

electrical current around the tumor, thereby reducing the intratumoral electric field. In this study, we address this issue with computational simulations. **Methods:** Finite element models were created with varying amounts of ptE surrounding a virtual tumor. The electric field distribution was simulated using the standard TTFields electrode montage. Electric field magnitude was extracted from the tumor and related to edema thickness. Two patient specific models were created to confirm these results. **Results:** The inclusion of ptE decreased the magnitude of the electric field within the tumor. In the model considering a frontal tumor and an anterior-posterior electrode configuration, ≥ 6 mm of ptE decreased the electric field by 52%. In the patient specific models, ptE decreased the electric field within the tumor by an average of 26%. The effect of ptE on the electric field distribution was spatially heterogeneous. **Conclusions:** Given the importance of electric field magnitude for the anti-tumoral effects of TTFields, the presence of edema should be considered both in future modelling studies and as a predictor of non-response.

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Management of recurrent glioblastoma multiforme: An inter-observer variability study

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doi: 10.1017/cjn.2021.437

Background: A significant proportion of glioblastoma multiforme (GBM) patients are considered for repeat resection, but evidence regarding best management remains elusive. **Methods:** An electronic portfolio of MR images of 37 cases of pathologically confirmed recurrent GBM with an accompanying clinical vignette was constructed. Surgical responders from various countries, training backgrounds, and years' experience were asked for each case to select: their chosen management (repeat surgery, chemotherapy, radiation, or conservative), confidence in recommended management, and whether they would include the patient in a randomized trial that gave a 50% chance of reoperation. Responses were evaluated with kappa statistics and values interpreted according to Landis and Koch (0–0.2, slight; 0.21–0.4, fair; 0.41–0.6, moderate; 0.61–0.8, substantial; 0.81–1.0 perfect agreement). **Results:** 26 surgeons responded to the survey. Agreement regarding best management of recurrent GBM was slight, even when management options were dichotomized (repeat surgery vs. all others) ($k=0.198$ (95%CI 0.133–0.276)). Country of practice, years' experience, and training background did not improve agreement. Responders were willing to include more than 70% of patients in a randomized trial. **Conclusions:** Only slight agreement exists regarding the question of re-operation for patients with recurrent GBM. This supports the need for a randomized controlled trial.

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Effects of Systemic Corticosteroid Treatment on Pseudotumoral Hemicerebellitis

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doi: 10.1017/cjn.2021.438

Background: Pseudotumoral hemicerebellitis is an acute, unilateral inflammation of the cerebellum that typically affects the pediatric population. The etiology remains to be elucidated, however frequently is attributed to post-infectious inflammation. Though it tends to be self-resolving, treatment may reduce the time to symptomatic recovery. Systemic corticosteroid therapy has been proposed as a mechanism for improving outcomes and time to symptomatic recovery. **Methods:** We present a case report of a 12-year-old male with pseudotumoral hemicerebellitis and unilateral cerebellar dysfunction. Additionally, we briefly review the additional 35 reported cases of pseudotumoral hemicerebellitis with respect to length of time to symptomatic recovery with or without systemic corticosteroid treatment. **Results:** 30 cases reported length of time to symptomatic recovery. Including our case, the mean time to recovery for those treated with systemic corticosteroids ($n=20$) was 48.05 days (SE=16.3). The mean time to recovery for those treated without ($n=10$) was 86.7 days (SE=29.3). **Conclusions:** Treatment with systemic corticosteroids was associated with a faster time to symptomatic recovery compared to without. Regardless of etiology, reducing inflammation and mass effect involved in pseudotumoral hemicerebellitis may be integral to a more rapid return to neurological baseline.

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Predictors of survival in elderly patients undergoing surgery for GBM

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doi: 10.1017/cjn.2021.439

Background: An increasing number of elderly patients are being diagnosed with GBM and undergoing surgery. These patients often present with multiple medical comorbidities and have significantly worse outcomes compared to adult patients. The goal of this study was to determine clinical predictors of survival in elderly patients undergoing surgery for GBM. **Methods:** A retrospective chart review of all consecutive patients 65 years of age and older that underwent surgery for newly diagnosed GBM from 2005–2018 was performed. A total of 150 patients were included, and subdivided into two age categories; 65–74 and 75 or older. **Results:** Advanced age and medical comorbidities were not associated with decreased survival ($p = 0.07$ and $p = 0.09$, respectively). Postoperative complication was associated with worse survival for all patients (HR = 2.34,

$p = 0.01$) and occurred in patients with longer lengths of stay ($p < 0.0001$) and discharge destination other than home ($p = 0.001$). **Conclusions:** The presence of medical comorbidities and advanced age are not reasons to exclude patients with GBM from surgical consideration. Postoperative complication is the most significant predictor of survival in elderly patients and can be avoided by a short length of stay and discharge home.

