

Perioperative epilepsy

Identification of [risk factors](#) for perioperative [epilepsy](#) remains crucial in the [care](#) of [patients](#) with [meningioma](#). Moreover, associations of brain invasion with clinical and radiological variables have been largely unexplored.

Hess et al., hypothesized that invasion of the [cortex](#) and subsequent increased [edema](#) facilitate [seizures](#), and they compared radiological data and perioperative seizures in patients with brain-invasive [meningioma](#) or noninvasive meningioma.

Correlations of brain invasion with tumor and edema volumes and preoperative and postoperative seizures were analyzed in univariate and multivariate analyses.

Totals of 108 (61%) females and 68 (39%) males with a median age of 60 years and harboring totals of 92 (52%) grade I, 79 (45%) grade II, and 5 (3%) grade III tumors were included. Brain invasion was found in 38 (22%) patients and was absent in 138 (78%) patients. The tumors were located at the convexity in 72 (41%) patients, at the falx cerebri in 26 (15%), at the skull base in 69 (39%), in the posterior fossa in 7 (4%), and in the ventricle in 2 (1%); the median tumor and edema volumes were 13.73 cm³ (range 0.81-162.22 cm³) and 1.38 cm³ (range 0.00-355.80 cm³), respectively. As expected, edema volume increased with rising tumor volume ($p < 0.001$). Brain invasion was independent of tumor volume ($p = 0.176$) but strongly correlated with edema volume ($p < 0.001$). The mean edema volume in noninvasive tumors was 33.0 cm³, but in invasive tumors, it was 130.7 cm³ ($p = 0.008$). The frequency of preoperative seizures was independent of the patients' age, sex, and tumor location; however, the frequency was 32% ($n = 12$) in patients with invasive meningioma and 15% ($n = 21$) in those with noninvasive meningioma ($p = 0.033$). In contrast, the probability of detecting brain invasion microscopically was increased more than 2-fold in patients with a history of preoperative seizures (OR 2.57, 95% CI 1.13-5.88; $p = 0.025$). In univariate analyses, the rate of preoperative seizures correlated slightly with tumor volume ($p = 0.049$) but strongly with edema volume ($p = 0.014$), whereas seizure semiology was found to be independent of brain invasion ($p = 0.211$). In multivariate analyses adjusted for age, sex, tumor location, tumor and edema volumes, and WHO grade, rising tumor volume (OR 1.02, 95% CI 1.00-1.03; $p = 0.042$) and especially brain invasion (OR 5.26, 95% CI 1.52-18.15; $p = 0.009$) were identified as independent predictors of preoperative seizures. Nine (5%) patients developed new seizures within a median follow-up time of 15 months after surgery. Development of postoperative epilepsy was independent of all clinical variables, including Simpson grade ($p = 0.133$), tumor location ($p = 0.936$), brain invasion ($p = 0.408$), and preoperative edema volume ($p = 0.081$), but was correlated with increasing preoperative tumor volume ($p = 0.004$). Postoperative seizure-free rates were similar among patients with invasive and those with noninvasive meningioma ($p = 0.372$).

Brain invasion was identified as a new and strong predictor for preoperative, but not postoperative, seizures. Although also associated with increased peritumoral edema, seizures in patients with invasive meningioma might be facilitated substantially by cortical invasion itself. Consideration of seizures in consultations between the neurosurgeon and neuropathologist can improve the microscopic detection of brain invasion ¹⁾.

The occurrence of perioperative seizures in patients with a preexisting seizure disorder is unclear. There are several factors unique to the perioperative period that may increase a patient's risk of perioperative seizures, including medications administered, timing of medication administration,

missed doses of antiepileptic medications, and sleep deprivation. We designed this retrospective chart review to evaluate the frequency of perioperative seizures in patients with a preexisting seizure disorder.

METHODS: We retrospectively reviewed the medical records of all patients with a documented history of a seizure disorder who received an anesthetic between January 1, 2002 and December 31, 2007. Patients excluded from this study include those who had an outpatient procedure or intracranial procedure, ASA classification of V, pregnant women, and patients younger than 2 years of age. The first hospital admission of at least 24 hours during which an anesthetic was provided was identified for each patient. Patient demographics, character of the seizure disorder, details of the surgical procedure, and clinically apparent seizure activity in the perioperative period (within 3 days after the anesthetic) were recorded.

RESULTS: During the 6-year study period, 641 patients with a documented seizure disorder were admitted for at least 24 hours after an anesthetic. Twenty-two patients experienced perioperative seizure activity for an overall frequency of 3.4%(95% confidence interval, 2.2%-5.2%). The frequency of preoperative seizures ($P < 0.001$) and the timing of the most recent seizure ($P < 0.001$) were both found to be significantly related to the likelihood of experiencing a perioperative seizure. As the number of antiepileptic medications increased, so did the frequency of perioperative seizures ($P < 0.001$). Neither the type of surgery nor the type of anesthetic (general anesthesia, regional anesthesia, or monitored anesthesia care) affected the frequency of perioperative seizures in this patient population.

CONCLUSIONS: We conclude that the majority of perioperative seizures in patients with a preexisting seizure disorder are likely related to the patient's underlying condition. The frequency of seizures is not influenced by the type of anesthesia or procedure. Because patients with frequent seizures at baseline are likely to experience a seizure in the perioperative period, it is essential to be prepared to treat seizure activity regardless of the surgical procedure or anesthetic technique ²⁾.

1)

Hess K, Spille DC, Adeli A, Sporns PB, Brokinkel C, Grauer O, Mawrin C, Stummer W, Paulus W, Brokinkel B. Brain invasion and the risk of seizures in patients with meningioma. *J Neurosurg*. 2018 Apr 27;1-8. doi: 10.3171/2017.11.JNS172265. [Epub ahead of print] PubMed PMID: 29701550.

2)

Niesen AD, Jacob AK, Aho LE, Botten EJ, Nase KE, Nelson JM, Kopp SL. Perioperative seizures in patients with a history of a seizure disorder. *Anesth Analg*. 2010 Sep;111(3):729-35. doi: 10.1213/ANE.0b013e3181e534a4. Epub 2010 Jun 14. PubMed PMID: 20547823.

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