Schulich MEDICINE & DENTISTRY

Western

2019 CNS DEPARTMENTAL RESEARCH DAY

KINGS UNIVERSITY COLLEGE, LONDON ON

TUESDAY, MAY 14, 2019

Welcome

We welcome you to the 2019 CNS Departmental Research Day. Based on the continuing feedback we received over the last few years we have made a number of changes this year.

Due to space and financial considerations we have decided to hold the event at the Darryl J. King Student Life Centre at Kings College University; this year we will have the most space ever entirely dedicated to the poster presentations. Each poster presenter will have adequate space for their individual poster and there should be more overall room for attendees and judges to have discussions with the poster presenters. Also the lunch hour will have a menu that is more conducive to browsing the posters and interacting with your colleagues. We value your feedback on this change.

We have further increased the time for the morning and afternoon poster session breaks – this year each of them will be 90 minutes, for a total poster view time of 180 minutes. This will allow attendees even more time to interact with poster presenters, more opportunities to discuss collaborations, and the judges more time to score the abstracts. As in previous years, there will be assigned times during the morning and afternoon break periods when poster presenters will be required to stand by their posters. Please use those times to discuss posters with the presenters. In order to allow for the longer poster viewing times, this year there will be fewer oral presentations. This year we had 60 abstract submissions, the second most ever. We will have 16 oral presentations and 44 poster presentations (22 in the morning and 22 in the afternoon).

Our keynote speaker / guest judge this year is Dr. Sheila Singh who is a pediatric neurosurgeon and surgeon-scientist at the McMaster Children's Hospital in Hamilton, Ontario and Professor at McMaster University. Dr. Singh is known for her skills as a paediatric neurosurgeon, for her research into brain tumour stem cells, and for her mentoring of resident and student trainees. Her biographical sketch is on the following page.

Once again we will be awarding prizes for the "best" abstract presentations. Though this has been a traditional part of the event it should not be construed as being the main goal of the event. The intent of the CNS Departmental Research Day is to make all members of the CNS family aware of what their colleagues are doing – both in clinical and basic science research. We look forward to both the formal and informal exchange of this research information throughout the day.

Finally, we would like to thank Alicia Baertsoen and Nicole Farrell for all their hard work in helping to put this event together! We all hope that you will have an enjoyable day!

Joe Megyesi
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Learning Objective

Attendees will learn about advances in both clinical and basic research that pertain to various topics in the clinical neurological sciences, both neurology and neurosurgery.

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Li X, Benoit S, Xu H, Esmaeili MA, Duenwald M, Hebb M

Poster 11 **(POST-11) The effect of cannabis on performance during neuropsychological testing.**

Fareez F, Olla P, Abeare K, McVinnie N, Hastings M, Erdodi LA

Poster 12 **(POST-12) A longitudinal analysis of depression, apathy, and anxiety in Parkinson's disease.**

Prenger MTN, Handfield-Jones N, MacDonald

Poster 13 **(POST-13) Resistance training combats neurocognitive decline in overweight older adults.**

Furlano JA, Nagamatsu LS

Poster 14 **(POST-14) Ambroxol as a disease-modifying treatment for Parkinson's disease dementia: preliminary findings from a Phase 2, randomized, double-blind, placebo-controlled trial.**

Silveira CRA, Coleman K, Li Z, Finger E, Bartha R, Morrow SA, Wells J, Borrie M, Tirona RG, Rupar CA, Zou G, Hegele RA, Mahuran D, MacDonald P, Jenkins ME, Jog M, Pasternak SH

Poster 15 **(POST-15) Pupil size tracks linguistic ambiguity and noise.**

Kadem M, Al-Khazraji B, Hermann B, Rodd J, Johnsrude I

Poster 16 **(POST-16) High rate spinal nerve root stimulation for the treatment of chronic neuropathic pain.**

Abbass M, Santyr B, MacDougall K, Staudt M

Poster 17 **(POST-17) Quantitative analysis of serum phosphorylated tau in Alzheimer's disease.**

Le C, Dayarathna T, Pasternak S

Poster 18 **(POST-18) A framework for evaluating correspondence between brain images using anatomical fiducials.**

Lau JC, Parrent AG, Demarco J, Gupta G, Park PJ, Ferko K, Khan AR, Peters TM

Poster 19 **(POST-19) Neural representations of gaze direction in primate basolateral amygdala.**

Mahamoudian B, Nicholson R, Martinez-Trujillo J

Poster 20 **(POST-20) Direct visualization of thalamic nuclei at 7 Tesla.**

Santyr B, Lau J, Khan A

Poster 21 **(POST-21) London Brain Biobank for concussion and neurodegenerative dementia.**

Mortuza R, Zhang Q, Coleman K, Jesso S, Pasternak S, Ang L-C, Finger E

Poster 22 **(POST-22) The psychophysiology of guilt.**

Stewart CA, MacDonald PA, Neufeld RWJ, Mitchell DGV, Finger EC

Poster 23 **(POST-23) Novel approaches in endoscopic transphenoidal sellar reconstruction.**

Chalil A, Rotenberg B, Duggal N

Poster 24 **(POST-24) Fibromyxoma of the petrous apex in a pediatric patient: a case report and review of the literature.**

Lucar Figueroa E, Staudt M, de Ribaupierre S

Poster 25 **(POST-25) First symptoms in genetic frontotemporal dementia.**

Tavares TP

Poster 26 **(POST-26) Brain-derived progenitor cells as novel homing delivery vehicles for GBM treatment.**

Olin A, Hamilton A, Ronald J, Hebb M

Poster 27 **(POST-27) Measuring cortical thickness in behavioural-variant frontotemporal dementia using the CAT12 Toolbox in SPM.**

Tham C, Liu L, St. Lawerence K, Finger E, Anazodo UC

Poster 28 **(POST-28) Heat shock factor-1 as a novel therapeutic target in diffuse intrinsic pontine glioma.**

Wile B, Deweyert A, Benoit S, Xu H, Hebb M

Poster 29 **(POST-29) Levodopa decreases craving for alcohol in abstinent alcoholics.**

Van Hedger K, Hiebert NM, Witt I, Seergobin KN, MacDonald PA

Poster 30 **(POST-30) Assessing post-stroke cardiac dysfunction in the insular ischemic stroke rat model.**

Jaremek V, Iankov S, Milazzo T, Wang L, Whitehead SN, Sposato LA

Poster 31 **(POST-31) Pattern of tau burden in progressive supranuclear palsy and corticobasal degeneration.**

Yan L, Ang L-C, Zhang Q

Poster 32 **(POST-32) Outcomes of general anesthesia and conscious sedation in endovascular treatment or stroke.**

Just C, Rizek P, Tryphonopoulos P, Pelz D, Arango M

Poster 33 **(POST-33) A small case series for invasively diagnosed temporal plus epilepsy with surgical success.**

Bottan JS, Suller Marti A, Parrent AG, MacDougall KW, Steven DA

Poster 34 **(POST-34) Increasing head circumference in a young child with shunt malfunction.**

Chalil A, Lo M, de Ribaupierre S

Poster 35 **(POST-35) Optimizing preprocessing of fMRI data to maximize correspondence of functional anatomy across patients.**

Ghazaleh N, Ladowski D, Hallgrimson Z, Gainham G, O'Reilly M, Buckland C, Khan A, Dykstra A, Bullen A, Abolhasani E, Burneo J, Mirsattari S, Parrent A, Steven D, Johnsrude

Poster 36 **(POST-36) Analyzing the electrophysiological effects of Rett Syndrome on neuronoal network development using machine learning.**

Khaki M, Pradeepan K, Martinez-Trujillo J

Poster 37 **(POST-37) Investigating rater reliability in the assessment of SEEG implantation accuracy.**

Istasy P, Christidis N, Lau JC, Steven DA

Poster 38 **(POST-38) Can resting-state fMRI be used for presurgical mapping of language networks in pediatrics?**

Pur DR, de Ribaupierre S, Eagleson R

Poster 39 **(POST-39) Targeting analysis for deep brain stimulation of the anterior nucleus of the thalamus for epilepsy and outcomes.**

Suller Marti A, Gilmore G, Parrent A, Steven DA, MacDougall K, Burneo JG

Poster 40 **(POST-40) Somatosensory evoked potentials and EEG reactivity after cardiac arrest or traumatic brain injury.**

Pelikan J, Althenayan E, Norton L, Debicki D, Hadhiah K, Gofton T

Poster 41 **(POST-41) Sexual dysfunction in multiple sclerosis: a systematic review and meta-analysis of prevelance.**

Kim D, Leurer C, So B, Casserly C, Seyman E, Baral S, Oh J

Poster 42 **(POST-42) The inderpeduncular angle: a practical and objective marker for the detection and diagnosis of intracranial hypotension on brain MRI.**

Wang D, Pandey S, Lee D, Sharma M

Poster 43 **(POST-43) Durable long-term outcomes after percutaneous glycerol rhizotomy in the management of trigeminal neuralgia in patients with multiple sclerosis.**

Staudt MD, Joswig H, Pickett G, MacDougall KW, Parrent AG

Poster 44 **(POST-44) Surface displacement of the striatum as biomarkers for Parkinson's disease.**

Hemachandra D, MacDonald P, Khan AR

Organizers: Dr. Joseph F. Megyesi, Dr. David R. Macdonald, Alicia Baertsoen, Nicole Farrell

Judges: Dr. Sheila Singh, Dr. Derek Debicki, Dr. Michael Mayich

Past Keynote Speakers / Guest Judges

2014 Dr. Rolando Del Maestro
Neurosurgery
McGill University
Montreal, Quebec
Simulation and Neurosurgical Expertise: Integrating Theory into Practice

2015 Dr. G. Bryan Young
Neurology
University of Western Ontario (emeritus) and Grey Bruce Health Services
Owen Sound, Ontario
Dammit, Jim, I'm Just a Community Neurologist

2016 Dr. M. Christopher Wallace
Neurosurgery
Queen's University
Kingston, Ontario
Research in Medical School, Residency and Practice: Worth It?

2017 Dr. Cynthia Hawkins
Neuropathology
University of Toronto
Toronto, Ontario
The Genetics and Epigenetics of Paediatric Astrocytoma

2018 Dr. Tom Mikkelsen
Neurology
Hermelin Brain Tumor Center, Detroit, Michigan, USA
President and Scientific Director, The Ontario Brain Institute, Toronto, Ontario
The Ontario Brain Institute – Team Science for Research with Impact

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Li X, Benoit S, Xu H, Esmaeili MA, Duenwald M, Hebb M

Poster 11 **(POST-11) The effect of cannabis on performance during neuropsychological testing.**

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Poster 12 **(POST-12) A longitudinal analysis of depression, apathy, and anxiety in Parkinson's disease.**

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Poster 13 **(POST-13) Resistance training combats neurocognitive decline in overweight older adults.**

Furlano JA, Nagamatsu LS

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Silveira CRA, Coleman K, Li Z, Finger E, Bartha R, Morrow SA, Wells J, Borrie M, Tirona RG, Rupar CA, Zou G, Hegele RA, Mahuran D, MacDonald P, Jenkins ME, Jog M, Pasternak SH

Poster 15 **(POST-15) Pupil size tracks linguistic ambiguity and noise.**

Kadem M, Al-Khazraji B, Hermann B, Rodd J, Johnsrude I

Poster 16 **(POST-16) High rate spinal nerve root stimulation for the treatment of chronic neuropathic pain.**

Abbass M, Santyr B, MacDougall K, Staudt M

Poster 17 **(POST-17) Quantitative analysis of serum phosphorylated tau in Alzheimer's disease.**

Le C, Dayarathna T, Pasternak S

Poster 18 **(POST-18) A framework for evaluating correspondence between brain images using anatomical fiducials.**

Lau JC, Parrent AG, Demarco J, Gupta G, Park PJ, Ferko K, Khan AR, Peters TM

Poster 19 **(POST-19) Neural representations of gaze direction in primate basolateral amygdala.**

Mahamoudian B, Nicholson R, Martinez-Trujillo J

Poster 20 **(POST-20) Direct visualization of thalamic nuclei at 7 Tesla.**

Santyr B, Lau J, Khan A

Poster 21 **(POST-21) London Brain Biobank for concussion and neurodegenerative dementia.**

Mortuza R, Zhang Q, Coleman K, Jesso S, Pasternak S, Ang L-C, Finger E

Poster 22 **(POST-22) The psychophysiology of guilt.**

Stewart CA, MacDonald PA, Neufeld RWJ, Mitchell DGV, Finger EC

Poster 23 **(POST-23) Novel approaches in endoscopic transphenoidal sellar reconstruction.**

Chalil A, Rotenberg B, Duggal N

Poster 24 **(POST-24) Fibromyxoma of the petrous apex in a pediatric patient: a case report and review of the literature.**

Lucar Figueroa E, Staudt M, de Ribaupierre S

Poster 25 **(POST-25) First symptoms in genetic frontotemporal dementia.**

Tavares TP

Poster 26 **(POST-26) Brain-derived progenitor cells as novel homing delivery vehicles for GBM treatment.**

Olin A, Hamilton A, Ronald J, Hebb M

Poster 27 **(POST-27) Measuring cortical thickness in behavioural-variant frontotemporal dementia using the CAT12 Toolbox in SPM.**

Tham C, Liu L, St. Lawerence K, Finger E, Anazodo UC

Poster 28 **(POST-28) Heat shock factor-1 as a novel therapeutic target in diffuse intrinsic pontine glioma.**

