elevation and compression of periventricular and subcortical white matter. Methods: This study investigates structural alterations in the CC in children diagnosed with infantile hydrocephalus. We examined both macrostructural and microstructural facets of the CC, providing insights into the nature and extent of alterations associated with this condition. 18 patients with infantile hydrocephalus (mean age = 9 years), and 18 age and sex matched typically-developing healthy children, participated in the study. Structural magnetic resonance imaging and diffusion tensor imaging were utilized to assess CC volume and microstructure, respectively. Results: Our findings reveal reductions in CC volume, particularly in posterior area, and distinct microstructural disparities, notably pronounced in these same segments. Conclusions: Investigating these structural alterations provides an understanding into the mechanisms underlying the effects of infantile hydrocephalus on CC integrity, given its role as a neural bridge. This knowledge offers a more nuanced perspective on neurological disorders and underscores the significance of investigating the CC's health in such contexts.

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Using optic nerve sheath diameter over ventricular size to assess elevated intracranial pressure in pediatric patients with pineal region tumors

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Background: Pineal region tumors are a heterogenous group of pathologies often symptomatic due to occlusive hydrocephalus leading to elevated intracranial pressure (ICP). High ICP may not always be associated with clinical signs. A non-invasive technique for assessment of ICP is measuring the optic nerve sheath diameter (ONSD). The goal of this study was to determine the utility of preoperative and postoperative ONSD measurements for assessment of elevated ICP in children with pineal region tumors. Methods: Retrospective data analysis was performed in patients operated for pineal region tumors at our tertiary care center between 2003 and 2022. Preoperative and postoperative MRI scans were reviewed. Clinical data and ONSD at multiple time points were analyzed and correlated. Results: Thirty-four patients with forty operative cases met the inclusion criteria. Hydrocephalus was seen in 80% of patients preoperatively (n=32/40). Presence of hydrocephalus was associated with significantly elevated ONSD preoperatively (p=0.006) and postoperatively (p=0.017). There was significant decrease in ONSD immediately postoperatively (p<0.001), at 3 months (p<0.001) and 12 months (p<0.001). In patients without hydrocephalus, no significant changes in ONSD were observed (p=0.369). Conclusions: ONSD is a useful adjunct for the identification of high ICP preoperatively and evaluation of treatment response postoperatively in patients presenting with pineal region tumors.

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How often does digital subtraction angiography change management in CT angiogram negative subarachnoid hemorrhages?

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Background: Subarachnoid hemorrhages (SAH) are emergencies that require expedient workup. While Aneurysms and vascular malformations are a common cause, a subset of cases may lack detectable structural causes. If a CT angiogram (CTA) is negative, the more invasive Digital Subtraction Angiogram (DSA) is used for diagnosis. It is unclear how often DSA alters treatment for CTA negative SAHs. Methods: A retrospective review of SAH patients from our institution (Vancouver General Hospital) with a negative CTA with subsequent DSA in the past 25 years. Results: Our preliminary analysis included 233 patients. The median age was 55. 105 (45%) were female, and 128 (55%) were male. The average length of hospitalization was 9.6 days, and 226 (97%) were discharged alive. The median number of CTAs and DSAs administered were 2 and 1 respectively. In 12 (5%) cases, DSA detected an abnormality not seen on CTA, which led to endovascular or open surgery treatment in 5 (2%) cases. 5 DSA procedures led to complications including transient neurologic changes and ischemia. Conclusions: In SAH patients with CTA negative scans, additional DSA testing identified actionable pathology in only a small minority of cases. Clinicians must weigh the benefit of DSAs in these cases.

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Rate and clinical utility of early postoperative CT head in adult craniotomy

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Background: Postoperative cranial neurosurgical imaging practices are highly variable. We evaluated the rate and utility of early postoperative computed tomography (EPCT, defined as a CT head scan within 24h of surgery) in consecutive adult craniotomies. Methods: We retrospectively reviewed consecutive adult craniotomies at the University of Alberta Hospital over a 45-day period (17/09/2022 to 01/11/2022). Electronic medical records were reviewed to extract data on the rate, timing, and utility of EPCT as well as the rate of neurologic deterioration and repeat surgical intervention. Results: A total of 56 patients (27 female; 55.5 ± 2.1 yrs, range: 19-84 years) were identified. All patients underwent EPCT, including 10/56 (17.9%) on POD0 and 46/56 (82.1%) on POD1. Surgical complications (bleeding, extensive pneumocephalus, edema, ischemia) were identified in 8/56 (14.3%) of the EPCT, of which 6 (10.7%) were reported to

have neurologic deterioration and 2 (3.6%) underwent further surgical intervention (hematoma evacuation). Clinical and radiological postoperative changes were highly related (p=5.16e-06), and the rate of EPCT being adverse without neurologic deficit, managed surgically, was 1/56 (1.8%). Conclusions: EPCT is routine practice. Given the low rate (1.8%) of repeat surgical intervention in the absence of neurologic deficit despite abnormal EPCT, omitting EPCT in neurologically intact patients may be warranted.

