

NEURORADIOLOGY (CSNR)

E.1

Clinical outcomes of ischemic stroke in indigenous populations – a systematic review and metanalysis

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Background: The burden and outcome of stroke in indigenous populations is less well understood. This review evaluates ischemic stroke outcomes in indigenous populations as compared to the general population in the context of recent advances in ischemic stroke therapy. Methods: The OVID Medline and EMBASE databases were searched for this review. Clinical outcome was measured using standardized outcome scale (eg. mRS) at 90 days following stroke intervention in indigenous as compared to non-indigenous adult populations. Results: 897 studies were identified, with 4 studies included in the final analysis. A total of (n=68895) patients were included who underwent thrombolysis. Study populations from Australia, New Zealand, United States and Canada comprised of (n=2012) indigenous patients. Mortality was significantly higher in indigenous populations as compared to non-indigenous (Odds Ratio-1.28, 95% CI-1.12; 1.46). The odds ratios of atrial fibrillation (1.26, 95% CI-1.12;– 1.41), diabetes (1.43, 95% CI- 1.27; 1.62), hypertension (1.33, 95% CI- 1.17; 1.51) and IHD (0.71, 95% CI- 0.62; 0.81) in indigenous patients was significantly higher than in non-indigenous patients. Conclusions: Indigenous populations undergoing stroke therapy are at a significantly increased risk of mortality as compared to non-indigenous populations. Comorbidities including diabetes, atrial fibrillation and hypertension are more prevalent in indigenous populations.

E.2

Predictors of successful endovascular thrombectomy for M2 occlusion in acute ischemic stroke

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Background: There remains lack of data in regards to factors influencing successful endovascular reperfusion of isolated occlusion of the M2 segment of the middle cerebral artery (MCA). In this study, we set out to investigate the variables that affect the successful endovascular reperfusion of isolated M2 segment occlusion. Methods: M2 segment occlusion was defined as isolated clot anywhere within the M2 segment of the MCA. A prediction model of successful endovascular reperfusion defined as modified Thrombolysis in Cerebral Ischemia (mTICI) score of 2b, 2c and 3 and unsuccessful endovascular reperfusion defined as mTICI score of 0, 1 and 2a was developed from demographics (age, sex), clinical factors (NIHSS at the time of presentation to hospital), imaging characteristics (ASPECTS, ICA occlusion, presence of Intracranial arterial disease (ICAD), computed tomography perfusion (CTP)-based ischemic core and mismatch volume estimation), and treatment (alteplase/tenecteplase use and

periprocedural complications) variables from 64 patients who underwent endovascular thrombectomy (EVT) at Kingston Health Science Centre between December 24, 2018 and October 18, 2022. Results: The only statistical significant predictor of successful endovascular reperfusion was CTP-based ischemic core volume (smaller core volume) ($p < 0.05$). Conclusions: The CTP-based ischemic core volume is the most important predictor of successful endovascular reperfusion for M2 occlusion.

E.3

Imaging of subdural hematoma

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Background: Radiologic imaging has become integral in not only the detection and diagnosis of subdural hematoma, but also in guiding potential treatment options. Particularly, in the arena of chronic subdural hematoma, which has conventionally been managed via surgical drainage, although is shifting toward procedural intervention with embolization of the middle meningeal artery. This paper aims to review the imaging manifestations of subdural hematoma as a function of chronicity, standardized methods of measurement, and identifying the middle meningeal artery and its clinically significant variant anatomy as it pertains to embolization planning. Methods: A literature search using key terms and titles was conducted for articles containing imaging characteristics of subdural hematoma, approaches to measurement, and middle meningeal artery anatomy as the primary focus. Results: The expected evolution of subdural hematoma over time encompasses a broad array of imaging characteristics. Attempts at standardizing hematoma measurements include width, volume, and midline shift. Given the implication of the middle meningeal artery in potential therapeutic embolization, familiarity with its anatomy is vital not only for mapping access, but also for delineating possible dangerous collaterals. Conclusions: Equipped with a more comprehensive approach to characterizing subdural hematoma, the radiologist will be able to curate findings of greater utility to the clinician.

