

of the brain showed a diffusely enhancing lobulated mass situated within the frontal horn of the right lateral ventricle with extension into the foramen of Monro and obstructive hydrocephalus. Results: The patient underwent an interhemispheric trans-callosal approach with gross total resection and relief of her hydrocephalus. Pathological examination showed clusters of highly pleomorphic neuron-like cells without evidence of neoplastic glial cells. Histopathological and immunohistochemistry findings were consistent with the diagnosis of gangliocytoma (World Health Organization grade 1). Conclusions: Gangliocytomas are rare low-grade CNS neoplasms that can present in an older population within unusual locations and should be included within the differential whenever a suspicious lesion is encountered.

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Dural arteriovenous fistulas with associated intracranial tumors: review of literature

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Background: Intracranial dural arteriovenous fistulas (DAVF) are relatively rare vascular malformations. While the pathophysiology of their formation is unknown, they are believed to be acquired lesions related to intracranial venous hypertension and dura sinus thrombosis. There have been rare reports of intracranial tumors associated with DAVF. Here we complete a systematic search of the literature. Methods: A systematic PRISMA search of the literature was conducted to identify papers in which an intracranial tumor was associated with sinus thrombosis and DAVF. 24 relevant studies were identified and analyzed, along with a case illustration. Results: A total of 38 cases of DAVF formation with concomitant intracranial tumor were identified. The median age was 60, the majority of tumors being meningiomas (71%), and involved primarily the transverse sigmoid sinus (52%) and superior sagittal sinus (16%). The most cases involved an occlusion (39%) or partial occlusion (24%) of the related sinus. The DAVF were classified as Borden Types I (35%), II (32%) or III (24%). Endovascular treatment was the most common intervention (56%), followed by a combined approach (28%) vs surgery alone (16%), all reporting resolution. Conclusions: This highlights that DAVFs can be rarely associated with intracranial tumors, and highlights the patterns of these lesions and their treatments.

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RANO-BM response criteria verification study in a SRS-treated cohort

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Background: Brain metastases are frequently seen in neurosurgical practice. Standardised criteria are created to better

classify these common pathologies in research studies. This study's goal was to evaluate RANO-BM criteria's current thresholds in a cohort of patients with brain metastases managed by SRS. Methods: We performed a retrospective metastasis-level analysis of patients treated with SRS for brain metastases. The data collected included cohort demographics, metastases characteristics, outcomes, and the rate of true positives, false negatives, true negatives and false positives as defined by RANO-BM criteria at last follow-up before second SRS. Results: 251 metastases in 50 patients were included in the analysis. RANO-BM criteria using current thresholds yielded a sensitivity of 38%, a specificity of 95%, a positive predictive value of 71% and a negative predictive value of 84%. Modified RANO-BM criteria using absolute diameter differences of 2.5 mm yielded a sensitivity of 83%, a specificity of 87%, a positive predictive value of 67% and a negative predictive value of 94%. Pseudoprogression occurred significantly earlier than tumor progression, with a median time of onset of 6.9 months and 12.1 months respectively. Conclusions: Current RANO-BM criteria unreliably identifies clinically relevant tumor progression, but are useful in assessing diameter increases caused by tumor progression and pseudoprogression.

NEUROCRITICAL CARE

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Exploring the Canadian management of aSAH and delayed cerebral ischemia

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Background: Delayed Cerebral Ischemia (DCI) is a complication of aneurysmal subarachnoid hemorrhage (aSAH) and is associated with significant morbidity and mortality. A paucity of high-quality evidence is available to guide the management of DCI. As such, our objective was to evaluate practice patterns of Canadian physicians regarding the management of aSAH and DCI. Methods: The Canadian Neurosurgery Research Collaborative (CNRC) performed a cross-sectional survey of Canadian neurosurgeons, intensivists, and neurologists who manage aSAH. The survey was distributed to members of the Canadian Neurosurgical and Neurocritical Care Societies, respectively. Responses were analyzed using quantitative and qualitative methods. Results: The response rate was 129/340 (38%). Agreement among respondents included the need for intensive care unit admission, use of clinical and radiographic monitoring, and prophylaxis for prevention of DCI. Indications for starting hyperdynamic therapy varied. There was discrepancy in the proportion of patients felt to require intravenous milrinone, intra-arterial vasodilators, or physical angioplasty for treatment of DCI. Most respondents reported their facility does not utilize a

standardized definition for DCI. Conclusions: DCI is an important clinical entity for which no consensus exists in management among Canadian practitioners. The CNRC calls for the development of national standards in the diagnosis and management of DCI.