Wile B, Deweyert A, Benoit S, Xu H, Hebb M

Poster 29 **(POST-29) Levodopa decreases craving for alcohol in abstinent alcoholics.**

Van Hedger K, Hiebert NM, Witt I, Seergobin KN, MacDonald PA

Poster 30 **(POST-30) Assessing post-stroke cardiac dysfunction in the insular ischemic stroke rat model.**

Jaremek V, Iankov S, Milazzo T, Wang L, Whitehead SN, Sposato LA

Poster 31 **(POST-31) Pattern of tau burden in progressive supranuclear palsy and corticobasal degeneration.**

Yan L, Ang L-C, Zhang Q

Poster 32 **(POST-32) Outcomes of general anesthesia and conscious sedation in endovascular treatment or stroke.**

Just C, Rizek P, Tryphonopoulos P, Pelz D, Arango M

Poster 33 **(POST-33) A small case series for invasively diagnosed temporal plus epilepsy with surgical success.**

Bottan JS, Suller Marti A, Parrent AG, MacDougall KW, Steven DA

Poster 34 **(POST-34) Increasing head circumference in a young child with shunt malfunction.**

Chalil A, Lo M, de Ribaupierre S

Poster 35 **(POST-35) Optimizing preprocessing of fMRI data to maximize correspondence of functional anatomy across patients.**

Ghazaleh N, Ladowski D, Hallgrimson Z, Gainham G, O'Reilly M, Buckland C, Khan A, Dykstra A, Bullen A, Abolhasani E, Burneo J, Mirsattari S, Parrent A, Steven D, Johnsrude

Poster 36 **(POST-36) Analyzing the electrophysiological effects of Rett Syndrome on neuronoal network development using machine learning.**

Khaki M, Pradeepan K, Martinez-Trujillo J

Poster 37 **(POST-37) Investigating rater reliability in the assessment of SEEG implantation accuracy.**

Istasy P, Christidis N, Lau JC, Steven DA

Poster 38 **(POST-38) Can resting-state fMRI be used for presurgical mapping of language networks in pediatrics?**

Pur DR, de Ribaupierre S, Eagleson R

Poster 39 **(POST-39) Targeting analysis for deep brain stimulation of the anterior nucleus of the thalamus for epilepsy and outcomes.**

Suller Marti A, Gilmore G, Parrent A, Steven DA, MacDougall K, Burneo JG

Poster 40 **(POST-40) Somatosensory evoked potentials and EEG reactivity after cardiac arrest or traumatic brain injury.**

Pelikan J, Althenayan E, Norton L, Debicki D, Hadhiah K, Gofton T

Poster 41 **(POST-41) Sexual dysfunction in multiple sclerosis: a systematic review and meta-analysis of prevelance.**

Kim D, Leurer C, So B, Casserly C, Seyman E, Baral S, Oh J

Poster 42 **(POST-42) The inderpeduncular angle: a practical and objective marker for the detection and diagnosis of intracranial hypotension on brain MRI.**

Wang D, Pandey S, Lee D, Sharma M

Poster 43 **(POST-43) Durable long-term outcomes after percutaneous glycerol rhizotomy in the management of trigeminal neuralgia in patients with multiple sclerosis.**

Staudt MD, Joswig H, Pickett G, MacDougall KW, Parrent AG

Poster 44 **(POST-44) Surface displacement of the striatum as biomarkers for Parkinson's disease.**

Hemachandra D, MacDonald P, Khan AR

Organizers: Dr. Joseph F. Megyesi, Dr. David R. Macdonald, Alicia Baertsoen, Nicole Farrell

Judges: Dr. Sheila Singh, Dr. Derek Debicki, Dr. Michael Mayich

Past Keynote Speakers / Guest Judges

2014 Dr. Rolando Del Maestro
Neurosurgery
McGill University
Montreal, Quebec
Simulation and Neurosurgical Expertise: Integrating Theory into Practice

2015 Dr. G. Bryan Young
Neurology
University of Western Ontario (emeritus) and Grey Bruce Health Services
Owen Sound, Ontario
Dammit, Jim, I'm Just a Community Neurologist

2016 Dr. M. Christopher Wallace
Neurosurgery
Queen's University
Kingston, Ontario
Research in Medical School, Residency and Practice: Worth It?

2017 Dr. Cynthia Hawkins
Neuropathology
University of Toronto
Toronto, Ontario
The Genetics and Epigenetics of Paediatric Astrocytoma

2018 Dr. Tom Mikkelsen
Neurology
Hermelin Brain Tumor Center, Detroit, Michigan, USA
President and Scientific Director, The Ontario Brain Institute, Toronto, Ontario
The Ontario Brain Institute – Team Science for Research with Impact

Platform 1

Abstract Title:

Epilepsy risk among survivors of intensive care unit hospitalization for sepsis

Author(s):

Antaya TC, Allen BN, Richard L, Shariff SZ, Saposnik G, Burneo JG

Abstract:

Objectives: Our objectives were to estimate the risk of new-onset epilepsy in survivors of intensive care unit (ICU) treatment for sepsis and to identify those at highest risk.

Methods: We conducted a population-based, retrospective matched cohort study using linked, administrative healthcare databases. We used the Discharge Abstract Database to identify adult residents of Ontario who were discharged from an ICU between January 1, 2010 and December 31, 2015. We used Cox proportional hazards regression models to estimate epilepsy risk and to identify sepsis survivors at highest risk. We also used Fine-Gray models to account for the competing risk of death.

Results: 143,892 patients were included, 32,252 (22.4%) of whom were exposed. Sepsis survivors were at significantly higher epilepsy risk (HR=1.44, 95% CI=1.15-1.80). However, this risk was not significant after controlling for the competing risk of death (HR=1.16, 95% CI=0.93-1.45). In multivariable analysis, younger age (HR=0.97, 95% CI=0.96-0.99) and having chronic kidney disease at baseline (HR=2.25, 95% CI=1.48-3.43) significantly increased epilepsy risk among sepsis survivors. Results were similar after accounting for the competing risk of death.

Conclusions: Sepsis survivors, particularly those who are younger and have chronic kidney disease, have a significantly higher risk of epilepsy.

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Platform 2

Abstract Title:

Hippocampal digitation asymmetry in MRI-negative focal temporal lobe epilepsy using ultra-high Field (7T): a marker of the seizure focus

Author(s):

Christidis N, Jurkiewicz MT, Lau JC, Burneo JG, Steven DA, Khan AR

Abstract:

In patients with medically refractory TLE, resective surgery of the temporal lobe has been well established as the optimal treatment. Although hippocampal sclerosis (HS) has been the most common MRI marker of the seizure focus, 15-30% of patients show no evidence of HS (i.e. MRI-negative TLE). Due to advancements in ultra-high field MRI, the presence of “bumps” (digitations) on the inferior surface of the hippocampus have been identified. Digitation asymmetry has been associated with clear hippocampal pathologies; however, whether digitation asymmetry can be observed in patients with MRI-negative TLE at 7T has yet to be established.

Patients with MRI-negative TLE undergoing evaluation for refractory epilepsy were recruited and imaged using a 7T MRI protocol. The extent of hippocampal digitation was assessed on sagittal slices by an expert neuroradiologist using a semi-quantitative rating scheme.

100% of patients with HS exhibited considerable hippocampal digitation loss ipsilateral to their seizure focus, sparing the contralateral architecture. Moreover, 60% of MRI-negative TLE patients displayed asymmetrical digitation loss ipsilateral to their seizure focus.

Alterations of hippocampal digitations in MRI-negative TLE can be reliably detected at 7T. Asymmetrical digitation loss may be an effective marker of TLE lateralization to aid HS-independent selection of appropriate surgical candidates.

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Platform 3

Abstract Title:

PET-guided DTI investigation of white matter integrity to improve surgical planning in medically refractory epilepsy

Author(s):

Poirier SE, Kwan BY, Jurkiewicz M, Steven D, Pavlosky W, Romsa J, Prato FS, Thompson TR, Burneo J, Thiessen JD, Anazodo UC

Abstract:

Introduction: A viable treatment option for medically refractory epilepsy (MRE) is to remove the epileptic focus (EF) – the brain tissue responsible for seizures. However, surgical treatment can lead to poor outcomes when the EF is poorly characterized. In patients with no visible lesions, ^{18}F-fluorodeoxyglucose positron emission tomography (FDG-PET) can detect the EF as brain areas showing decreased glucose activity. Diffusion tensor imaging (DTI) can also be used to measure white matter (WM) integrity around the EF. We aim to combine FDG-PET and DTI to investigate WM integrity in MRE patients using quantitative DTI measurements and fiber tractography.

Methods: FDG-PET and DTI data were acquired from 20 MRE patients. FDG-PET was used to detect the EF as brain areas showing glucose hypometabolism. WM integrity was assessed by calculating the mean fractional anisotropy (FA) in WM regions around the EF. WM fibers were subsequently visualized using Fibernavigator, a novel tractography tool.

Results: In five patients, mean FA was reduced in WM ipsilateral to the EF. Using Fibernavigator, fiber tract differences were observed between ipsilateral and contralateral WM.

Conclusion: PET-guided DTI tractography is a feasible method for investigating WM integrity in MRE patients and can be used to improve epilepsy surgical planning.

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Platform 4

Abstract Title:

3D Robot-assisted insular depth electrodes implantation. Anatomical nuances, technique, accuracy, and safety of the oblique trajectories

Author(s):

Bottan JS, Rubino PA, Lau JC, MacDougallKW, Parrent AG, Burneo JG, Steven DA

Abstract:

Background: The insula is a deep cortical structure that has renewed interest in epilepsy investigation. Invasive EEG recordings of this region have been challenging. Robot-assisted SEEG has improved feasibility and safety of such procedures.

Objective: To describe technical nuances of 3D oblique trajectories for insular robot-assisted depth electrode implantation.

Methods: 50 patients who underwent robot-assisted depth electrode implantation between June 2017 to December 2018 were retrospectively analyzed. Insular electrodes were implanted through oblique, orthogonal or parasagittal trajectories. Trajectories, accuracy, number of contacts within insular cortex, imaging and complication rates were analyzed. Cadaveric and CT/MRI 3D reconstructions were used to visualize insular anatomy and technical implications.

Results: 41 patients (98 insular electrodes) were included. 30 (73.2%) patients had unilateral insular coverage. Average insular electrodes per patient was 2.4. The most frequently used was the oblique trajectory (85 electrodes). Accuracy results and number of contacts in the insula are presented. There were no complications related to insular electrodes.

Conclusion: Oblique trajectories are the preferred method for insular investigation at our institution, safely and efficiently maximizing the number of contacts within insular cortex without traversing through sulci or major CSF fissures. 3D understanding of the insula’s anatomy can help the surgeon to improve targeting of this structure.

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Platform 5

Abstract Title:

Computerized optimization of multi-electrode locations and voltages in intratumoral modulation therapy for primary brain tumors

Author(s):

Iredale E, Deweyert A, Hebb MO, Schmid S, Peters T, Wong E

Abstract:

Introduction: Primary glioma brain tumors are sensitive to electric fields delivered using low voltage, intermediate frequency waveforms. Intratumoral Modulation Therapy (IMT) is the developing application of electric fields using electrodes implanted directly into tumor regions. Methods are needed to accurately plan electrode placement and optimize IMT field coverage.

Hypothesis: We hypothesized that the problem of determining the optimal multi-electrode locations and voltages can be cast into a mathematical model for computerized treatment planning.

Materials and Methods: Employing a least square difference objective function in terms of electric fields, we optimized using a BFGS gradient search algorithm for 2 to 4 electrodes *in-vitro*. Electric fields were computed by modeling electrodes in a 3.5 cm dish and optimization performed in MATLAB (MathWorks Inc).

Results: The optimization yielded equally spaced 2 and 4 electrode models at radii and input voltages of 1.2 cm (0V, ±2V) and 1.3 cm (0V, ±2V, 0V, ±2V) respectively. For 3 electrodes, two ±2V electrodes located at (1.4 cm, 0.87π), (1.4 cm, 0.5π) and one 0V at (1.2 cm, 1.64π) was optimal.

Conclusions: This work significantly contributes to the translational pipeline for IMT by establishing field optimization methods that will be adapted to perform patient-specific MR-based treatment planning.

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Platform 6

Abstract Title:

Intratumoral modulation therapy enhances multi-modality treatment platforms for pediatric diffuse intrinsic pontine glioma

Author(s):

Deweyert A, Iredale E, Xu H, Wong E, Schmid S, Hebb MO

Abstract:

Introduction: Intratumoral modulation therapy (IMT) is a putative new treatment modality that delivers non-ablative electrical stimulation directly into tumor-affected brain regions to induce tumor cell death. We have previously shown IMT reduces glioblastoma burden and now aim to assess the therapeutic potential of IMT in the high fatality brain cancer, diffuse intrinsic pontine glioma (DIPG). Hypothesis: We hypothesize that IMT combined with chemoradiotherapy will increase drug sensitivity and reduce DIPG viability. Methods: Patient-derived-DIPG cells were treated with 72-hour IMT (200kHz, ±2V), temozolomide (TMZ), radiation (RT) or combination therapies. The impact of single and multi-modal therapies was assessed using spectrophotometric and flow cytometry viability assays. Computer-generated electric field modeling was performed to predict and quantify IMT field strength, amplitude and geometry using low intensity, intermediate frequency sinusoidal waveforms. Results: MTT revealed significant loss of metabolic viability in DIPG cells treated with IMT compared to sham (>40%, n=3, $p<0.01$). TMZ and RT revealed a modest 19% and 28% reduction in viability respectively but increased significantly to 80% with concomitant IMT (>80%, n=3, $p<0.001$). Conclusion: This study provides first-time evidence of DIPG cell susceptibility to non-ablative electrical therapy and demonstrates the potential of IMT to enhance multi-modality treatment platforms currently available for DIPG.

