance: Alcohol use disorder (AUD) is consistently rated among the leading causes of preventable death world-wide, and pharmacological medications are under-utilized in AUD treatment. Patients with AUD commonly have altered dopamine signaling in the striatum, and prior studies have linked this brain region to feelings of craving.

Objective(s): The purpose of this study was to examine the effects of acute levodopa administration on cue-induced alcohol craving in patients with AUD. We hypothesized that, similar to patients with Parkinson's disease, levodopa would disrupt ventral striatum activity in these patients and reduce feelings of craving relative to placebo.

Design and Participants: This within-subjects study tested patients (N = 19, 9 women, mean age = 46.7, range = 26 - 73) with self-diagnosed AUD at two experimental sessions. Eligibility criteria included current abstinence from alcohol for at least two weeks, no history of neurological disorder, no prior treatment with dopaminergic medication or stimulant drug use, and no contraindications for MRI scanning or levodopa administration. Participants completed a cue reactivity task while undergoing two 7T MRI scans following single-blind pre-treatment with levodopa and placebo (in counterbalanced order). Participants also completed questionnaires about their AUD severity and history of alcohol use.

Results: Multi-level modeling indicated that participants reported less craving when viewing both alcohol and neutral images following levodopa administration compared to at their placebo session (F(1,17) = 4.66, p < .05). Extracted striatal activation values did not show significant differences between levodopa and placebo sessions; however, follow-up analyses are underway to examine individual differences in brain-response to levodopa related to AUD severity.

Conclusions and Relevance: These findings provide new evidence of the complex relationship between dopamine and alcohol craving among abstinent patients with AUD and offer preliminary evidence of the potential for levodopa to help alleviate acute alcohol craving in some AUD patients.

The Social Observation Inventory: what can behavioral observation tell us about bvFTD?

M. Restrepo-Martinez, S. Iskhakova, K. Coleman, E. Finger

Importance: Behavioral variant frontotemporal dementia (bvFTD) is one of the most frequent forms of dementia in people under 65. Unlike other dementias, bvFTD can perform quite well in standard neuropsychological tests, and its diagnosis depends on the abnormal behaviors reported by families and caregivers. Although abnormalities in social behavior are crucial for diagnosing bvFTD, structured observational scales are lacking in clinical settings. An objective scale to measure behavior through direct observation could facilitate diagnosis for this population. The Social Observation Inventory (SOI) has been proposed as a reliable tool for these purposes; however, studies about the reliability of these scales are lacking, as well as their correlation with caregiver reports.

Objective(s): To describe and characterize changes in social behavior and their correlation with caregiver reports and cognitive testing in patients with bvFTD using systematic observation of videos of patients and caregivers interacting in a comfortable setting. To evaluate The Social Observation Inventory, inter-rater reliability.

Design and participants: We included 31 participants diagnosed with bvFTD enrolled for the FOXY study. Baseline, 15-minute videos will be evaluated by two raters using The Social Observation Inventory (SOI). Ratings from the SOI will be correlated with additional baseline measurements such as MSSE and CDR and the NPI provided by caregivers. The SOI consists of 10 verbal and 10 nonverbal behavioral deficits rated on a 5-point Likert-type scale. The verbal items include observed deficits in: (1) spontaneous verbal behavior, (2) verbal responsiveness to others' comments (eg, facilitation and reflective comments), (3) appropriate timing of verbal responses (eg, lack of latency and turn taking), (4) elaboration of verbal responses (more than minimal answers), (5) ''on-topic'' verbal responses, (6) ''others'' references (''you'' statements), (7) ''self'' references (''I'' statements), (8) absent verbal disinhibition (inappropriate comments), (9) absent incongruous vocalizations (eg, out-of-context laughter), and (10) absent stereotypical/repetitive speech. The nonverbal items were observed deficits in (1) spontaneous nonverbal behavior, (2) physically staying with the interaction (vs getting up or leaving during the interaction), (3) joint or shared attention, (4) gaze/eye contact during the interaction, (5) facial responses appropriate to interaction, (6) head orientation toward the interlocutor during the conversation, (7) body orientation toward the interlocutor, (8) social tact and manners, (9) absent nonverbal disinhibition, and (10) absent stereotypical/ repetitive motor behavior.

