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2357

Radiosurgery for Pediatric Central Nervous System Lesions – Initial Report and Insights from a Multicenter Registry

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Purpose/Objective(s): Brain tumors are the most common solid neoplasms in pediatric patients. However, treatment options remain limited in cases of local recurrence, metastasis, or inoperability. Stereotactic radiosurgery (SRS) offers a potential treatment option in these scenarios, given its conformal delivery of high radiation doses to well-circumscribed targets. However, there is a distinct lack of studies investigating the role of SRS in the management of pediatric patients. This multicenter study aims to review the indications and outcomes of SRS in pediatric central nervous system (CNS) lesions.

Materials/Methods: Pediatric patients, i.e., <18 years of age at the time of treatment, who underwent single-fraction or hypofractionated SRS up to five fractions for a brain or spine lesion at four institutions were retrospectively and prospectively included and analyzed. All patients were required to have at least one complete follow-up to be eligible.

Results: A total of 84 pediatric patients with 164 benign or malignant lesions met the inclusion criteria. All treatments were delivered between 2005 and 2023. Patients were primarily treated for arteriovenous malformations (AVM) (28.6%), schwannomas (26.2%), ependymomas (14.3%), and astrocytomas (10.7%). The primary indications for SRS were the need for salvage treatments (79.3%), interdisciplinary consensus (79.3%), and palliative care (42.7%). Most treatments (90.9%) were performed with single-fraction SRS. The majority of lesions (79.9%) were intracranial, with 20.1% located in the spine. The median lesion volume measured 0.9 cc (IQR: 0.36–2.9 cc). The median prescription dose for AVM, ependymoma, schwannoma, astrocytoma, and metastases was 17 Gy, 15 Gy, 13 Gy, 14 Gy, and 20 Gy, respectively. Steroids were used in 15.9% of treatments, and sedation, i.e., anesthesia, was used in 4.3%. The median age of the seven sedated patients was 4.4 years (IQR: 2.7–5.1 years). The median follow-up was 30.4 months. In patients treated for AVM, the median time to at least partial obliteration and to complete obliteration was 12.0 months and 38.4 months, respectively. The median local control for ependymoma and astrocytoma was 35.5 months and 23.9 months, respectively, while the median local control for schwannoma and metastases was not reached. Seventeen deaths were observed. The rate of high-grade treatment-associated toxicity was low (3.6%).

Conclusion: This multicenter study reports on the use of SRS for various pediatric CNS lesions, including but not limited to AVMs, ependymomas, and schwannomas. Despite the confined role in managing pediatric tumors, our findings highlight the safety and efficacy of SRS, particularly in the treatment of recurrent lesions and metastatic disease. Therefore, SRS should be considered a treatment option in carefully selected pediatric patients. Further prospective studies are required to define the role of SRS in the management of pediatric CNS lesions.

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2358

Treatment Interruptions in NSCLC Radiotherapy: Impact on Outcomes in a Statewide Quality Collaborative

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Purpose/Objective(s): For patients receiving radiation therapy for non-small cell lung cancer (NSCLC), unplanned interruptions prolong the treatment course. However, little is known regarding patient and treatment planning characteristics that contribute to interruptions as well as the consequences of these interruptions on clinical outcomes. The purpose of this study was to characterize the frequency, predictors, and prognosis of patients with NSCLC who experienced interruptions in radiation therapy throughout a statewide quality collaborative.

Materials/Methods: Clinical and dosimetric data as well as frequency and duration of treatment interruptions (> or ≤ 5 days), were prospectively collected by 29 institutions within the Michigan Radiation Oncology Quality Consortium between 2017 and 2024 for patients with NSCLC treated with conventional fractionation and systemic therapy at the discretion of the medical team using a physician-assessed survey. We modeled the influence of patient, disease, and treatment characteristics including radiation dose metrics for lung and esophagus on the odds of any treatment interruption, toxicity breaks, and toxicity breaks > 5 days using multivariate logistic regression. We also assessed the potential effect of any treatment interruption on locoregional progression free survival (LR-PFS) using Kaplan-Meier survival estimates.

Results: Any treatment interruption was reported in 20% of patients (189/963), toxicity breaks were reported in 6% of patients (59/963), and prolonged toxicity breaks (>5 days) were reported in 2% (20/963). Multivariate analysis identified key predictors of toxicity-related breaks: comorbidity group (1 vs. 3, OR = 0.397; 95% CI 0.173-0.910), planning target volume (PTV) (OR = 1.001; 95% CI 1.001-1.002), and maximum esophageal dose (DMax) (OR = 1.07; 95% CI 1.011-1.132). Predictors of prolonged toxicity breaks (>5 days) included lung V5 (OR = 1.065; 95% CI 1.031-1.100) and patient age (OR = 1.070; 95% CI 1.014-1.128). Any treatment interruption was associated with worse locoregional progression-free survival (20-month LR-PFS, 44% vs 59%) (HR = 1.518; p = 0.0032).

Conclusion: These findings underscore the potential impact of treatment interruptions on clinical outcomes in NSCLC patients receiving conventionally fractionated radiation. Identifying high-risk patients based on clinical and dosimetric factors is crucial for optimizing treatment planning and reducing interruptions. Targeted interventions to mitigate these risks could improve treatment continuity and ultimately improve patient outcomes.

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