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Platform 7

Abstract Title:

Deformation-based morphometry analysis of longitudinal low-grade glioma growth

Author(s):

Gui C, Lau JC, Kai J, Khan AR, Megyesi JF

Abstract:

Background: Diffuse low-grade gliomas (LGGs) are primary brain tumours with anisotropic growth related to surrounding white and grey matter structures. Deformation-based morphometry (DBM) is an image analysis method that identifies areas of local volume change over time. In this study, we use DBM to study the local expansion patterns of LGGs on magnetic resonance imaging (MRI) over time.

Methods: We developed an image-processing pipeline optimized for the study of LGG growth involving the fusion of follow-up MRIs for a given patient into an average template space using nonlinear registration. The displacement maps derived from nonlinear registration were converted to Jacobian maps, which estimate local tissue expansion and contraction over time.

Results: Our results demonstrate that neoplastic growth occurs primarily around the edges of the tumour while the lesion core and areas adjacent to obstacles, such as the skull, show no significant expansion. Regions of normal brain tissue surrounding the lesion show slight contraction over time, which may represent compression due to mass effect of the tumour.

Conclusion: DBM may be a useful clinical tool to understand the long-term clinical course of individual tumours and identify areas of rapid growth, which may explain the current presentation and/or predict future symptoms.

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Platform 8

Abstract Title:

Preliminary findings from in vivo imaging of activated microglia in frontotemporal dementia using 18F-FEPPA PET

Author(s):

Anazodo UC, Hicks J, Liu L, Prato FS, Rusjan P, St. Lawrence KS, Finger E

Abstract:

Inflammation is emerging as a potential critical contributor to the pathogenesis and/or progression of frontotemporal dementia (FTD), given that FTD genetic mutations are linked to altered microglial function and tauopathies can induce inflammation. Since little is known of the cortical patterns of inflammation in FTD, we examined the regional pattern of activated microglia in the behavioural variant of FTD, using PET imaging and 18F-FEPPA, a PET ligand targeted to translocator proteins (TSPO) over expressed by activated microglia. PET/MRI in 8 FTD patients (59 ± 7 years, 4 males) were compared to 11 healthy controls (61 ± 7 years, 5 males) after controlling for differences in TSPO genetic polymorphism. On average, the FTD patients had higher 18F-FEPPA activity in the fronto-temporal and cerebellum regions compared to controls (see figure below). Although preliminary, the pattern of elevated microglial activation in our FTD cohort overlaps with pathologically confirmed patterns of microglial activation and brain atrophy in FTD. Efforts are currently underway to further confirm evidence of elevated 18F-FEPPA binding in a larger cohort of FTD patients as well as investigate associations of increased activated microglia to FTD-related functional and structural brain changes.

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Platform 9

Abstract Title:

Voxel-based analysis of white matter degenerations in frontotemporal dementia

Author(s):

Scott S, Dacey M, St. Lawrence K, Finger E, Anazodo UC

Abstract:

Changes in white matter (WM) structure contribute to the progressive cognitive decline and behavioural changes in frontotemporal dementia (FTD), but the mechanisms triggering these WM changes are not well understood. To explore possible mechanisms, we correlated WM changes measured by diffusion tensor imaging (DTI) to levels of activated microglia measured by 18F-FEPPA PET. Tract-based spatial statistics were performed on DTI data of 19 FTD patients and 21 age-matched controls to quantify WM changes in DTI metrics of fractional anisotropy (FA), radial diffusivity (RD), mean diffusivity (MD), and axial diffusivity (AD). Preliminary exploration of associations between DTI measures and 18F-FEPPA PET were performed in 8 of the 19 patients and 11 of the 21 controls who had 18F-FEPPA PET scans and in whom we previously observed regional changes in 18F-FEPPA binding. Although we found patterns of WM degeneration - demyelination and axonal degeneration in FTD patients (see figure below) in line with previous findings, as well as increased 18F-FEPPA in a subset of patients, there were no clear associations between 18F-FEPPA PET and DTI measures. A much larger sample is need to ascertain the interaction between WM degeneration and neuroinflammation especially given the the complex and heterogeneous nature of FTD pathology.

Platform 9

Abstract Title:

Voxel-based analysis of white matter degenerations in frontotemporal dementia

Author(s):

Scott S, Dacey M, St. Lawrence K, Finger E, Anazodo UC

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Platform 10

Abstract Title:

Novel genetic signature identified in brain tissue from living patients with Parkinson’s disease

Author(s):

Benoit SM, Xu H, Alexandrova R, Kaur G, Thiruvahindrapuram B, Schmid S, Hebb MO

Abstract:

Introduction: RNA sequencing (RNAseq) is an innovative unbiased method to define aberrant gene expression in Parkinson’s Disease (PD). To date, however, RNAseq studies in PD are scant and restricted to peripheral or cadaveric tissues.

Hypothesis and Objective: Living brain samples possess a more sensitive and representative genetic signature than previously studied tissues. This study sought to identify differentially expressed genes (DEG) in the living PD brain and compare this genetic profile with published RNAseq data.

Methods: RNA extracted from living cortical biopsies (6 PD, 5 control patients) was sequenced on an Illumina HiSeq 2500 and DEGs identified using edgeR. Bioinformatic methods were used to compare this living brain DEG dataset with reported RNAseq datasets in PD.

Results: 376 significant DEGs were identified in the living brain samples. Of these, 128 were not identified in any of the 7 peripheral or cadaveric tissue datasets publically available. In contrast, a small subset appeared both in the living samples and the majority of comparative datasets.

Conclusions: This pilot study revealed a unique genetic signature in living PD brain compared to peripheral or cadaveric tissues. The novel DEG profile highlights putative new biomarkers that may shed light on PD pathogenesis and warrant further investigation.

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Platform 11

Abstract Title:

The use of diffusion weighted MRI to distinguish Parkinson’s disease patients from healthy controls

Author(s):

Handfield-Jones N, Alushaj E, Hiebert NM, Owen AM, Khan AR, MacDonald PA

Abstract:

Parkinson's disease (PD) is characterized by the presence of both motor and non-motor symptoms. Whereas motor symptoms are treated by dopamine replacement therapies, non-motor symptoms lack treatment options. Clinical trials of improved therapies that address all PD symptoms are hampered by the lack of adequate PD biomarkers. Given the progressive nature of PD neurobiological deficits, finding biomarkers of de novo PD patients would represent a step towards improved PD treatment and care. In the present study, we collected diffusion weighted imaging scans of 21 recently diagnosed PD patients and 22 age-matched healthy controls. For each subject, we parcellated the cortex, striatum, and midbrain into 14 sub-regions each. We found that in the midbrain, the caudal-motor region--the region associated with symptoms at the onset of PD--had significantly lower fractional anisotropy in PD as compared to control (p=0.008). Follow-up receiver operating characteristic (ROC) analysis to distinguish PD from control revealed an area under the curve (AUC) of 0.728 (p=0.011). In the striatum, a combined measure of the caudal motor volume and mean diffusivity L/R ratio scores resulted in an AUC of 0.76 (p=0.0004). These measures are promising signs for de novo PD patient biomarker detection.

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Platform 12

Abstract Title:

Direct visualization of the human zona incerta region using ultra-high field imaging: implications for stereotactic neurosurgery

Author(s):

Lau JC, Parrent AG, Xiao Y, Gilmore G, MacDougall KW, Currie C, Peters TM, Khan AR

Abstract:

Background: The zona incerta (ZI) is a small structure in the deep brain first identified by Auguste Forel for which robust in vivo visualization has remained elusive. The increased inherent signal from ultra-high field (7-Tesla or greater; 7T) magnetic resonance imaging (MRI) presents an opportunity to see structures not previously visible. In this study, we investigated the possibility of using quantitative T1 mapping at 7T to visualize the ZI region.

Methods: We recruited healthy participants (N=32) and patients being considered for deep brain stimulation therapy as part of a prospective imaging study at 7T. Computational methods were used to process and fuse images to produce a high-resolution group average from which ZI anatomy could be delineated.

Results: We pooled 7T data using image fusion methods and found that the contrast from quantitative T1 mapping was strikingly similar to classic histological staining, permitting facile identification of the ZI and nearby structures in reference to conventional stereotactic atlases.

Conclusions: Using computational neuroimaging techniques, we demonstrate for the first time that the ZI is visible in vivo. Furthermore, we determined that this nuclear region can be decoupled from surrounding fibre pathways. This work paves the way for more accurate patient-specific optimization of deep brain targets for neuromodulation.

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Platform 13

Abstract Title:

Automatic localization of anatomical fiducials using 3D intensity features and machine learning

Author(s):

Cao DJ, Hemachandra D, Lau JC, Khan AR

Abstract:

The anterior commissure (AC) and the posterior commissure (PC) are two anatomical fiducials (also called points or landmarks) that serve as references in stereotactic neurosurgery. Labelling these two landmarks is usually performed manually, which is an accurate but tedious process. We propose a method that can automatically complete the localization procedure for these two landmarks. We acquired 27 T1w MRI images in which 25 were used for training and 2 were used for testing. All images were labelled manually with ground-truth fiducials for the AC and PC. Support vector machines (SVMs) were employed to learn the voxel intensity information around the ground-truth fiducials from the training data. In doing so, the voxel containing the AC and PC could be distinguished from the rest of the voxels in the brain. Testing images were fed into the SVMs to generate AC and PC predicted points. For the two test images, the average Euclidean distance between predicted points and ground-truth points was 0.84 mm for the AC and 0.88 mm for the PC. Future work will include optimizing the machine learning model so that more accurate localization of the AC and the PC, among other anatomical fiducials, can be achieved.

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Platform 14

Abstract Title:

Analysis of in-patient falls on the neurosurgery ward

Author(s):

Naeem A-H, Staudt MD, Siddiqi F

Abstract:

Background: We present our institution's experience with in-patient falls on the Neurosurgery ward.

Methods: In-patient falls database was analyzed from January 1st, 2013 till December 31st, 2017.

Results: From the 6,585 patients admitted under Neurosurgery during 2013 till 2017, 4.95% (n= 326 patients) had an in-patient fall. A repeat CT head was done in 17% (n=50 patients) who had an in-patient fall and 95% (n=48 patients) of these CT head scans were read as radiologically stable with no interval complications of trauma reported. The remaining 4% (n=2 patients) of the radiological reports indicated very minute interval traumatic hemorrhagic changes and only 2% (n=1 patient) of the radiological reports resulted in a change in clinical management.

Conclusion: Our study of in-patient falls on the neurosurgery ward revealed that refraining from eagerly ordering a CT head scan without a clear decline in neurological status as part of a routine fall workup has significant cost savings potential ($36,750.00 in this study). In addition, CT head scans to investigate in-patient falls rarely demonstrate radiological findings that alter clinical management.

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Platform 15

Abstract Title:

Video enhancement to guide brain arteriovenous malformation surgical interventions

Author(s):

Vassallo R, Lownie SP, Kasuya H, Lo BWY, Peters T, Xiao Y

Abstract:

Arteriovenous malformations (AVMs) are abnormal collections of blood vessels in the brain where blood flows directly from an artery to a vein through a shunt. For effective surgical treatment, it is important to know which vessels are bringing blood towards and away from the diseased region. However, it is nearly impossible to differentiate these vessels visually. Previous work to guide the intraoperative identification of the vessels included augmented reality (AR) using pre-operative images, fluorescent videoangiography, and Doppler ultrasound, but each of these has inherent limitations. We propose and demonstrate a novel technique to differentiate vessel types by magnifying near-invisible blood pulsation patterns in short videos from the surgical microscope, using video enhancement and spectral analysis. The analysis results rendered as intuitive colourmaps and the surgical microscopic view are fused in AR views. The pulsation strength within blood vessels, inferred from spectral analysis, is normalized with respect to the average signal of the video and vessel diameter for each pixel. This is used to characterize the vessels as the feeding or draining type. The technique is demonstrated retrospectively with three AVM surgical cases, matching the vessel identities as determined by the operating surgeon in each case.

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Platform 16

Abstract Title:

Atrial fibrillation diagnosed after stroke and increased risk of dementia: a multicenter cohort study

Author(s):

Krawczyk M, Fridman S, Cheng Y, Fang J, Saposnik G, Sposato LA

Abstract:

Aims: Atrial fibrillation is an independent risk factor for dementia, but it is unknown if AF detected *after* stroke (AFDAS) is similarly associated with dementia. AFDAS constitutes a unique population, as it is comprised of both neurogenic and cardiogenic forms of AF. We assessed the association between AFDAS and the incident risk of dementia. We also evaluated whether the use of oral anticoagulants (OAC) was associated with lower dementia risk among AFDAS patients.

Methods: In this cohort study, we classified 9791 first-ever ischemic stroke patients from the Ontario Stroke Registry into three groups: 1) No AF, 2) AF known before the stroke, and 3) AFDAS (AF diagnosed *after* stroke). We used multivariable Cox proportional models to estimate cause-specific hazard ratios (HR) for the association between AFDAS and incident dementia risk.