Results:

Conclusions and Relevance:

Combined Resting-State Functional MRI and Functional Near-Infrared Spectroscopy in Preoperative Language Mapping in Children with Drug-resistant Epilepsy

JS. Bottan, R. Ragguett, L. Tang, M. Zuljievic, AV. Andrade, MT. Jurkiewicz, EG. Duerden, R. Eagleson, M. Nabavi Nouri, S. de Ribaupierre

Importance: Task-based fMRI (tb-fMRI) is the only clinically available tool for non-invasive preoperative language mapping in children with drug-resistant epilepsy (DRE). Children's cooperation during the study is low. Resting-state fMRI emerges as a valid alternative that may cope with some of these issues, but its complex processing and difficulty to interpret signal challenges its clinical application. The combination with fNIRS, a lower-complexity technique, has not been reported. This may cope with some of the issues and enhance the reliability.

Objective(s): To develop a combined approach utilizing fNIRS and resting-state fMRI to reliably determine language lateralization and localization in children with DRE that are candidates for surgery. Design and

Participants: Thirty-five children with DRE preselected for epilepsy surgery who have completed tb-fMRI (2 tasks, verb generation and object naming in block design) and rs-fMRI (short video projection) scans as part of their preoperative study where included. An independent component analysis (ICA) approach with a template-matching procedure was used to identify language networks1. A subgroup of 10 patients will further undergo fNIRS with the same task protocol. An fNIRS-guided seed-based analysis will be carried out and compared to both, tb-fMRI and ICA rs-fMRI. The overlap between language networks derived from the different methods will be measured and statically analyzed using Dice coefficients and correlations.

Expected Results: A higher incidence of atypical language location was observed in the patients included. We anticipate language lateralization results from task-based fMRI and rs-fMRI mapping to have an acceptable concordance. Rs-fMRI may indicate a more extensive language representation networks than with tb-fMRI. Preliminary results suggest lateralization with fNIRS is concordant. fNIRS-guided SEED-based analysis can improve the rs-fMRI analysis resulting in a bigger overlap with tb-fMRI that the ICA procedure.

Conclusions & Relevance: The combined approach between fNIRS and fMRI is a novel and valid tool to localize language networks in this population. Resting-state functional connectivity analysis has a higher sensitivity for language networks but less specificity, thus, lower power to lateralize. Despite its lower yield in signal, fNIRS has a higher specificity, therefore assisting rs-fMRI approaches for language network lateralization.

Effect of vagal nerve stimulation (VNS) on patients with bilateral temporal lobe epilepsy

A. Alshahrani, J.C. Lau, J.G. Burneo, S.M. Mirsattari, D.B. Debicki, M-L. Jones, D.A. Steven, K.W. MacDougall, A.G. Parrent, R.S. McLachlan, A. Suller Marti

Rational: Temporal lobe epilepsy (TLE) is the most common form of focal epilepsy. Approximately 6 out of 10 people with focal epilepsy have temporal lobe epilepsy. The most common type of drug-resistant epilepsy is TLE. Bilateral temporal lobe epilepsy (bi-TLE) occurs in 10–20% of patients with TLE. Surgery is usually not considered in cases of bilateral temporal lobe epilepsy (bi-TLE). Vagus nerve stimulation (VNS) is approved as a palliative therapeutic option. The outcome of treating bi-TLE using VNS is unknown. The aims of this study is to: 1) Evaluate the effect of VNS on the reduction of seizure frequency in drug-resistant epilepsy patients with bi-TLE. 2) Report the safeness of the VNS and its most frequent side effects.

