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Intracranial intraoperative radiotherapy (IORT): evaluation of electrocorticography and peri-operative seizure risk

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Abstract

Background: Intra-operative radiotherapy (IORT) for brain metastases (BMs) and primary brain tumors has emerged as an adjuvant radiation modality that allows for consolidation of care into a single anesthetic episode with surgical resection. Yet, there is a paucity of data regarding the impact that IORT may have on peri-operative and long-term seizure risk.

Methods: A retrospective analysis of patients receiving IORT during tumor resection was performed via registry including data regarding peri-operative anti-seizure medications and anesthetic agents. Intra-operative neuromonitoring was performed using electrocorticography (ECoG) captured before-, during-, and after-IORT then analyzed for evidence of seizure or significant baseline changes. Kaplan-Meier estimations were used for overall survival analysis relative to documented clinical seizure incidence post-IORT.

Results: Of the 24 consecutive patients treated with IORT during tumor resection included, 18 (75%) patients were diagnosed with BMs while 6 (25%) had newly-diagnosed glioblastoma. Mean and median survival times were 487 and 372 days, respectively. Clinical seizures occurred in 3 patients post-IORT, 2 BMs patients within 9 months and 1 glioblastoma patient at 14 months. IORT time represented 9.5% of anesthetic time. ECoG recordings were available for 5 patients (4 BMs; 1 glioblastoma), with mean recording durations of 13% of the total anesthetic time and no evidence of high-frequency oscillations or seizure activity.

Conclusions: IORT is an option for delivery of definitive radiation in surgically resected brain tumors without increasing the peri-operative or long-term risk of seizure. ECoG data during the delivery of radiation fail to demonstrate any electrophysiological changes in response to ionizing radiation.

Keywords: Brain metastases; Glioblastoma; IORT; Radiotherapy; Seizure.

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