Results: Relative to patients without AF, the risk of dementia was higher for those with AFDAS (HR 1.78, 95%CI 1.51−2.10) and the use of OACs was associated with lower risk of dementia (HR 0.58, 95%CI 0.43−0.79).

Conclusion: This is the first study to demonstrate a link between AFDAS and increased risk of incident dementia. Importantly, our results suggest that dementia risk may be mitigated with anticoagulation use.

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Poster 1

Abstract Title:

Identifying neuroimaging and genetic correlates of delusions and hallucinations in Alzheimer's disease

Author(s):

Ahmed J, Beaton D, Robertson AD, Patel S, Palaniyappan L, Pasternak S, Masellis M, Finger E

Abstract:

The co-occurrence of psychotic symptoms and Alzheimer's disease (AD) is a devastating phenotype that affects around 50% of individuals with AD. We hypothesized that distinct interactions between brain structures and genetic polymorphisms in neurotransmitter systems may be associated with the presence of hallucinations and delusions in AD. Using the Alzheimer's Disease Neuroimaging Initiative, we identified two cohorts of participants: 1)AD/MCI patients with hallucination and a matched control group, and 2)AD/MCI patients with delusions and a matched control group. Partial least squares correspondence analysis (PLS-CA) was used to analyze the relationship between structural neuroimaging measures and 15 SNPs. Preliminary PLS-CA identified a trend towards significance for Component 1. Bootstrap analysis showed that cortical thickness and subcortical volumes below the grand mean for bilateral frontal, temporal, left inferior parietal, lingual, right insula, and accumbens area were associated with SNPs in the glutamatergic system. This pattern of brain structure and SNPs separated those with hallucinations from those without. Preliminary results suggest no significant difference in the interactions between neuroimaging and genetic factors for those with and without delusions. Overall, results provide evidence of a unique signature of neuroimaging and genetic interactions which may be associated with the presence of different psychotic symptoms in AD.

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Poster 2

Abstract Title:

L-dopa alters brain activity associated with auditory regularity processing

Author(s):

Al Jaja A, Hiebert NM, Herrmann B, Seergobin KN, Grahn J, MacDonald PA

Abstract:

The brain is particularly tuned to the presence of regularities (e.g., repetitions) within auditory scenes, potentially as means of facilitating the segregation of different superimposed auditory streams. Processing regularities is thought to be automatic and associated with higher activation at the auditory cortex and inferior frontal gyrus (IFG). Neural signals that indicate regularity processing (RP) are reduced in older people. In addition, 3,4-dihydroxyphenylalanine (L-dopa) reduced the same neural signals in healthy older adults and patients with Parkinson's disease. We aim to investigate the effects of L-dopa on the neural signatures of RP. We hypothesized that L-dopa overdoses dopamine-replete brain regions that mediate RP. Functional magnetic resonance imaging was obtained from eighteen healthy undergraduates, once on L-dopa/carbidopa 100/25mg and once on placebo. Participants listened to two different auditory stimuli that consisted of short tone pips that either contained a regularity (i.e., a repeating pattern) or did not contain a regularity. Off medication, unlike on medication, significant activation arose in the IFG and primary auditory cortex when the regular condition was contrasted with either random or silent conditions. Our results increase our understanding of the neural processing of RP and favors the role of the ventral tegmental area in facilitating this process.

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Poster 3

Abstract Title:

Financial capacity in frontotemporal dementia and related presentations

Author(s):

Blair M, Gill S, Jesso S, Kershaw M, MacKinley J, Coleman K, Pantazopoulos K, Pasternak S, Finger E

Abstract:

Background: Changes in financial judgement and skills can herald a neurodegenerative dementia and are a common reason for referral for cognitive neurologic assessment. However, patients with neurodegenerative diseases affecting the frontal or temporal lobes may perform well on standard cognitive tests, complicating clinical determinations about their diagnosis and financial capacity.

Methods: Forty-five patients with possible or probable FTD or Alzheimer's disease and 22 healthy controls completed two financial assessment batteries, the Financial Assessment and Capacity Test (FACT) and the Financial Competence Assessment Inventory (FCAI). Patients' performance was compared to study partner estimates of patients' financial abilities.

Results: All three patient groups performed worse than controls on both the FACT and the FCAI. Study partners over-estimated the performance of patients with Alzheimer's disease.

Conclusions: These initial findings suggest that accurate clinical assessment of financial skills and judgement in patients with possible neurodegenerative dementias requires performance based assessment.

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Poster 4

Abstract Title:

Differentiating the substantia nigra and ventral tegmental area in early-stage Parkinson’s disease using quantitative susceptibility mapping

Author(s):

Alushaj E, Handfield-Jones N, Owen A, Khan A, MacDonald P

Abstract:

The midbrain dopaminergic system plays a major role in the pathology of Parkinson’s disease (PD). The degeneration of the substantia nigra pars compacta (SNc) causes motor symptoms while neuronal loss in the ventral tegmental area (VTA) causes non-motor symptoms. Excessive iron accumulation in the midbrain is thought to cause this degeneration through mechanisms such as ferroptosis. Magnetic resonance imaging (MRI) can localize and quantify iron in the brain based on its magnetic properties, showing potential for PD biomarker discovery. Twenty early-stage PD patients and elderly controls were scanned once at 3T and 7T. Using quantitative susceptibility mapping (QSM) and R2* images we analyzed iron content in these midbrain nuclei based on the CIT168 atlas. Repeated measures analysis of variance of average susceptibility values from QSM revealed significantly higher SNc iron content in early-stage PD patients compared to elderly controls at both field strengths. R2* mapping could only detect this difference at 7T suggesting this method is less sensitive than QSM. No significant group differences in iron content were found in the VTA. The increased iron load in the SNc of early-stage PD patients, best detected using QSM, could be the first diagnostic biomarker of PD following validation.

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Poster 5

Abstract Title:

A QuIC fix for prion detection? Investigating the predictive value of endpoint quaking-induced conversion in Creutzfeldt-Jakob disease

Author(s):

Budhram A

Abstract:

Creutzfeldt-Jakob disease (CJD) is a fatal neurological illness for which accurate diagnosis is paramount. Real-time quaking-induced conversion (RT-QuIC) is a prion-specific assay with high sensitivity and specificity for CJD. The Canadian endpoint quaking-induced conversion (EP-QuIC) test is similar, but unlike RT-QuIC there is little data regarding its diagnostic utility in clinical practice. In this single-centre retrospective exploratory analysis of EP-QuIC in CJD the negative predictive value (NPV) and positive predictive value (PPV) was 100% and 83%, respectively, with one false-positive result identified. Re-testing this sample with an optimized EP-QuIC protocol eliminated this false-positive result, leading to a PPV of 100%.

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Creutzfeldt-Jakob disease (CJD) is a fatal neurological illness for which accurate diagnosis is paramount. Real-time quaking-induced conversion (RT-QuIC) is a prion-specific assay with high sensitivity and specificity for CJD. The Canadian endpoint quaking-induced conversion (EP-QuIC) test is similar, but unlike RT-QuIC there is little data regarding its diagnostic utility in clinical practice. In this single-centre retrospective exploratory analysis of EP-QuIC in CJD the negative predictive value (NPV) and positive predictive value (PPV) was 100% and 83%, respectively, with one false-positive result identified. Re-testing this sample with an optimized EP-QuIC protocol eliminated this false-positive result, leading to a PPV of 100%.

Poster 6

Abstract Title:

Dopaminergic modulation of a fast visuomotor pathway in health and in Parkinson’s disease (PD)

Author(s):

Anello M

Abstract:

PD is marked by the progressive loss of dopaminergic neurons supplying the basal ganglia, producing movement impairments such as slowness of movement. PD patients can adjust reaching movements mid-flight to displaced targets, which we hypothesize arises from a fast visuomotor network. Recently, we have proposed that stimulus-locked responses (SLRs), which are brief bursts of limb muscle activity that occur ~100 ms after visual target onset, provide a novel way of assessing the fast visuomotor network. The impact of dopamine therapy on SLRs is unknown.

We measured SLRs in PD patients and age-matched healthy controls (HC) both on and off dopamine therapy. All participants generated left or right arm movements toward (pro-reach) or away from (anti-reach) moving targets. We recorded surface electromyographic activity from the right pectoralis major muscle. Prominent SLRs were observed in both PD patients and HC regardless of dopamine treatment. We also found that dopamine therapy influenced the comparative ratio of the SLR on pro- and anti-reach trials, worsening it in HCs, but improving it in PD patients. These results suggest that the fast visuomotor network is spared in PD, and that appropriate dopamine levels contribute to the contextual control of this network.

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Poster 7

Abstract Title:

A Phase 2 clinical trial of intranasal oxytocin for frontotemporal dementia background and progress report

Author(s):

Coleman K, Berry S, Cummings J, Hsiung R, Masellis M, Huey E, Ducharme S, Tartaglia C, Onyike C, Domoto-Reilly K, Mendez M, Dickerson B, Laforce R, Feldman H, Boxer A, Finger E

Abstract:

Oxytocin, a neuropeptide is a mediator of aspects of social cognition and behaviour. The first studies of intranasal oxytocin as a symptomatic treatment in FTD indicate that oxytocin may improve apathy/indifference and related empathic behaviours (Jesso et al. 2011; Finger et al. 2015). Based on these findings, a phase 2 randomized controlled trial of intranasal oxytocin for symptoms of social apathy and empathy deficits in one-hundred patients with FTD was launched across 6 Canadian and 5 US sites in January 2018. As new evidence suggests the pharmacokinetics of oxytocin may vary with chronic use, we designed an adaptive cross-over study with 6 week treatment intervals to identify the best dose schedule. In the second phase, remaining patients are enrolled at the most promising dose. The primary outcome measure is change on NPI apathy/indifference score. Secondary outcome measures include change in caregiver distress/burden ratings, facial expression recognition performance, and total NPI scores. Oxytocin levels are measured in CSF in each treatment period to confirm entry into the CNS. Results of the trial will be used to determine if a phase 3 trial of intranasal oxytocin for symptoms in FTD is warranted. Interim enrollment and safety data will be reported.

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Poster 8

Abstract Title:

Alternative splicing signatures in the prefrontal cortex of living patients with Parkinson's disease

Author(s):

Benoit SM, Xu H, Schmid S, Hebb MO

Abstract:

Introduction: Alternative mRNA splicing (AS) allows generation of multiple functional proteins from a single gene. Mounting evidence suggests that AS aberrations may be related to development of Parkinson's disease (PD). RNAseq, a novel technique for unbiased definition of gene expression, can detect mRNA splicing but has only been reported in PD using peripheral or cadaveric tissues.

Hypothesis and Objective: Cortical samples from living patients may offer a highly sensitive tissue source to identify CNS-relevant AS aberrations in PD. This pilot study sought to determine the feasibility and compare the AS profiles using RNA-seq in cortical samples from PD and control patient cohorts.

Methods: Total RNA was extracted from fresh cortical biopsies (6 PD, 5 controls), sequenced on an Illumina HiSeq 2500 unit and analysed with Spliceseq (v.2.1).

Results: 646 significant differential AS events were identified. There was broad transcriptome representation with notable foci of significance in genes responsible for regulating AS, including 31 zinc-finger proteins and CDC-like kinases 1, 3, and 4.

Conclusions: This first ever look at mRNA splicing patterns in the living PD brain offers new insight into mechanisms and genetic biomarkers that may enhance the understanding and management of patients with PD.

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Poster 9

Abstract Title:

Cardiac rehabilitation is a potential potent neuromodulator of disrupted white matter macrostructure in adults with coronary artery disease

Author(s):

Dacey M, Poirier S, Suskin N, McIntyre C, St. Lawrence KS, Shoemaker JK, Anazodo UC

Abstract:

Objectives: Cognitive decline in coronary artery disease (CAD) patients is linked to white matter (WM) macrostructure (WMM) degeneration. WMM integrity can be quantified using diffusion tensor imaging (DTI) scalar maps; fractional anisotropy (FA), mean and radial diffusivity (MD/RD) are sensitive to local changes in fiber macrostructure, cellularity/edema, and demyelination, respectively. We examined WMM changes in a cohort of CAD patients. We hypothesized that aerobic exercise based cardiac rehabilitation (CR) would improve WMM in these patients.

Methods: DTI images were acquired from 35 CAD patients and 21 controls at baseline using a single-shot EPI sequence. 19 CAD patients were rescanned after 6-months of CR. The images were processed to correct for artifacts and noise prior to tensor fitting. Tract-based spatial statistics were performed to compare WMM between CAD patients and controls and between patients pre- and post-CR.

Results: Compared to controls, CAD patients had increased MD in the thalamic radiation, corticospinal tract and longitudinal fasciculus. Post-CR, patients exhibited increased FA, decreased MD and RD in several WM tracts linked to cognitive function, including areas of disrupted WMM at baseline.

Conclusion: In general, positive WMM changes were observed in a cohort of CAD patients after CR.

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Poster 10

Abstract Title:

Defining the therapeutic impact of brain-derived progenitor cells in a preclinical model of Parkinson's disease

Author(s):

Li X, Benoit S, Xu H, Ali Esmaeili M, Duennwald M, Hebb M

Abstract:

Introduction: Cell-based therapeutics (CBT) remain a critical initiative for Parkinson's Disease (PD). We first described human brain-derived progenitor cells (BDPCs) that co-express multiple cytoprotective neurotrophic factors (NTFs) and neural markers, raising the exciting prospect of effective integration and benefit in the host brain. To establish the translational potential, it is necessary to evaluate the therapeutic impact of BDPCs in an accurate preclinical model.