Method: We interrogated the VNS database of the Epilepsy program at Western University and identified patients with bilateral temporal lobe epilepsy (bi-TLE), who underwent VNS implantation, from 1997 to April 2019. We selected: 1) Bitemporal cases confirmed by either scalp or invasive EEG; 2) Patients who were implanted with VNS; 3) Patients who have drug resistant epilepsy; 4) patients who were followed for at least 12 months post VNS implantation. We considered a patient a responder when the seizure frequency reduction per month (m) was 50% or more, comparing the frequency before and after the VNS implantation. The seizure reduction rate per month was calculated: (Initial frequency seizures per month) – (Final frequency per month) / Initial Frequency per month

Result: Our study included 17 patients (11 women). The mean seizure onset age was 19.4 years (SD=12.99). Bi-TLE was confirmed by scalp EEG in 8 cases (47%) and invasive recording in 9 (52.9%). The mean follow-up was 48.11 months (SD=59.49). The mean seizure frequency per month before VNS was 8.75/m, and after VNS stimulation was 2.64/m. Compared to the baseline, 11 individuals (64.7%) achieved at least 60% reduction in seizure frequency. None of our patients became seizure-free. Six patients (35.3%) experienced either no or minimal reduction in seizure frequency. The responder rate was 87.5% in those who underwent scalp EEG only and 55.5% in those who underwent invasive EEG. Side effects were reported in 10 patients (58.8%). VNS output current was 1.75(0.75-3.5)mA, Magnet stimulation 2(0.75-3.5)mA, pulse width 250(130-500)ms, frequency 30 Hz, and time on 30 (30-60) seconds. In one case, post-surgical wound infection was documented and managed with a brief course of antibiotics.

Conclusion:

- In drug-resistant Bi-TLE therapeutic choices are restricted.

- Surgery is usually not considered in cases of bi-TLE.

- Seizure reduction was 64.7 % after at least 12 months follow-up post VNS implantation.

- VNS was shown to be safe and beneficial as an additional treatment in this group of patients.

- Limitations: small sample size, lack of control group and retrospective design

The Impact in Headache after the Implantation of Vagus Nerve Stimulation Devices in Patients with Medically Resistant Epilepsy

J. Zhang, A. Suller Marti

The objective of this study was to investigate the impact in headache after the implantation of vagus nerve stimulation (VNS) devices in patients with medically resistant epilepsy. Headache is a common comorbidity that is displayed among patients with epilepsy. These headaches are of concern as they can be painful and a burden to patients, reducing their quality of life. Some neuromodulation devices have shown to be effective in improving symptoms of headache in the general population, however there is limited literature surrounding the impact of these devices in patients with medically resistant epilepsy. This prospective study included adult patients (n = 30) who were implanted with VNS at London Health Sciences Centre and who had completed HIT-6 and QOLIE-10 questionnaires before as well as 6 months after VNS implantation. There was no significant decrease in pathological headache compared to baseline. However, a Wilcoxon Signed Rank Test revealed a significance improvement in quality of life (p = .009). To improve the results of this study, larger scale prospective studies with increased follow up times are needed to further explore the impact of VNS implantation in headache of patients with medically resistant epilepsy.

Automatic segmentation of stereoelectroencephalography electrodes using convolutional neural networks

A. Thurairajah, A. Taha, G. Gilmore, M. Abbass, M. Cespedes, Western Epilepsy Surgery Research Collaborative, J. G. Burneo, D. A. Steven, A. Suller-Marti, A. R. Khan, J. C. Lau

Importance: Stereoelectroencephalography (SEEG) is a minimally invasive procedure using intracerebral electrodes to determine the seizure onset zone. The localization of SEEG electrodes and individual contacts is crucial for guiding the surgical plan, and is often performed manually or through semi-automated processes that necessitate additional review.

Objective(s): The objective of the following project is to automate the process of contact segmentation via a convolution neural network (CNN) using clinically acquired post-operative Computed Tomography (CT) scans with minimal preprocessing.

Design and Participants: CNNs are a branch of Artificial Intelligence commonly used in computer vision tasks, where a series of convolutional kernels or filters are applied across an image to extract both lower-level and more abstract features. Our study trains a 3-Dimensional (3D) U-Net, a popular CNN architecture used in medical image segmentation. Training data was pooled from a subset of 125 patients who underwent surgical workup at London Health Sciences Centre between 2017 and 2022. Post-operative CT scans formed the inputs with manually curated segmentations for each electrode contact making up the ground-truth labels. Training occurred on 3D "patches" of our images to reduce computational load. TensorFlow and Keras (version 2.9.0) were used to implement the U-Net architecture. Dice metrics were used to evaluate the network, which assess the region of overlap between our desired segmentation and the ground truth. Dataset was partitioned into training, testing and validation prior to preprocessing to prevent data leakage.