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The Rising Incidence and Prevalence of Brain Tumours: a Canadian epidemiological study

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doi: 10.1017/cjn.2021.440

Background: Primary malignant brain tumours account for over one third of all brain tumours and are associated with high morbidity and mortality. The purpose of this paper is to estimate the rate and trends of incidence and prevalence for primary malignant CNS tumours in Canada from 1992 to 2017. **Methods:** An epidemiological study using publicly available data from Statistics Canada: Canadian Cancer Registry (CCR) from 1992 to 2017 for all of Canada was conducted. Incidence and prevalence per 100,000, age-standardized incidence, and age-standardized prevalence per 100,000 person-years of primary malignant CNS tumours were calculated and stratified by sex and age: pediatric (0-19), adult (20-64), and elderly (>64) populations. **Results:** During the study period, incidence and prevalence increased by 27.3% and 28.8%, respectively. Males accounted for 56% of all diagnoses and experienced decreased survival compared to females one year after diagnosis (p -value = 0.04). Age-standardized rates of incidence and prevalence were highest in elderly populations. **Conclusions:** Overall, the incidence of primary malignant CNS tumours has increased from 1992 to 2017 with males and the elderly disproportionately affected. Increased healthcare resources and awareness are needed to better identify and deliver evidence-based care for these patients.

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Surgery for recurrent GBM: deciding when to operate

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doi: 10.1017/cjn.2021.441

Background: Previous studies have found conflicting results regarding the role of repeat surgery on overall survival (OS) in patients with GBM. We used a novel approach that includes time to tumour recurrence as an additional prognostic factor in order to determine which patients benefit most from repeat surgery. **Methods:** A retrospective chart review from 1992-2018 was performed on all adult (≥ 18 years old) patients with primary GBM that received surgery for recurrent disease and compared to publicly available data from The Cancer Genome Atlas (TCGA) of adult patients with primary GBM that did not undergo surgery for recurrent disease. **Results:** A total of 672 adult patients with GBM were included in the study, including 87 that received surgery at tumour recurrence (surgery cohort). The surgery cohort

had longer OS and similar complication rates to those that did not receive surgery at recurrence, independent of time to tumour recurrence ($p < 0.0001$ and $p = 0.4$, respectively). Within the surgery cohort, patients with tumour recurrence >6 months demonstrated additional survival benefit ($p < 0.0001$). **Conclusions:** Surgery for recurrent GBM leads to improved survival without increased complications. Patients with tumour recurrence >6 months benefit most from repeat surgery.

NEUROCRITICAL CARE

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Assessment of External Ventricular Catheter Associated Infections at the Ottawa Hospital: Literature Review and Quality Improvement Initiative

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doi: 10.1017/cjn.2021.442

Background: External ventricular drains are a lifesaving intervention in the management of acute hydrocephalus. EVD associated infections vary significantly, and expert panels recommend reviewing institutional policies if infection rates exceed 10%. The audit aims to identify the infection rate at our institution, whereas the literature review aims to synthesize a new institutional EVD best practice guideline. **Methods:** An audit of EVD catheters inserted in the time period between 07/01/2019 and 10/25/2020 was conducted. Statistical analysis to calculate absolute incidence, infections per 1000 days of catheter use. A literature review to identify best practices for the insertion and management of EVDs was conducted. **Results:** 75 patients required a total of 105 EVD catheters. There were 16 (15.3%) EVD related infections, equating to 14.3 infections per 1000 days. Fifty percent of patients developed an EVD related infection within 9 days of insertion. Most infections were induced by skin flora (87.5%). A comprehensive step-by-step EVD insertion and management protocol was developed aiming to reduce the risk of infection. **Conclusions:** The incidence of EVD associated infections at the Ottawa Hospital is significantly higher than acceptable rates as suggested by expert panels. A new evidence-based best practice guidelines should be implemented. A follow-up audit is necessary.

NEUROIMAGING

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Application of the Anatomical Fiducials Framework to a Clinical Dataset of Patients with Parkinson's Disease

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doi: 10.1017/cjn.2021.443

Background: Establishing spatial correspondence between subject and template images is necessary in neuroimaging research and clinical applications. A point-based set of anatomical