Hypothesis and Objectives: BDPCs derived from rodent brain produce NTFs and confer neuroprotection against PD degeneration. The study objectives were to quantify secreted NTFs and evaluate the therapeutic impact of rodent BDPC conditioned media in dopaminergic cells.

Methods: NTFs from rodent BDPCs were quantified using PCR, Western blot and ELISA. Co-cultured BDPCs or conditioned media were used to assess putative protective actions against the cell toxin, 6-OHDA, in dopaminergic SH-SY5Y cells.

Results: Rodent BDPCs express substantial levels of cytosolic and secreted NTFs. The NTF measures and BDPC impact on the survival of dopaminergic cells will be reported.

Conclusions: Our preclinical rodent model permits novel evaluation of the therapeutic impact of BDPCs. This is the first and critical step in establishing a translational pipeline for this newly described, highly promising cell type in CBT for PD.

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Poster 11

Abstract Title:

The effect of cannabis on performance during neuropsychological testing

Author(s):

Fareez F, Olla P, Abeare K, McVinnie N, Hastings M, Erdodi LA

Abstract:

This study evaluated the effects of cannabis on cognitive functioning during an acute stage of intoxication following a 10-minute period of smoking cannabis with a concentration of 20% Tetrahydrocannabinol (THC), compared to a relative state of deprivation (Baseline) and a period of 2-3 hours delay without any further cannabis consumption (Recovery). Participants (n = 22, 59.1% men) were community volunteers with a medical marijuana license (M_{Age} = 36.0 years, $M_{Education}$ = 13.7 years). Average amount of daily cannabis consumption was 3.2 grams. A battery of neuropsychological tests [Boston Naming Test- Short Form (BNT-15), category fluency, Coding, Digit Span, Stroop and Trail Making Test] was administered during Baseline, THC and Recovery.

Performance on most tests either remained stable or improved from Baseline to THC (Cohen's d: 0.49-0.65, medium effect). Mean performance increased during Recovery (Cohen's d: 0.45-0.51, medium effect). Failure rates on performance validity indicators increased during THC, and dropped to zero during Recovery. Possible explanations for these results include learning effects and the deleterious effects of THC or the relationship of pain, THC and cognitive performance. Future research using double-baselines, higher doses of THC, more comprehensive test batteries and recreational cannabis users with lower levels of tolerance is needed.

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Poster 12

Abstract Title:

A longitudinal analysis of depression, apathy, and anxiety in Parkinson’s disease

Author(s):

Prenger MTM, Handfield-Jones N, MacDonald PA

Abstract:

Parkinson’s disease (PD), a neurodegenerative disorder characterized by loss of dopaminergic neurons supplying the basal ganglia, is commonly recognized for its motor symptoms. There are also several non-motor symptoms which are highly prevalent and contribute to reduced quality of life, including depression, apathy, and anxiety. However, the mechanisms underlying these affective symptoms in PD are currently unknown and are complicated by several disease factors. In this study, depression, apathy, and anxiety symptoms of PD patients (n = 86) and healthy controls (n=67) were longitudinally evaluated. All participants completed the Beck Depression Inventory (BDI), Starkstein Apathy Scale (SAS) and Beck Anxiety Inventory (BAI) at several time points. Furthermore, all participants were tested both ON and OFF dopaminergic medication (L-DOPA) at each time point. Using a mixed-models approach, we evaluated the severity of affective symptoms in PD compared to controls, and the progression of these symptoms over time. Compared to controls, PD patients experienced higher BDI, SAS, and BAI scores and a worsening of depression, but not anxiety or apathy, over time. Interestingly, medication showed positive effects for BAI scores. These results elaborate on the complex and progressive nature of affective symptoms in PD and might help inform future treatment approaches.

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Poster 13

Abstract Title:

Resistance training combats neurocognitive decline in overweight older adults

Author(s):

Furlano JA, Nagamatsu LS

Abstract:

Studies show that overweight older adults experience neurocognitive decline beyond normative aging, and are at high risk for developing diseases such as diabetes and dementia. One promising lifestyle intervention that may improve cognition and brain health in this population is exercise, but studies examining whether resistance exercise (RE) can improve neurocognition is limited. Therefore, we conducted a pilot 6-month RE intervention in 20 overweight older adults (aged 60-80, BMI ≥ 25), examining cognition (via standardized neuropsychological tests) and brain health (structure and function assessed via 3T MRI). Results show that 6 months of RE can improve cognition (e.g., memory, executive function) and brain health (e.g., increased whole brain volume and functional activation of the hippocampus) in this population. Thus, our findings unveil a feasible, accessible lifestyle intervention strategy to improve neurocognition in a population of older adults at-risk for dementia.

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Poster 14

Abstract Title:

Ambroxol as a disease-modifying treatment for Parkinson’s disease dementia: preliminary findings from a Phase 2, randomized, double-blind, placebo-controlled trial

Author(s):

Silveira CRA, Coleman K, Li Z, Finger E, Bartha R, Morrow SA, Wells J, Borrie M, Tirona RG, Rupar CA, Zou G, Hegele RA, Mahuran D, MacDonald P, Jenkins ME, Jog M, Pasternak SH

Abstract:

Parkinson’s disease dementia (PDD) is suggested to result from the aggregation of α-synuclein in subcortical and cortical neurons. Currently, there are no disease-modifying treatments for PDD. A potential target for treatment is the enzyme β-Glucocerebrosidase (GCase), since raising GCase levels was shown to lower the levels of α-synuclein in cell and animal models. Ambroxol is an over the counter expectorant that is a pharmacological chaperone for GCase; a small molecule which stabilizes and increases the levels of GCase. This study aims to assess the safety and tolerability of Ambroxol in PDD, and to examine the effects of Ambroxol on cognitive, biochemical, and neuroimaging measures. Fifty individuals with mild to moderate PDD are being randomly assigned to Ambroxol 1050mg/day or placebo for 1 year. Primary outcomes are the ADAS-Cog and the ADCS-CGIC. Secondary outcomes include the UPDRS, an extended set of cognitive and clinical assessments, and plasma, CSF and neuroimaging biomarkers. Twenty-seven participants have been enrolled in the study. Ambroxol appears to be well tolerated. Blinded pharmacological analysis shows increased levels of GCase in white blood cells and penetration of Ambroxol in CSF. If found safe and effective, Ambroxol will be the first disease-modifying treatment for PDD. Clinical Trial Registration NCT02914366.

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Poster 15

Abstract Title:

Pupil size tracks linguistic ambiguity and noise

Author(s):

Kadem M, Al-Khazraji B, Herrmann B, Rodd J, Johnsrude I

Abstract:

Listening to speech in noisy environments is cognitively taxing in hearing-impaired persons. Researchers in clinical audiology are getting interested in pupillometry as a way to objectively measure differences in effortful listening that cannot be explained by an individual's hearing impairment, or by their success in a clinical speech-in-noise task. Pupillometry is relatively quick and easy to measure, and a host of studies indicate that when acoustics are degraded or hearing impairment is present, the pupil is larger than when listening is effortless. However we've known since Kahneman's Attention and Effort in the 50s that the pupil responds to a broad range of cognitive demands, potentially including linguistic demands, such as when speech includes semantically ambiguous words, like mean or run. Although we are not always aware of the presence of ambiguity, behavioural and imaging results indicate that ambiguity is increases cognitive load. To investigate the impact of linguistic ambiguity and noise on the pupillary response we used a factorial design to deliver low and high ambiguity sentences, in both clear and noise conditions. We found main effects of noise and linguistic ambiguity on the pupillary responses, which is a timely reminder to the audiological community that pupil dilation may be a nonspecific marker of difficulty, and that the linguistic challenge introduced by material needs to be carefully controlled if pupil response to acoustic challenge is to be observed and interpreted.

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Poster 16

Abstract Title:

High rate spinal nerve root stimulation for the treatment of chronic neuropathic pain

Author(s):

Abbass M, Santyr B, MacDougall K, Staudt M

Abstract:

Introduction: Dorsal column spinal cord stimulation (SCS) has been successfully used in the treatment of intractable neuropathic pain, although some patients find paresthesias uncomfortable and certain dermatomal regions are difficult to target. Nerve root stimulation (NRS) has been shown to be efficacious in treating dermatomal pain not amenable to SCS. We sought to investigate the use of paresthesia-free, high-frequency (HF) stimulation targeting nerve roots (HF-NRS) for intractable neuropathic pain.

Methods: This is an updated retrospective institutional study investigating the use of HF-NRS in patients with intractable neuropathic pain fitting a specific nerve-root dermatomal pattern.

Results: 14 patients (mean age 56.9, 4 male and 10 female) were analyzed. Mean duration of pain before NRS was 6.29 years. Mean VAS for all patients prior to NRS was 7.46. Mean VAS for patients treated with conventional NRS was (2.81 at 1.5 months and 2.9 at 1 year), while mean VAS for patients treated with HF-NRS was (2.73 at 1.5 months and 2.56 at 1 year). There were no significant differences in VAS between patients treated with conventional and HF-NRS.

Conclusion: HF-NRS is effective in treating neuropathic pain in a nerve-root dermatomal pattern without producing undesired paresthesias. There were no differences in efficacy between conventional and HF paradigms.

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Poster 17

Abstract Title:

Quantitative analysis of serum phosphorylated tau in Alzheimer's disease

Author(s):

Le C, Dayarathna T, Pasternak S

Abstract:

Objective: To investigate the use of quantitative nanoflow cytometry in the analysis of serum phosphorylated tau biomarkers for Alzheimer’s disease (AD). Background: In AD, neuronal tau progresses from a pre-tangle state and undergoes abnormal phosphorylation and truncation before misfolding into small tangles and packed paired helical filaments (PHF). We hypothesize that by targeting phosphorylated tau epitopes that occur early in the neurodegenerative sequence, we may be able to distinguish early AD from controls.

Methods: Nanoflow cytometry quantification analysis was applied to human serum from healthy controls (n=6) and patients with mild (n=6), moderate (n=6), and severe (n=5) AD. The specific antibodies used were AT8, Thr231, T22, Ser422, T46, PHF-tau 13.6, PHF ser 212/214, tau-5, anti-synaptophysin and anti-neurogranin.

Results: A higher event rate was observed with anti-Thr231 in mild AD versus controls. Higher event rates were also observed for anti- PHF-ser396, tau-5, synaptophysin and neurogranin in more severe AD samples.

Conclusion: Quantification of serum phosphorylated tau at threonine 231 by nanoflow cytometer may distinguish healthy controls versus patients with mild AD. Future studies will attempt to validate our findings and determine whether these biomarkers can be used to monitor disease progression.

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Le C, Dayarathna T, Pasternak S

Abstract:

Objective: To investigate the use of quantitative nanoflow cytometry in the analysis of serum phosphorylated tau biomarkers for Alzheimer’s disease (AD). Background: In AD, neuronal tau progresses from a pre-tangle state and undergoes abnormal phosphorylation and truncation before misfolding into small tangles and packed paired helical filaments (PHF). We hypothesize that by targeting phosphorylated tau epitopes that occur early in the neurodegenerative sequence, we may be able to distinguish early AD from controls.

Methods: Nanoflow cytometry quantification analysis was applied to human serum from healthy controls (n=6) and patients with mild (n=6), moderate (n=6), and severe (n=5) AD. The specific antibodies used were AT8, Thr231, T22, Ser422, T46, PHF-tau 13.6, PHF ser 212/214, tau-5, anti-synaptophysin and anti-neurogranin.

Results: A higher event rate was observed with anti-Thr231 in mild AD versus controls. Higher event rates were also observed for anti- PHF-ser396, tau-5, synaptophysin and neurogranin in more severe AD samples.

Conclusion: Quantification of serum phosphorylated tau at threonine 231 by nanoflow cytometer may distinguish healthy controls versus patients with mild AD. Future studies will attempt to validate our findings and determine whether these biomarkers can be used to monitor disease progression.

Poster 18

Abstract Title:

A framework for evaluating correspondence between brain images using anatomical fiducials

Author(s):

Lau JC, Parrent AG, Demarco J, Gupta G, Park PJ, Ferko K, Khan AR, Peters TM

Abstract:

Background: Accurate spatial correspondence between template and subject images is a crucial step in neuroimaging studies and clinical applications like stereotactic neurosurgery.

Methods: In the absence of a robust quantitative approach, we sought to propose and validate a set of point landmarks, anatomical fiducials (AFIDs), that could be quickly, accurately, and reliably placed on magnetic resonance images of the human brain. Several publicly available brain templates and individual participant datasets were used for validation.

Results: Novice users could be trained to place a set of 32 AFIDs with millimetric accuracy. Furthermore, the utility of the AFIDs protocol is demonstrated for evaluating subject-to-template and template-to-template registration. Specifically, we found that commonly used voxel overlap metrics were relatively insensitive to focal misregistrations compared to AFID point-based measures.

Conclusions: Our entire protocol and study framework leverages open resources and tools, and has been developed with full transparency in mind so that others may freely use, adopt, and modify. This protocol holds value for a broad number of applications including alignment of brain images and teaching neuroanatomy.