E.4

Hippocampal subfield thickness measurements evaluated using HippUnfold in patients with mild cognitive impairment and Alzheimer's disease

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Background: Alzheimer's disease (AD) is an emerging public health crisis and biomarkers are playing a large role in AD research. Magnetic Resonance Imaging (MRI) holds advantages over existing biomarkers for AD. This project aims to measure subfield thickness throughout the hippocampal long axis using HippUnfold, a novel open-source automated hippocampal segmentation software. Methods: High resolution (0.39x0.39x2mm) Hippocampal MR Images [control, n= 16, mild cognitive

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impairment (MCI, $n = 16$), and AD, ($n = 16$) acquired by the Alzheimer's Disease Neuroimaging Initiative (ADNI) were analyzed with an automated segmentation software (HippUnfold) to compute thickness measurements. ADNI data such as Positron Emission Tomography (PET) biomarkers, Cerebrospinal Fluid biomarkers, and cognitive scores such as Mini-Mental State Exam (MMSE), Montreal Cognitive Assessment (MoCA), Alzheimer's Disease Assessment Scale (ADAS13), and Rey Auditory Verbal Learning Test (RAVLT), were correlated to thickness along the hippocampal long axis using linear regression models. Results: We found significant cluster correlations ($p < 0.05$) throughout the long axis between hippocampal subfield thickness to MoCA scores, ADAS13 scores, PET phosphorylated tau levels, and PET beta-amyloid levels. Conclusions: Subfield atrophy throughout the hippocampal long axis is associated with disease severity (as measured with existing biomarkers and cognitive testing) in patients with MCI and AD.

E.5

Large scale network changes immediately after Magnetic Resonance Imaging-Guided Laser Interstitial Thermal Therapy (MRgLITT) for hypothalamic hamartoma

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Background: Hypothalamic hamartomas (HH) are a challenging cause of seizure in children, partly because the neural circuitry involved in ictogenesis is incompletely understood. We review our institutions' use of magnetic resonance imaging-guided laser interstitial thermal therapy (MRgLITT) to treat hypothalamic hamartoma (HH) with resting-state fMRI performed immediately before and after ablation. Methods: Seed-based whole brain connectivity to thalamic regions of interest was performed immediately pre- and post- MRgLITT. Multivariable generalized linear models were used to correlate resting-state data with seizure outcomes. Results: Eight patients underwent MRgLITT treatments for HH, with a mean follow up of 29 months. Four patients (50%) were seizure free at 12 months and two (25%) had a significant improvement in seizure frequency. We identified reduced thalamocortical connectivity involving the anterior cingulate and posterior parietal regions, consistent with disconnection of the mammillothalamic tract and interruption of Papez circuit. Large-scale thalamocortical connectivity changes were driven by children who subsequently became seizure free. Conclusions: Disconnection of the mammillothalamic tract and interruption of thalamic circuitry in patients undergoing MRgLITT for HH appears to be associated with improved seizure outcomes. The ability to assess network changes immediately post- MRgLITT could enable operative adjustments to be made mid-procedure to optimize seizure outcome in real time.

F.1

DNA methylome profiling identifies stability of IDH mutations throughout glioma evolution

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Background: Isocitrate dehydrogenase (IDH) mutation status is a key diagnostic and prognostic feature of gliomas. There are conflicting reports regarding the stability of IDH mutations throughout glioma evolution and treatment. Here, we provide an institutional experience of patients with conflicting IDH mutation status longitudinally in order to determine if IDH mutation status changes over time. Methods: We retrospectively identified patients from 2009-2018 with immunohistochemistry (IHC)-recorded IDH mutation status discrepancies longitudinally. Archived frozen tissue samples were analyzed using methylation profiling, Sanger sequencing, and droplet digital PCR (ddPCR). Results were compared to the IHC-reported IDH mutation status. Results: We reviewed 1491 archived glioma samples including 91 patients with multiple tumour samples collected longitudinally. In all instances of IDH mutation discrepancy, we found reasonable explanations through multi-platform profiling that resolved the discrepancies. This included the presence of non-canonical IDH2 mutations identified through Sanger sequencing and perilesional tumour samples or reactive brain tissue identified through methylation profiling. Conclusions: Our findings support the hypothesis that IDH mutations occur early in gliomagenesis and are stable throughout glioma treatment and evolution. Our study highlights the importance of accurate surgical sampling and the role of DNA methylome profiling in diagnostically uncertain cases for integrated pathological and molecular diagnosis.

F.2

Multiplatform molecular analysis of vestibular schwannoma reveals two robust subgroups with distinct microenvironment

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Background: Vestibular schwannoma (VS) is the most common tumour of the cerebellopontine angle and poses a significant morbidity for patients. While many exhibit benign behaviour, others have a more aggressive nature. There is a need for a better understanding of the molecular landscape, and important subgroups therein, of this disease. Methods: We select all VS from our tumour bank with both methylation and RNA profiling.