NEUROIMAGING

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Evaluation of Arterial Spin Labeling (ASL) perfusion imaging in poorly- defined focal epilepsy in children

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Background: Poorly-defined cases (PDCs) of focal epilepsy are cases with no/subtle MRI abnormalities or have abnormalities extending beyond the lesion visible on MRI. Here, we evaluated the utility of Arterial Spin Labeling (ASL) MRI perfusion in PDCs of pediatric focal epilepsy. **Methods:** ASL MRI was obtained in 25 consecutive children presenting with poorly-defined focal epilepsy (20 MRI- positive, 5 MRI-negative). Qualitative visual inspection and quantitative analysis with asymmetry and Z-score maps were used to detect perfusion abnormalities. ASL results were compared to the hypothesized epileptogenic zone (EZ) derived from other clinical/imaging data and the resection zone in patients with Engel I/II outcome and >18 month follow-up. **Results:** Qualitative analysis revealed perfusion abnormalities in 17/25 total cases (68%), 17/20 MRI-positive cases (85%) and none of the MRI-negative cases. Quantitative analysis confirmed all cases with abnormalities on qualitative analysis, but found 1 additional true-positive and 4 false-positives. Concordance with the surgically-proven EZ was found in 10/11 cases qualitatively (sensitivity=91%, specificity=50%), and 11/11 cases quantitatively (sensitivity=100%, specificity=23%). **Conclusions:** ASL perfusion may support the hypothesized EZ, but has limited localization benefit in MRI-negative cases. Nevertheless, owing to its non-invasiveness and ease of acquisition, ASL could be a useful addition to the pre-surgical MRI evaluation of pediatric focal epilepsy.

NEUROSCIENCE EDUCATION

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Action-related fixation in microsuturing, a new gaze behavior metric to differentiate the level of expertise

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Background: Gaze behavior differences between expert and novice surgeons have been established in general surgery

literature. Limited information is available about surgeon's visual attention during microsurgery procedures where surgical microscope is used. **Methods:** 4 experts and 3 novices performed 37 independent sutures under the surgical microscope. Eye movements of surgeons and scene video of the surgical performance were recorded. Total suturing time and subtask times were compared between level of expertise. We defined three discrete surgical actions and examined eye gaze (fixation) directly related to each of these actions. Fixation duration (total, pre-action, and post-action duration) were compared between expert and novice, over 3 subtasks (piercing, exiting and cutting) and between pre- and post-action phases. **Results:** Expert surgeons completed the suture with shorter total time and displayed longer fixation time than novices. Experts also maintained their visual engagement constantly over the 3 level of subtask in comparison to novices who required a longer fixation time for the challenging subtask (piercing). Experts use longer pre- than post-action fixation, and this pattern is distributed over all three subtasks. This gaze engagement strategy was not shown in novices. **Conclusions:** The action-related fixation can be used to evaluate microsurgeons' level of expertise and in surgical education for gaze training.

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High-fidelity simulation-based microsurgical training for neurosurgical residents

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Background: Mastery of microsurgical skills requires regular hands-on practice. Simulation is increasingly recognized as an important supplement to operative training experience. The live rat femoral artery model is the gold standard model for micro-neurosurgical skills simulation. We present an 11-year experience incorporating simulation-based microsurgical training into an established Canadian neurosurgery program. **Methods:** Post-graduate year 2 (PGY-2) neurosurgery residents completed a one-year curriculum spanning 17 training sessions divided into 5 modules of increasing fidelity. Both perfused duck wing and live rat vessel training modules were used. Three modules comprised live microvascular anastomosis. Trainee performance was video recorded and blindly graded using the Objective Structured Assessment of Technical Skills Global Rating Scale. **Results:** Eighteen participants completed 107 microvascular anastomoses. There was significant improvement in six measurable skills during the curriculum. Mean overall score was significantly higher on the fifth attempt compared to the first attempt for all 3 live anastomotic modules ($p < 0.001$). Each module had a different improvement profile across the skills assessed. The greatest improvement was observed during artery-to-artery anastomosis. **Conclusions:** This high-fidelity microsurgical simulation curriculum demonstrated a significant improvement in the six microneurosurgical skills assessed, supporting its use as an effective teaching model. Transferability to the operative environment is actively being investigated.