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Poster 19

Abstract Title:

Neural representations of gaze direction in primate basolateral amygdala

Author(s):

Mahmoudian B, Nicholson R, Martinez-Trujillo J

Abstract:

Introduction: In primates, head and eye orientation can signal one's direction of attention and is used to interpret one's intentions and goals. As social communication in primates relies heavily on the visual system, understanding how and where social communicative signals are represented in the brain allows investigation of networks supporting social cognition. Furthermore, it provides opportunity to examine how disturbances to these networks can result in cognitive deficits observed in numerous mental illnesses.

Objective: This project aims to investigate whether and how the basolateral (BLA) nucleus of the primate amygdala encodes head and eye orientation. It is hypothesized that different populations of neurons in the BLA are tuned for gaze cues of head and eye orientation. The amygdala receives highly processed visual information from areas representing facial features, while having strong projections to brainstem areas controlling the autonomic nervous system. Therefore, amygdala is at the nexus of translating incoming visual information into behavioral output. It is proposed that perturbation to this gaze direction encoding circuit can result in gaze aversion behavior seen in individuals with Autism Spectrum Disorder.

Methods: Two Rhesus macaque monkeys will be placed in front of a monitor screen and have their eyes tracked while performing a four-alternative choice gaze cueing task. A virtual monkey model will cue one of the four objects presented on the screen and the subject must utilize this cue to attend the correct object to be rewarded. Cues will include a combination of head and eye orientation and will be compared to conditions presenting non-biological cues (e.g. an arrow). Single neurons from the BLA will be recorded using microelectrodes and the activity will be correlated with presentation of social stimuli containing cues of head and eye orientation.

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Poster 20

Abstract Title:

Direct visualization of thalamic nuclei at 7 Tesla

Author(s):

Santyr B, Lau J, Khan A

Abstract:

Introduction: Thalamic nuclei are frequently targeted in stereotactic neurosurgery. Individual thalamic nuclei cannot be directly visualized on routine clinical magnetic resonance imaging (MRI) sequences. Therefore, targeting techniques are indirect, relying on stereotactic coordinate systems, histological atlases, and electrophysiological recording. These systems do not account for inter-subject variability. Higher field MRI affords the opportunity to directly visualize the thalamic nuclei in vivo, allowing for individualized targeting and analysis of disease-related changes in these substructures.

Methods: A series of healthy individuals, imaged using 7 Tesla (7T) MRI, were used to create a normative atlas. Quantitative susceptibility mapping (QSM) was reconstructed from the images acquired at 7T. To obtain a high-resolution composite image, these maps were registered, averaged together, and transformed to the common AC-PC space. Representative axial slices of the thalamus were chosen for comparison with the Schaltenbrand-Wahren Atlas.

Results: QSM at 7T in healthy individuals provides sufficient resolution and contrast within the thalamus for the visual identification of the ventrooralis, ventro-intermediate, ventro-caudalus, medio-dorsal, and pulvinar nuclei.

Conclusion: Ultra-high field MRI at 7T and QSM provides a method of direct visualization of thalamic nuclei, uncovering substructures not previously identifiable in vivo. Facilitating quantitative analysis of disease-related changes to these structures and improved clinical targeting.

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Poster 21

Abstract Title:

London Brain Biobank for concussion and neurodegenerative dementia

Author(s):

Mortuza R, Zhang Q, Coleman K, Jesso S, Pasternak S, Ang L-C, Finger E

Abstract:

Neurodegenerative dementias are the greatest cause of disability and debilitation in the geriatric population. While hallmark pathologic proteins have been identified for many neurodegenerative diseases such as Alzheimer's disease and Frontotemporal Dementia, the full cascade of molecular pathophysiology is still not understood, and no treatments are available to prevent or slow the progression of these conditions. Furthermore, confirmation and characterization of links between concussion and later development Chronic Traumatic Encephalopathy with multiple molecular pathologies require additional examination of cohorts with concussion, with and without a history of subsequent dementia. Evaluation of brain tissue obtained at autopsy of patients with neurodegenerative dementia remains a critical resource for further characterizing the cellular and molecular nature of these diseases, linkage to specific risk factors, and the identification of potential therapeutic targets.
ondon, Ontario serves as a clinical center of excellence for southwestern Ontario region for clinical and neuropathological evaluation of patients with neurodegenerative disorders and sport concussions. Currently, infrastructure for the organization, processing, storage of biosamples (brain tissue, blood, cerebrospinal fluid) and linkage to clinical, genetic and neuroimaging information is lacking.
We are launching a Brainbank biorepository in London Ontario in collaboration with scientists and physicians of London Health Sciences Centre, Western University and Robarts Research Institute, St. Joseph Health Care and Lawson Health Research Institute. The London Brain Biobank for Concussion and Neurodegenerative Dementias will increase public awareness of the value of brain donation, coordinate brain and biosample donation, create & maintain de-identified participants database, store tissues and facilitate the distribution of high quality, human post-mortem brain tissue from well characterized patients with dementia and related disorders to qualified researchers locally and globally. In conclusion, LBBCND will facilitate innovative scientific research by acting as a local and external resource for distributing well-characterized human biosamples and clinical data among researchers in the community conducting research in the field of neurodegenerative dementias.

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Poster 22

Abstract Title:

The psychophysiology of guilt

Author(s):

Stewart CA, MacDonald PA, Neufeld RWJ, Mitchell DGV, Finger EC

Abstract:

The autonomic nervous system (ANS), which regulates bodily functions, is known to affect the experience of emotions. Previous research has established physiological activation patterns for numerous basic emotions. One emotion that has not yet been characterized, despite an anecdotally visceral experience, is guilt, an emotion that is elicited by causing actual or perceived harm to another. We sought to identify the specific ANS patterns elicited when experiencing guilt. Fifty healthy individuals (25 female) completed a novel task, viewing videos that elicited guilt and the comparison emotions of amusement, disgust, sadness, pride, and neutral. Participants' swallowing, heart, and respiration rates were monitored. Preliminary analysis identified a significant interaction between emotion and physiological states ($F(9.782, 459.769)= 2.070$, $p=.027$). Post-hoc analyses found that, compared to neutrality, guilt elicited increased swallowing ($t(42)=3.828$, $p<.001$) and increased sympathetic activation of heart rate ($t(41)=3.246$, $p=.002$). Guilt had no significant effect on respiratory sinus arrhythmia, ($t(41)=.473$, $p=.639$) or respiration rate ($t(42)=.952$, $p=.347$). These results suggest that there is a distinguishable autonomic output representing guilt, characterized by enhanced sympathetic outflow. Future studies will aim to identify whether changes in these physiological responses may have implications for emotional dysregulation in disorders featuring low guilt, such as psychopathy or frontotemporal dementia.

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Poster 23

Abstract Title:

Novel approaches in endoscopic transphenoidal sellar reconstruction

Author(s):

Chalil A, Rotenberg B, Duggal N

Abstract:

Background: The last 10 years have transformed the endonasal endoscopic approach to become the workhorse of sellar/suprasellar operations due to its minimally invasive nature and efficiency in tumour resections. Despite its many advantages, the achilles heel of this approach is the risk of intra/post operative cerebrospinal fluid (CSF) leak, which can significantly impact the patients' length of hospital stay and their overall outcomes. Although fat grafts and pedicled mucosal flaps have become the main endoscopic techniques for sellar reconstruction and CSF leak prevention, these approaches still have a significant failure rate. We present two novel approaches to sellar reconstruction and CSF leak repair using a silicone burrhole cap and mini vascular metal clips.

Methods: A total of 9 cases are presented, with intraoperative imaging and approach to repair. Failure rate of these new approaches is compared to traditional repairs.

Conclusion: We present two novel techniques with follow-up for CSF repair for endoscopic transphenoidal approach to the skull base. These repairs can be added to the surgical armamentarium to deal with refractory or complicated CSF leaks.

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Poster 24

Abstract Title:

Fibromyxoma of the petrous apex in a pediatric patient: a case report and review of the literature

Author(s):

Lúcar Figueroa E, Staudt M, de Ribaupierre S

Abstract:

Skull lesions are common in the pediatric population. The differential diagnosis is broad including a diverse collection of congenital and acquired, as well as nonneoplastic and neoplastic lesions. Among these, fibromyxoma is a very rare mesenchymal tumor. It commonly involves the heart, subcutaneous tissue and bone, typically the maxilla and the mandible. Although benign and slow growing, they enlarge with time and they may recur after maximal resection.

We describe a 6-year old girl presenting with a 2-week history of right-sided facial weakness, esotropia and headache. A large expansile soft tissue mass with associated bony thinning and destruction in the right petrous apex was found on MRI. The mass was resected through a combined temporal craniotomy and mastoidectomy. Histological examination showed stellate cells in myxoid/collagenous background consistent with fibromyxoma. This is a unique case of a pediatric skull base fibromyxoma with no evidence of tumor recurrence at 3 years after resection and radiotherapy. The clinical manifestations, imaging and surgical findings are discussed with a review of the literature of the few cases reported to highlight the need for early surgical intervention and continuous meticulous follow-up.

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Poster 25

Abstract Title:

First symptoms in genetic frontotemporal dementia

Author(s):

Tavares TP

Abstract:

Frontotemporal Dementia (FTD) is a heterogeneous neurodegenerative disorder that features changes in behaviour and or language. Approximately 40% of FTD is strongly hereditary, and mutations in the *C9orf72, GRN* and *MAPT* genes are the most common cause of genetic FTD. As clinical trials of disease modifying treatments are underway it is essential to identify markers that can track and assess the effectiveness of treatments. Designating a primary outcome measure for symptomatic and pre-symptomatic individuals is challenging, as the symptoms can differ widely between patients. Current studies of the predominant initial symptoms are limited to examining small samples and have not compared genetic groups. The current study aims to evaluate and compare the initial symptoms across the three main FTD-causing gene mutations in the international GENFI cohort of patients and in genetically at-risk individuals. Caregivers of symptomatic mutation carriers reported up to three initial symptoms. Informants of genetically at-risk family members (N=588) completed the Cambridge Behavioural Inventory-Revised at baseline and at a one-year follow-up to assess symptom occurrence and severity. Preliminary results suggest different endorsement of initial symptoms across the FTD-causing mutations. Generalized linear mixed models are currently being conducted to assess differences in symptom endorsement between pre-symptomatic and non-mutation carriers.

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Poster 26

Abstract Title:

Brain-derived progenitor cells as novel homing delivery vehicles for GBM treatment

Author(s):

Olin A, Hamilton A, Ronald J, Hebb M

Abstract:

Introduction: The newly recognized homing ability of somatic stem cells to glioblastoma (GBM) raises exciting potential to develop biological delivery vehicles for chemotherapeutics otherwise impeded by the blood brain barrier. The success of this strategy is highly dependent upon the innate properties of the delivery cells and to date the use of neural-derived stem cells has not been reported.

Hypothesis and Objective: Compared to somatic cells, neural-derived progenitor/stem cells will more effectively home to GBM tumors and integrate within the brain. This study sought to evaluate the GBM homing ability of human progenitor cells isolated from a neural origin.

Methods: Fluorochrome-labeled patient brain-derived progenitor cells (BDPCs) were evaluated in a custom homing assay using primary GBM cells as the target. This system allows for continuous, real-time image acquisition throughout the duration of the assay, without destruction of the sample.

Results: BDPCs were evaluated in our custom homing assay for a period of 3 days with regular interval imaging surveillance. Detailed migration measures will be reported.

Conclusions: The demonstration of BDPC homing to GBM will identify a novel neural-derived delivery vehicle with promise for critically-needed, personalized cell-based strategies in GBM.

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Poster 27

Abstract Title:

Measuring cortical thickness in behavioural-variant frontotemporal dementia using the CAT12 Toolbox in SPM

Author(s):

Tham C, Liu L, St. Lawrence K, Finger E, Anazodo UC

Abstract:

This study compared cortical thickness in 24 patients diagnosed with the behavioural variant frontotemporal dementia (bvFTD) (65 ± 8 years, 10 males) and 23 healthy controls (62 ± 8 years, 10 males) using surface-based morphometry (SBM) analysis of anatomical MRI recently implemented in the Computational Anatomy Toolbox (CAT12) of the Statistical Parametric Mapping software (SPM12) . CAT12 is a fast, automated and robust approach for SBM analysis - a direct measure of the amount of brain atrophy (distance between white matter and pial surface) associated with age or disease. Here, we evaluated whether CAT12 SBM analysis would reveal similar patterns of FTD-related atrophy reported by previous studies, where well established SBM implementations such as Freesurfer were used. Compared to healthy controls, bvFTD patients showed bilateral cortical thinning in the superior frontal lobes, medial temporal lobes and frontal poles (figure), in line with patterns of cortical involvement in FTD observed by previous studies [2,3]. A follow study up will explore associations of cortical thinning in bvFTD measured with CAT12 SBM to neuroinflammation measured with positron emission tomography to investigate the role of neuroinflammation in brain morphological retrogressions in bvFTD.

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Poster 28

Abstract Title:

Heat shock factor-1 as a novel therapeutic target in diffuse intrinsic pontine glioma

Author(s):

Wile B, Deweyert A, Benoit S, Xu H, Hebb M

Abstract:

Background: Heat shock factor-1 (HSF1) is a transcription factor that regulates the expression of multiple heat shock proteins (Hsp) that protect and confer malignant properties to various types of cancer cells. There is little known about HSF1 or Hsp function in the rapidly fatal, paediatric, high grade glioma called diffuse intrinsic pontine glioma (DIPG).