Results: Data consisted of 103 patients, totalling to 1169 implanted electrodes and 12246 contacts. Performance on training and validation sets revealed a patch size of 15, 15, and 15 voxels yielded the lowest Dice loss (1 - Dice coefficient). The loss converged to 0.0073 on the training set.

Conclusions and Relevance: Our results show that convolutional neural networks are a robust method for automatic segmentation of SEEG electrode contacts, requiring minimal pre-processing and no prior information outside of the original post-operative CT scan. Future directions include further optimization and quantitatively assessing the performance of our model against other validated tools.

POST-25

Doesn't consent to having the abstract online

Normative Modelling of Hippocampal Morphology in Epilepsy

M. Yousif, J. Dekraker, J. Arts, G. Gilmore, J. Lau, A. Suller Marti, A. Khan

Importance: New neuroimaging methods are required to improve outcomes for drug resistant epilepsy patients. Normative modelling (NM) provides context to quantitative features extracted from neuroimaging allowing for quantification of individual patient differences relative to a predicted normal reference.

Objective(s): We are evaluating the efficacy of normative modelling (NM) at different sample sizes and applied epilepsy population, using hippocampal segmentation and reconstruction.

Design and Participants: Hippocampal thickness was extracted from T1w Magnetic Resonance Imaging (MRI) with Hippunfold which segments and reconstructs hippocampal surfaces. Bayesian linear models were trained with the PCNtoolkit Python package on control subjects to predict normal hippocampal thickness at each vertex based on inputs of age, sex and acquisition site. Z-scores were computed to compare ground truth and predicted hippocampal thickness. Sample size was tested with a dataset of T1w 3T MRIs (0.8mm3) with a holdout set of 81 subjects for testing and sampling between 25-500 subjects for training. Applying NM in epilepsy, we used a dataset of T1w (0.7mm3) 7T MRIs; we trained and tested on 27 control subjects and applied to 32 participants who suffer from epilepsy.

Results: Sample size analysis used 581 subjects (age 36-100 years) while the NM analysis involved 59 subjects (27 controls and 32 epilepsy). Distribution of thickness z-scores averaged across vertices and subjects for the 25 subject model were shifted ~0.5 standard deviations (SD) higher than larger sample size models. Mean z-scores in both the left and right hippocampus are ≥3 in the hippocampal midsections, especially along the inner fold corresponding roughly to CA2-3. In patients with known epilepsy types, a left temporal and right frontal subject had less variable z-scores. Another left temporal and bitemporal subject had z-scores ≥3 in the hippocampal midsection with the bitemporal subject having z-scores in the left tail ≤-3.

Conclusions and Relevance: This analysis shows differences between smaller and larger training set size models and possibly relevant differences between epilepsy and control subjects for thickness z-scores. Larger datasets are necessary to understand the effect of larger training sets and better represent variation in hippocampal thickness.

Perception and knowledge of Brain Tumor Banking across Canada among neurosurgeons

A. Ahmed, B. Santyr, M. Abbass, Q. Zhang, A. Ranger, J. Megyesi

Title: Perception and knowledge of Brain Tumor Banking across Canada among neurosurgeons

Importance: Brain tumor banking provides an important resource for understanding the underlying pathophysiology of brain tumors. It requires a multidisciplinary team, including neurosurgeons who must recognize the importance of these banks and actively contribute. The perceptions and involvement of neurosurgeons regarding Canadian brain tumor banking remains to be studied.

Objective(s): This study aims to 1) assess current Canadian tumor tissue banking practices 2) determine the perception of neurosurgeons towards brain tumor tissue banks, and 3) uncover obstacles to tissue sample access.

Design and Participants: A 26 question survey was conducted using Qualtrics, which was distributed to 178 Canadian neurosurgeons. Questions pertained to respondent demographics, tissue samples being banked, funding, and collaboration.

