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# Outcomes of adjuvant radiation treatment following subtotal resection of world health organization grade II meningiomas

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## Abstract

**Purpose:** Existing literature on adjuvant radiation after subtotal resection (STR) of WHO II meningiomas is limited by heterogenous patient cohorts, combining adjuvant and salvage radiation, gross total resection (GTR) and STR, primary radiation treatment vs. re-treatment, or grade II and III meningiomas, all of which have different expected outcomes. Tumor control estimates in a large homogenous patient cohort are needed to accurately counsel patients.

**Methods:** A retrospective review of patients that had immediate post-operative imaging-confirmed residual WHO grade II meningioma followed by either adjuvant intensity-modulated radiation therapy (IMRT) or stereotactic radiosurgery (SRS) between 1996 and 2020 was conducted. Kaplan-Meier survival analysis and log-rank test was used to assess progression-free survival (PFS).

**Results:** Thirty-nine patients met inclusion criteria (IMRT = 32; SRS = 7). Overall, the 3-, 5-, and 10-year PFS was 81.1%, 61.2%, and 44.6%, respectively. Median follow-up time was 37 months. When comparing IMRT and SRS cohorts, baseline characteristics did not differ significantly between groups, but significantly larger residual tumor volumes were treated with IMRT (22.2 cm<sup>3</sup> vs. 6.3 cm<sup>3</sup>,  $p = 0.004$ ). PFS was not significantly different between IMRT and SRS at 3 years (81.1% vs. 80.0%) or 5 years (65.5% vs. 40%) ( $p = 0.19$ ). There was no significant difference in radiation necrosis between groups (IMRT = 3/32 patients vs. SRS = 0/7 patients,  $p = 0.32$ ).

**Conclusion:** Our homogenous patient cohort displayed acceptable control rates at 3 years using SRS or IMRT as adjuvant therapy. No significant difference in PFS or radiation necrosis was noted between patients treated with adjuvant IMRT versus SRS.

**Keywords:** Adjuvant radiation; Intensity-modulated radiation therapy; Meningioma; Stereotactic radiosurgery.

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