Hypothesis and Objective: We hypothesize that HSF1 regulates Hsp expression and cell viability in the harsh microenvironment of DIPG tumors. This study sought to determine if HSF1 could be effectively knocked down in DIPG cells and, if so, the impact on downstream Hsps (Hsp27, 70 and 90) and cell viability.

Methods: Patient DIPG cells were treated with control or HSF1-specific siRNA. HSF1 and Hsp levels were evaluated with quantitative PCR analysis and viability measured using MTT spectrophotometry.

Results: HSF1 siRNA produced a specific, marked knockdown of the HSF1 transcript as well as reduced levels of Hsp27, Hsp70 and Hsp90 mRNA. DIPG cells treated with HSF1 siRNA showed viability decreased to approximately 50% of untreated or control siRNA-treated DIPG cells.

Conclusions: Targeted reduction of HSF1 expression leads to deficiency in cytoprotective Hsp levels and may offer an efficient new strategy to disrupt key survival mechanisms in DIPG.

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Poster 29

Abstract Title:

Levodopa decreases craving for alcohol in abstinent alcoholics

Author(s):

Van Hedger K, Hiebert NM, Witt I, Seergobin KN, MacDonald PA

Abstract:

Craving is a common experience in individuals with substance use disorders. It refers to the urge or desire to use a drug and can vary in intensity. One neurobiological explanation for the development of craving is through a process of incentive salience, where addictive drugs co-opt the endogenous dopamine system and sensitize it to reinforce future drug use. As a result, individuals with substance use disorders have disrupted dopaminergic signaling, with previous research showing increased ventral striatum responses to drug cues. In this study, we evaluate the effects of levodopa, a dopamine precursor, on behavioral ratings of alcohol craving in a sample of abstinent self-identified alcoholics. Participants were pre-screened prior to completing two sessions involving cue-reactivity tasks where they rated their feelings of craving for alcohol while viewing alcohol-related pictures after pre-treatment with either levodopa or placebo. Among participants who reported any craving for alcohol, significantly less craving was experienced following levodopa compared to their placebo session ($p < .05$). These findings are consistent with previous levodopa studies indicating a decrease in ventral striatum activation. Follow-up functional magnetic resonance imaging measures of striatal and cortical activation in response to alcohol cues will help clarify the mechanism of this decrease in craving.

Poster 29

Abstract Title:

Levodopa decreases craving for alcohol in abstinent alcoholics

Author(s):

Van Hedger K, Hiebert NM, Witt I, Seergobin KN, MacDonald PA

Abstract:

Craving is a common experience in individuals with substance use disorders. It refers to the urge or desire to use a drug and can vary in intensity. One neurobiological explanation for the development of craving is through a process of incentive salience, where addictive drugs co-opt the endogenous dopamine system and sensitize it to reinforce future drug use. As a result, individuals with substance use disorders have disrupted dopaminergic signaling, with previous research showing increased ventral striatum responses to drug cues. In this study, we evaluate the effects of levodopa, a dopamine precursor, on behavioral ratings of alcohol craving in a sample of abstinent self-identified alcoholics. Participants were pre-screened prior to completing two sessions involving cue-reactivity tasks where they rated their feelings of craving for alcohol while viewing alcohol-related pictures after pre-treatment with either levodopa or placebo. Among participants who reported any craving for alcohol, significantly less craving was experienced following levodopa compared to their placebo session ($p < .05$). These findings are consistent with previous levodopa studies indicating a decrease in ventral striatum activation. Follow-up functional magnetic resonance imaging measures of striatal and cortical activation in response to alcohol cues will help clarify the mechanism of this decrease in craving.

Poster 30

Abstract Title:

Assessing post-stroke cardiac dysfunction in the insular ischemic stroke rat model

Author(s):

Jaremek V, Iankov S, Milazzo T, Wang L, Whitehead SN, Sposato LA

Abstract:

Objective: To assess the time course of post-stroke cardiac fibrosis and inflammation in a rat model of selective insular ischemic stroke.

Background: Patients who have suffered an ischemic stroke with damage to the right insular cortex (IC) often develop post-stroke cardiac complications. However, the time course of these post-stroke myocardial changes require further investigation which is complicated by a lack of pre-clinical models.

Design/Methods: IC ischemic stroke was induced in six-month-old Wistar rats via stereotaxic injection of endothelin-1 into the right IC (n=6/surgical group). Control rats received a phosphate-buffered saline (PBS) injection into the right IC. To establish a time course of cardiac dysfunction, hearts were histologically examined at 6, 24 hours, 7, 14 and 28 days post-stroke for fibrosis (Masson's Trichrome stain) and inflammation (CD45+, myeloperoxidase immunostaining).

Results: Results from this study showed that focal IC ischemic stroke led to neutrophil infiltration at 6 hours, followed by T lymphocyte infiltration at 7 days at the PV-LA border. Left atrial tissue experienced long-term fibrosis at 28 days following focal IC stroke. Further, B lymphocyte infiltration was seen at 28 days post-stroke in left ventricular tissue.

Conclusions: These findings provide insight into the progression of post-stroke cardiac changes.

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Poster 31

Abstract Title:

Pattern of tau burden in progressive supranuclear palsy and corticobasal degeneration

Author(s):

Yan L, Ang L-C, Zhang Q

Abstract:

Introduction: Progressive supranuclear palsy (PSP) and corticobasal degeneration (CBD) overlap in both clinical symptoms and pathological changes. One of the most common clinical features in both disorders is parkinsonism. It is generally accepted that parkinsonism is caused by neuronal loss in substantia nigra. However, there is growing evidence showing that parkinsonism is associated with brain network involving multiple regions. In the present study, we are exploring the extent of Tau and β-amyloid burden in different brain regions and to determine the correlation of regional difference and clinical symptoms in PSP and CBD.

Methods: In this pilot study, 19 neuropathology confirmed Tauopathy autopsy cases were examined, including 4 PSP, 4 CBD and 11 Alzheimer disease (AD) cases. All PSP and CBD cases presented with parkinsonism. There are no movement symptoms reported in the 11 AD cases. The digital image analysis software *QuPath* was used to quantify Tau- and amyloid burden on scanned whole slide images. We used the DAB staining intensity as a surrogate marker to measure expression of abnormal phosphorylated tau protein and beta-amyloid accumulation. Six different brain regions were examined, including putamen, globus pallidus (GP), claustrum, subthalamic nucleus (STN), substantial nigra (SN), and anterior cingulate (AC).

Results: Both PSP and CBD have high Tau burden in SN, STN, and GP, which is significantly higher than AD-high level cases. In contrast to CBD, there is a much lower Tau expression in the claustrum, putamen and anterior cingulate of the PSP cases. AD-high level cases show similar amount of Tau expression as CBD in these 3 regions. Compared with AD, β-amyloid is either absent or very low in both CBD and PSP groups.

Conclusions: PSP and CBD share an overlapping but distinct Tau-pathology expression pattern.

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Poster 32

Abstract Title:

Outcomes of general anesthesia and conscious sedation in endovascular treatment or stroke

Author(s):

Just C, Rizek P, Tryphonopoulos P, Pelz D, Arango M

Abstract:

The role of rapid endovascular treatment in acute ischemic stroke has become increasingly supported by recent literature. What is less clear, however, is the method of anesthesia that is more likely to be associated with positive outcomes. Previous research has shown the need for further investigation into the consequences of general anesthesia (GA) versus conscious sedation (CS). Heated debate has occurred around the superiority of each type of anesthesia. The key factors affecting the choice of GA versus CS include patient pain, patient movement, time delays, and hemodynamic parameters, particularly blood pressure. GA provides greater control of patient pain and movement compared with CS, but presents greater hemodynamic instability, risk for aspiration, and postulated time delays. We used a retrospective design to compare morbidity and mortality of type of anesthesia in patients who received endovascular treatment in the setting of acute ischemic stroke using CS versus GA.

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Poster 33

Abstract Title:

A small case series for invasively diagnosed temporal plus epilepsy with surgical success

Author(s):

Bottan JS, Suller Marti A, Parrent AG, MacDougall KW, Steven DA

Abstract:

Background: ‘Temporal plus’ epilepsy is a term that is used when the epileptogenic zone extends beyond the boundaries of the temporal lobe. Stereotactic electroencephalography has been essential to identify additional epileptogenic zones in adjacent structures that might be part of the temporal lobe/limbic network.

Objective: To present a small case series of ‘temporal plus’ cases successfully identified by stereotactic electroencephalography who underwent resective surgery, with a successful outcome (seizure free).

Methods: We conducted a retrospective analysis of 156 patients who underwent SEEG in 4.5 years. Six cases were identified as ‘temporal plus’ epilepsy and underwent temporal lobectomy with additional resections.

Results: Five cases were right-sided ‘temporal plus’ epilepsy. Three cases were non-lesional and three lesional. Mean follow-up time since surgery was 2.5 years (SD±1.8). Three patients had subdural electrodes investigation prior or in addition to SEEG. All patients underwent standard ATL and additional resections during the same procedure or staged. All patients were seizure-free at their last follow-up appointment (Engel Ia = 3; Engel Ib =2; Engel Ic = 1). Pathology was non-specific/gliosis for 5 cases and focal cortical dysplasia type Ib for 1 case.

Conclusion: ‘Temporal plus’ epilepsy might explain part of the failures in temporal lobe epilepsy surgery. We present a small case series of 6 patients in which SEEG successfully identified this phenomenon and surgery proved effective.

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Poster 34

Abstract Title:

Increasing head circumference in a young child with shunt malfunction

Author(s):

Chalil A, Lo M, de Ribaupierre S

Abstract:

Ventriculoperitoneal shunt (VPS) is a common treatment for hydrocephalus. Complications of VP shunts include malfunction, infection, and hemorrhage. VPS malfunction is common in both the pediatric and adult neurosurgical patients. For children and adults, the main indicator for early VPS is ventriculomegaly while rapidly increasing head circumference is only observed in infants and not in young children. Here, we present a rare case of rapidly increasing head circumference with minimal change in ventricular calibre in a 9 year old boy with a VPS malfunction..

Case: a 9 year old with Dandy Walker spectrum malformation and a VPS insertion at the age of 8, presented with rapidly increasing head circumference over the course of 18 months from 57 cm up to 59.5 cm, in the setting of progressive headaches consistent with increased ICP. The patient subsequently underwent a shunt valve replacement to improve CSF diversion.

Methods: The patient was followed over 18 months, with 3 pre-operative and one post operative MRI of the head. Volumetric measurements of the ventricles and head circumference are compared over the same time period.

Conclusion: We present a unique case of increasing head circumference in a 9 year old boy with Dandy Walker spectrum malformation. To our knowledge, only one similar case was reported in the literature.

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Poster 35

Abstract Title:

Optimizing preprocessing of fMRI data to maximize correspondence of functional anatomy across patients

Author(s):

Ghazaleh N, Ladowski D, Hallgrimson Z, Gainham G, O'Reilly M, Buckland C, Khan A, Dykstra A, Bullen A, Abolhasani E, Burneo J, Mirsattari S, Parrent A, Steven D, Johnsrude I

Abstract:

When healthy individuals watch a movie, widespread cortical areas of their brain show robust hemodynamic activity (measured using fMRI) that is time-locked to the content of the movie, and synchronous across viewers. This intersubject correlation (ISC) indicates a functional correspondence across listeners. Even normal brains differ in shape: spatial normalization and smoothing are required for inter-subject functional overlap. What normalization method (and smoothing) yields the best overlap of functional anatomy? We used ISC as a metric to examine this across two different normalizations (DARTEL and SPM12) and 3 levels of smoothing (Gaussian kernels of 0, 6 and 10 mm) in 48 healthy subjects who watched an 8-min audiovisual movie in a 3T scanner. Both normalization method and smoothing affected the strength of intersubject correlation. ISC was stronger for DARTEL than for SPM12, and was strongest at 10 mm smoothing, and weakest at 0 mm smoothing. This convenient and sensitive movie-fMRI paradigm is proposed as a potential presurgical evaluation method for neurological patients, such as those with drug-resistant temporal lobe epilepsy, for functional localization of brain lesions.

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Poster 36

Abstract Title:

Analyzing the electrophysiological effects of Rett Syndrome on neuronal network development using machine learning

Author(s):

Khaki M, Pradeepan K, Martinez-Trujillo J

Abstract:

Rett Syndrome is a genetic neurodevelopmental disorder caused by an MECP2 mutation that results in deficits characteristic of classical autism spectrum disorder. Multielectrode array technology is capable of measuring different aspects of electrophysiological features of the developing neuronal network. However, the amount of data produced is too large to manually explore and extract meaningful patterns. Using a machine learning technique allows us to reduce the amount of redundant information captured during the experiment. Using a supervised classification approach, it is possible to reveal the characteristic differences between normal and Rett syndrome affected cells. Although the higher volume of information encapsulates the different aspects of the problem it also leads to significantly increased observations and exacerbates the computational complexity. The preliminary results generated by the approach demonstrates that it is possible to rescale the solution to include sufficient number of observations. The results of the pilot experiment show that the differences can be categorized into three distinct developmental periods (early, intermediate, late). These inconsistencies indicate that the rate of growth for Rett syndrome is significantly stunted compared to wildtype, consistent with previous literature. This confirms that the relevant features extracted and selected in classification are biological meaningful in distinguishing Rett syndrome.