Results: 35 neurosurgeons completed the survey (19.66%). The majority of respondents treated adult populations (65.71%) and practiced in Ontario (57.14%). Most centers banked a wide variety of primary and metastatic brain tumors; however, only 25% of respondents stated that their center collaborates with others. Personal communication was the most frequently stated method (58.33%) used to raise awareness of tumor banks. Funding was the most commonly mentioned obstacle to successful banking (70.4%).Banks are funded through research grants (30.76%), departmental support (30.76%), government funding (11.5%) and donations (26.9%).

Conclusions and Relevance: This study investigated neurosurgeons' perceptions of brain tumor banking and the state of Canadian tumor banking. Despite numerous centers banking a wide variety of brain tumors, collaboration between institutes was limited. The greatest perceived obstacle is funding. Canadian brain banking may benefit from improved communication, collaboration and funding.

A meta-analysis of subthalamic nucleus size and volume in healthy controls and Parkinson's disease

A. Ahmed, C. Zajner, A. Hadi, C. Gui, J. Demarco, S. Wong, A. Taha, J. Lau

Importance: While the subthalamic nucleus (STN) is a common target for deep brain stimulation (DBS) in Parkinson's disease (PD), existing literature does not report a consistent volume and size of the STN in health or disease. A clear appreciation of these characteristics can allow for improved diagnosis and accurate and safe neurosurgical interventions where millimeter deviations can be the differences between optimal treatment and side-effects.

Objective(s): This systematic review and meta-analysis aimed to summarize articles investigating the size and volume of the STN measured on MRI in healthy control (HC) and PD patient populations.

Design and Participants: A search on MEDLINE and EMBASE databases was performed between 1980-2017. In brief, inclusion criteria were studies investigating a population of adult PD patients or HC with no other neurological diseases and reported volume, length, width or height of STN using MRI across different field strengths, as measured in Teslas (T, i.e. 1.5T, 3T, 7T). Studies were excluded if they employed imaging modalities other than MRI or investigated animal populations. Four raters went through title and abstract screening according to eligibility criteria, followed by full text review for data extraction. Conflicts were resolved after discussion with a fifth reviewer. This review was pre-registered on PROSPERO (Study ID 79750). Averages of PD and HC participants across all studies were compared using a weighted student t-test (α = 0.05). Random-effects models were fitted to STN volume sizes among young vs. old patients and male vs. female patients. Statistical analysis was performed in R version 4.1.1

Results: 22 studies met our inclusion criteria, which included a pooled number of 723 participants. The weighted mean length, width, and height in patients living with PD was 8.75 mm, 6.57 mm, and 6.75 mm respectively. The weighted mean length, width, and height in patients without PD was 10.78 mm, 3.63 mm, and 3.76 mm respectively.

Conclusions and Relevance: This review improved clarity into the size and volume of the STN, which remains challenging to visualize using conventional MRI protocols and field strengths. Our results may help improve imaging of the STN and the refinement of surgical targeting for neuromodulation

Acquired PTEN loss may mediate dabrafenib and trametinib resistance in BRAF V600E–mutated epithelioid glioblastoma: A case report and review of literature

A. Ahmed, L. Nobre, J. Bennett, W. Mason, U. Tabori, C. Hawkins

Importance: Epithelioid glioblastoma is a rare variant of glioblastoma that primarily affects children and young adults. This commonly has a BRAF V600E mutation and can be treated with BRAF and MEK inhibitors.

Case Description: An 18-year-old woman was diagnosed with an epithelioid glioblastoma. She received temozolomide chemoradiotherapy. Upon progression she had redo surgery and received dabrafenib and trametinib. The patient developed a drop metastasis to the cervical spine, and consequently received focal radiotherapy, 20 Gy in five fractions. Treatments were halted six months after her second resection due to further disease progression. She developed uncal herniation, requiring her to have a third resection approximately six months after her second resection. She passed away after this, 12 months following her initial diagnosis. Retrospective genetic analysis of three tumor specimens showed a novel PTEN mutation that arose after her first surgery. We suspect that the acquired PTEN mutation conferred resistance to dabrafenib and trametinib.