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Machine learning based approach to improving the prediction of neurological deterioration in mild Degenerative Cervical Myelopathy

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Background: Degenerative cervical myelopathy (DCM) is the most common form of atraumatic spinal cord injury globally, yet clinical guidelines remain unclear on surgical recommendations for patients with mild forms of DCM. This is in part due to limitations in current MR imaging interpretation and complex mechanisms of neurological deterioration. Supervised machine learning (ML) models can help to identify clinical and imaging indicators of deterioration within mild DCM patients. Methods: 127 MRI scans (T2w, Diffusion Tensor Imaging, and Magnetization transfer scans) accompanied by a series of clinical tests underwent a semi-automated analysis to derive quantitative metrics. Random forest classifier, Support Vector Machine, and Logistic Regression models were trained and tested to predict 6-month neurological deterioration within patients. Results: The ML models performed, on average, better than previous studies with a balanced accuracy ranging between 70-75%. "Advanced" imaging metrics such as diffusion tensor imaging and magnetization transfer scans played an important role in improving model accuracy but only when used near the maximally compressed disc level, suggesting that limited yet targetted imaging metrics support ML model performance. Conclusions: The inclusion of specific, targeted imaging and clinical metrics support ML model performance in predicting neurological deterioration within mild DCM patients.

Neuroscience Education

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Evaluating AI performance in written neurosurgery exams: a comparative analysis of large language models

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Background: The integration of Artificial Intelligence (AI) in medical education is an area of growing importance. While AI models have been evaluated extensively in multiple-choice question formats, their proficiency in written exams remains to be explored. Methods: Four AI models—GPT-4 (OpenAI), Claude-2.1 (Anthropic), Gemini Pro (Google), and Perplexity 70B (Perplexity)—were tested using the Canadian Royal College Sample Neurosurgery Exam. The written exam covered diagnostic reasoning, knowledge of neurosurgical conditions, and understanding of radiographic imaging techniques. Results: GPT-4 and Perplexity 70B both achieved a score of 68.42%, followed by Claude-2.1 with 60.53%, and Gemini Pro with 57.89%. The models showed proficiency in answering questions that required factual knowledge, such as identifying pathogens in spinal epidural abscess. However, they struggled with more complex diagnostic reasoning tasks, particularly in explaining the pathophysiology behind a sudden rise in blood pressure during surgery and interpreting radiographic characteristics of intracranial abscesses on MRI. Conclusions: The findings indicate that while AI models like GPT-4 and Perplexity 70B are adept at handling factual neurosurgical questions, their performance in complex diagnostic reasoning in a written format is less consistent. This underscores the need for more advanced and specialized AI training, particularly in the nuances of medical diagnostics and decision-making.

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The surgeon experience of flow

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Background: Cognitive flow has been linked with enhanced performance, career satisfaction, and decreased burnout. However, while elite sport has long trained athletes to enter flow states, the concept has not been adopted strongly in healthcare. Flow has primarily been explored from a unidimensional (cognitive) perspective. The present study sought to understand the experience of flow among surgeons through a multidimensional lens. Methods: Using a constructivist grounded theory methodology, semi-structured interviews were conducted with 19 staff surgeons at the University of Toronto, purposively sampled. Data were coded and analyzed iteratively by three researchers until theoretical saturation was achieved. Results: Although many surgeons had not previously heard of cognitive flow, the phenomenon deeply resonated with most. Participants described different physical, cognitive, emotional, sociocultural, and environmental components that interacted to shape the subjective experience of flow: "I think that there are many different facets of [flow] that don't always come together all at the same time, you may feel different parts of it… depending on what the kind of case is, who your help is, if you recently had a complication." (P4) Conclusions: Understanding flow in clinical practice may lead to new avenues for enhancing career satisfaction and promoting physician wellness.