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Poster 37

Abstract Title:

Investigating rater reliability in the assessment of SEEG implantation accuracy

Author(s):

Istasy P, Christidis N, Lau JC, Steven DA

Abstract:

Stereoelectroencephalography (SEEG) is increasingly becoming the chosen method for intracranial EEG monitoring of patients with focal refractory epilepsy. Recently, the Epilepsy Program at LHSC obtained a Neuromate robot to assist with this procedure. A study involving multiple raters analyzing implantation accuracy is currently underway, and determining the impact of intra- and inter-rater reliability of electrode locations is imperative. Two raters performed entry and target locations for 115 SEEG implanted electrodes on two separate occasions (total of 460 points placed) using data from post-operative CT scans of 10 patients (3M, 7F; median age = 37.5, range = 21-57). Data was analyzed using the intraclass coefficient formula, measuring the consistency of a single rater over two rounds of the same placements and the absolute agreement of two raters on the same placements. Preliminary results show a good to excellent intra-rater reliability in both raters (r1=0.916, r2=0.879). Furthermore, an analysis of the accuracy of the implanted electrodes shows a mean target point localization error, consistent with previous literature of 2.13mm (SD=0.36mm) and entry point localization error of 1.48mm (SD=0.51mm).

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Poster 38

Abstract Title:

Can resting-state fMRI be used for presurgical mapping of language networks in pediatrics?

Author(s):

Pur DR, de Ribaupierre S, Eagleson R

Abstract:

Brain tumours and epilepsy affect neural processing and often cause the reorganization of eloquent brain areas. Pediatric patients are poor candidates for conventional brain mapping techniques due to their inability to cooperate or undergo awake surgery. Resting-state functional magnetic resonance imaging (rs-fMRI) is an emerging mapping technique based on the intrinsic neural activity of the brain at rest. Since the patient does not have to follow commands and can instead watch a movie it has the potential to overcome the limitations of conventional techniques.

The objective was to compare language networks obtained from rs-fMRI with those from task-fMRI (i.e. verb generation, naming) in pediatric patients with brain tumors or epilepsy.

Language networks were identified from 1) t-fMRI, 2) rs-fMRI using independent component analysis with 20, 40 target components and automatic dimensionality estimation. Rs-vs-task fMRI concordance was determined via spatial cross-correlations >.204, significant.

Language networks derived from rs-fMRI showed significant spatial correlation with task-based ones. Rs-fMRI maps obtained with target components ≥40 showed higher overlap with t-fMRI than those with 20 components. Overall, the rs-fMRI derived maps were larger.

Our preliminary experience using rs-fMRI mapping in pediatric cases suggests this technique can be used to identify language networks.

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Poster 39

Abstract Title:

Targeting analysis for deep brain stimulation of the anterior nucleus of the thalamus for epilepsy and outcomes

Author(s):

Suller Marti A, Gilmore G, Parrent A, Steven DA, MacDougall K, Burneo JG.

Abstract:

Introduction: Deep brain stimulation of the Anterior Nuclei of the Thalami (DBS-ANT) is a neuromodulation therapy used in patients with therapy-resistant epilepsy (TRE). Accurate surgical DBS lead placement is critical for optimal clinical outcome.

Methods: We identify all patients with TRE epilepsy, who underwent DBS-ANT implantation in our Epilepsy program at Western University, since this treatment became available in Canada, until March 2019.

Results: Six patients were implanted with DBS-ANT. The median age was 30.5 years (IQR=17.8-28.5) and five were males. The median follow up time after implantation was 36.5 months (IQR24-55.8m). The median rate of seizure reduction at the time of last follow up was -13.9% (IQR=(-72.2)-(86)) and only one patient had more than a 50% seizure reduction. The optimal implantation coordinates for each patient was determined by an expert surgeon. In the responder, the Euclidean distances from the optimal target point were 3.23 mm in the left and 4.7 mm in the right. In the non-responders, the average Euclidean distances from the optimal point were 4.43 mm in left and 4.50 mm in the right. The electrode position difference between both groups was 2.95 mm x -1.59 mm x 3.07 mm concerning the left electrode and -1.48 mm x -1.98 mm x 3.07 mm in the right electrode.

Conclusions: DBS-ANT may help some patients with TRE but more data is required to localize the most effective target in ANT.

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Poster 40

Abstract Title:

Somatosensory evoked potentials and EEG reactivity after cardiac arrest or traumatic brain injury

Author(s):

Pelikan J, Althenayan E, Norton L, Debicki D, Hadhiah K, Gofton T

Abstract:

Prognosis is difficult in comatose survivors of cardiac arrest. Investigations shed light on patients who will die or remain in a persistent vegetative state after cardiac arrest (CA) or traumatic brain injury (TBI). However, one cannot determine the degree of improvement a patient may have after CA or TBI. Somatosensory evoked potentials (SSEPs) and electroencephalography (EEG) are ways to determine prognosis, and at London Health Sciences Centre (LHSC), SSEPs are difficult to obtain. This study aims to compare SSEPs and EEG reactivity during the acute stages of coma following CA or TBI, and to determine whether there is an association between EEG reactivity and the cortical N20 response using SSEPs. In a retrospective chart review of patients >18 years old at LHSC who underwent SSEP and EEG reactivity testing after CA or TBI, we examined clinical and demographic information, latencies and amplitudes of the SSEP cortical waveforms, and the presence or absence of EEG reactivity. 18 patients were included, and we found no significant difference in SSEP N20 response among patients with either reactive or unreactive EEG. This may point to an inability of using EEG or SSEP to supplant the other when only one test is available for neuroprognostication.

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Poster 41

Abstract Title:

Sexual dysfunction in multiple sclerosis: a systematic review and meta-analysis of prevalence

Author(s):

Kim D, Leurer C, So B, Casserly C, Seyman E, Baral S, Oh J

Abstract:

Background: Sexual dysfunction (SD) is commonly observed among people living with multiple sclerosis (MS) and can substantially impact quality of life. However, SD is not generally discussed in practice guidelines, and frequently overlooked in the clinical setting. To date, there remains limited consensus on the actual prevalence of SD in MS and determinants of SD among people affected by MS.
Objective: To perform a systematic review on SD in MS, and to perform a meta-analysis to estimate the point prevalence of this symptom in total MS patients, and stratified by gender.
Methods: Relevant literature databases were searched with *a priori* search strategies for studies reporting on the prevalence of SD in MS between January 1977 and January 2015. Random-effects models were used to pool reported prevalence of SD in MS. Stratified meta-analysis and meta-regression were used to estimate differences due to study-level characteristics. Heterogeneity was assessed using DerSimonian and Laird's Q-test and the I^2-index. Sensitivity analyses were performed to assess studies deemed to have low risk-of-bias (ROB) according to a modified version of the Newcastle-Ottawa Scale.
Results: 6135 studies were retrieved, of which 43 met inclusion and exclusion criteria. The overall pooled weighted prevalence of SD was 58% (6635/14538 individuals, 95% CI, 52-64%), 63% (95% CI, 53-74%; n=27 studies), and 62% in men (95% CI, 54-69%; n=24 studies). There was significant between-study heterogeneity (all MS: Q= 1608.63, I2 = 97.39%; women: Q= 1608.63, I2 = 97.39%; men: Q=302.34, I2 = 92.39%, p<0.01 for all). Pooled meta-regression did not indicate a significant association of SD prevalence with age, disability (Expanded Disability Status Scale), duration of disease, or proportion with relapsing-remitting disease. A sensitivity analysis including only studies deemed to have low ROB did not result in a significant difference in the pooled prevalence of SD (55%, 95% CI, 48-62%, p=0.95).
Conclusion: SD is highly prevalent in people living with MS, across the spectrum of disease. Despite this, SD is under-recognized, and rarely addressed in clinical settings and practice guidelines. Taken together, these data highlight the need for increased recognition of SD within MS clinical practice and evidence-based approaches to address this facet of the disease.

Poster 41

Abstract Title:

Sexual dysfunction in multiple sclerosis: a systematic review and meta-analysis of prevalence

Author(s):

Kim D, Leurer C, So B, Casserly C, Seyman E, Baral S, Oh J

Abstract:

Background: Sexual dysfunction (SD) is commonly observed among people living with multiple sclerosis (MS) and can substantially impact quality of life. However, SD is not generally discussed in practice guidelines, and frequently overlooked in the clinical setting. To date, there remains limited consensus on the actual prevalence of SD in MS and determinants of SD among people affected by MS.
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Poster 42

Abstract Title:

The interpeduncular angle: a practical and objective marker for the detection and diagnosis of intracranial hypotension on brain MRI

Author(s):

Wang D, Pandey S, Lee D, Sharma M

Abstract:

Background and Purpose: Findings of intracranial hypotension on MRI, such as brainstem slumping, can be subtle and subjective, potentially confounding the diagnosis. We hypothesize that the angle between the cerebral peduncles is decreased in cases of intracranial hypotension and aim to investigate its use as an objective assessment for intracranial hypotension.

Materials and Methods: Brain MRIs of 30 patients with intracranial hypotension and 30 controls were evaluated for classical findings of intracranial hypotension and the interpeduncular angle. Group analysis was performed with Student's *t*-test and ROC analysis was used to maximize sensitivity and specificity. Interobserver reliability was assessed for classical findings of intracranial hypotension using Cohen's kappa value and the interpeduncular angle using intraclass correlation.

Results: The interpeduncular angle had excellent interobserver reliability (ICC value = 0.833) and was significantly lower in the intracranial hypotension group compared to the control group (25.3˚ vs 56.3˚; $p < 0.0005$). There was significant correlation between the interpeduncular angle and the presence of brainstem slumping ($p < 0.0005$) as well as severe cases, defined as having 3 or more classical features of intracranial hypotension ($p = 0.013$). Optimal sensitivity and specificity were 80% and 96.7%, respectively.

Conclusion: The interpeduncular angle is a sensitive and specific measure of intracranial hypotension and is a reliably reproducible parameter on routine clinical MRI scans.

Poster 42

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Poster 43

Abstract Title:

Durable long-term outcomes after percutaneous glycerol rhizotomy in the management of trigeminal neuralgia in patients with multiple sclerosis

Author(s):

Staudt MD, Joswig H, Pickett G, MacDougall KW, Parrent AG

Abstract:

Objective: The prevalence of trigeminal neuralgia (TN) in patients with multiple sclerosis (MS-TN) is higher than in the general population (idiopathic TN [ITN]). Long-term pain relief is poor with any treatment. The objective of this study was to assess the efficacy of percutaneous retrogasserian GR in the treatment of MS-TN compared to ITN.

Methods: A retrospective chart review was performed identifying 219 patients undergoing 401 GR procedures from 1983 to 2018. All patients were diagnosed with medically-refractory MS-TN (n=182 procedures) or ITN (n=219 procedures). Primary outcomes included immediate pain relief and time to pain recurrence. Secondary outcomes included medication usage and presence of hypoesthesia.

Results: The initial pain-free response rate was similar between groups (p=0.726): MS-TN initial GR 89.6%; MS-TN repeat GR 91.9%; ITN initial GR 89.6%; ITN repeat GR 87%. The median time to recurrence was similar between MS-TN (2.7±1.3 years) and ITN patients (2.1±0.6 years) undergoing an initial GR (p=.87). However, there was a statistically significant difference between MS-TN (2.3±0.5 years) and ITN patients (1.2±0.2 years) undergoing a repeat GR ($p<0.05$). The presence of peri-procedural hypoesthesia was predictive of pain-free survival ($p<0.01$).

Conclusion: Patients with MS-TN achieve meaningful pain relief following GR, with an efficacy comparable to patients with ITN.

Poster 44

Abstract Title:

Surface displacement of the striatum as biomarkers for Parkinson’s disease

Author(s):

Hemachandra D, MacDonald P, Khan AR

Abstract:

Parkinson’s disease (PD) is a common neurological disorder that mainly affects the motor system of the brain. Lack of reliable biomarkers for this disease has made it challenging for developing cures or therapies. Diffusion MRI tractography has opened up new ways to look at the structural connectivity of the human brain in depth, which has shown some promising results to address this problem. With the large amount of data available in Parkinson’s Progression Markers Initiative (PPMI) database, we were able to train a classier using structural and anatomical data of the brain as features to distinguish Parkinson's patients from healthy controls with over 90% accuracy.

3T Diffusion and T1 MRI data of 100 subjects with Parkinson's disease and 50 healthy control subjects were obtained using the PPMI database and pre-processed using in-house tools. Atlas-based segmentation was performed using probabilistic tractography to parcellate striatum into 14 sub-regions according to its connectivity to the cortex. Within these 14 regions, fiber integrity measures of fractional anisotropy (FA) and mean diffusivity (MD) were calculated and the independent connectivity, surface area and volume of these 14 sub-regions were also calculated. Diffeomorphic shape registration was used to compute striatal surface displacements relative to a canonical surface, and averaged for each sub-region. A classier (Random-forest) was trained with 70% of the data using the above information as features to distinguish PD subjects from healthy controls. The trained model was tested on the remaining 30% of the data and it was able to distinguish Parkinson’s patients from the healthy controls with over 90% accuracy. Moreover, it was found that the surface displacement of these sub-regions plays a major role in classifying the two groups and it shows the best test receiver operating characteristic curve which implies the best test accuracy. These preliminary results show that, surface displacement of the parcellated striatal sub-regions can be used as reliable biomarker to identify Parkinson's patients.