Discussion: This case offers teaching points and research questions. Firstly, early treatment with BRAF and MEK inhibitors in high grade BRAF V600E–mutated gliomas may be optimal as the patient may have stabilized with earlier treatment on dabrafenib and trametinib. Secondly, further studies are required to investigate whether the addition of PTEN mutation to BRAF V600E leads to aggressive tumor behavior. Lastly, there is a need for investigation into potential benefits of treating similar patients by co-targeting the BRAF and PI3K/AKT pathways.

Conclusion: This case report details a novel finding of an acquired PTEN loss of function mutation in a patient with a BRAF V600E–mutated epithelioid glioblastoma (E-GBM). These mutations may have precipitated the development of intrinsic resistance to BRAF and MEK inhibitor medications, dabrafenib and trametinib respectively. Future studies are necessary to determine the consequences of these mutations on the management of patients with similar tumors.

Seinfeld in the scanner: Examining the effects of aging and Parkinson's disease on humor processing with fMRI

M. Prenger, K. Van Hedger, K. Seergobin, A. Owen

Importance: Humor is a complex cognitive phenomenon that promotes well-being; however, its scientific investigation (e.g., with functional magnetic resonance imaging; fMRI) has been limited by a reliance on behavioral responses and low ecological validity. Furthermore, the effects of aging and neurodegenerative disease on humor have been understudied, despite the importance of understanding changes in social functioning within the context of an aging population.

Objective(s): To determine whether humor processing is disrupted by aging and/or Parkinson's disease (PD) using a naturalistic sitcom-viewing fMRI approach.

Design and Participants: Twenty-six healthy young adults, 18 healthy older adults, and 14 patients with PD took part in this mixed-factorial experimental study. Participants were recruited from the OurBrainsCAN and Movement Disorders databases at Western University. Patients had been diagnosed with PD by a movement disorders neurologist, and all participants were screened to exclude cognitive impairment, major depression/anxiety, and dementia. Participants viewed a full episode of the sitcom Seinfeld while undergoing 3T fMRI. The episode laugh track was used to determine events of functional interest; humor comprehension (i.e., "getting the joke") epochs were the 2-seconds immediately prior to the onset of laughter, and humor appreciation (i.e., subjective amusement) epochs were the middle 2-seconds within each burst of laughter. Brain responses during these events were evaluated in regions of interest in the dorsal and ventral striatum.

Results: The younger (11 male), older (10 male), and PD (11 male) groups had mean (SD) ages of 22.35 (3.43), 64.33 (6.85), and 69.07 (7.50), respectively. Compared to younger adults, PD patients had significantly lower activation (-0.26, 95% CI [-0.52, -0.01], p = .04) in dorsal striatum during humor comprehension. For humor appreciation, PD patients had lower activation compared to younger and older adults in dorsal striatum (versus young: -0.33, 95% CI [-0.59, -0.06], p = .01; versus old: -0.30, 95% CI [-0.58, -0.02], p = .03) and ventral striatum (versus young: -0.37, 95% CI [-0.65, -0.10], p = .005; versus old: -0.31, 95% CI [-0.60, -0.03], p = .03).

Conclusions and Relevance: These results demonstrate that PD might lead to disruptions in humor processing, which could negatively impact quality of life.

Teamwork Makes Dreamwork: A Stroke of Genius

W. Koopman, D. Dilkes, C. Casserly

Background: Interprofessional collaboration is at the center of much of our work as Neurologists, yet often Medical Education inadequately prepares students for the complexities of interprofessional health care (IPHC).

Methods: We collected stories from patients and health care professionals (HCPS) on the acute stroke care team. Drawing on these narratives, we have crafted a multimedia story.

Results: This IPHC case will be integrated into Western University's Undergraduate Medical Education curriculum, but also used for teaching IPE competencies in all IPE contexts. All media will be available through Western Libraries open access Health Education Media Library. Main learning outcomes include improved recognition of HCP roles and the vital and diverse contributions of each team member.

Conclusions: Drawing on the experiences of stroke patients, families, and HCPs, we have crafted a rich educational case portraying the complexity of IPHC, allowing learners to reflect on the complex roles of HCP in a successful interprofessional team.

Thank you for attending the 2023 CNS Research Day!

Schulich
MEDICINE & DENTISTRY

Western