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Abstract
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Improved Progression-Free Survival Following Dose-Escalated vs. Standard Dose Post-Operative Radiation Therapy for High-Risk Meningiomas: An International Multicenter Individual Patient Level Meta-Analysis (FIRESTORM)

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Abstract

Purpose: We performed an individual patient level meta-analysis of high-risk meningiomas to compare the outcomes of dose-escalated radiation therapy (DE-RT) vs. standard-dose post-operative radiation therapy (SD-RT).

Methods: A total of 7 institutions participated. DE-RT was defined as treatment with a biological effective dose (BED10) of ⩾79.2 Gy (equivalent of 66 Gy in 33 fractions). We compared PFS with DE-RT vs. SD-RT via Kaplan-Meier analysis and log-rank t-tests, a Cox proportional hazards multivariate model, and propensity score analyses with inverse probability treatment weighting (IPTW). We also compared incidences of central nervous system radionecrosis (RN) with DE-RT vs.SD-RT.

Results: The analysis included 248 patients with high-risk meningioma (59 received DE-RT and 189 received SD-RT). One-hundred and eighty-eight cases (75.8%) were WHO Grade 2, and 103 cases (41.5%) were recurrent meningiomas. Extent of resection was STR in 182/248(75.2%). Three- and 5 year PFS rates were 62.8%(55.8-69.0%) and 45.0%(37.3-52.3%), respectively. DE-RT was associated with superior PFS rates at 3- (86.4% vs. 55.6%) and 5-years (65.8% vs. 38.8%; p=0.0022). Controlling for Grade, extent of resection, and de novo vs. recurrent disease, MVA confirmed DE-RT was significantly associated with PFS (hazard ratio (HR)=0.51(95% CI: 0.34-0.76); p=0.001). On IPTW, DE-RT continued to be associated with superior PFS (HR=0.53 (95% CI: 0.34-0.82; p=0.004). A greater incidence of any grade RN was observed following DE- RT (20/59; 33.9%) vs. SD-RT (25/189; 13.2%) (p=0.001) but with similar Grade 3 or greater RN events [DE-RT (5.1%) vs. SD-RT (3.2%)].

Conclusion: DE-RT resulted in superior PFS for patients with high-risk meningiomas over SD-RT without an increase in severe toxicities.