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Long-term outcomes following upfront single-session gamma knife stereotactic radiosurgery for large volume meningiomas

Suchet Taori¹, Zhishuo Wei², Constantinos G Hadjipanayis³, Ajay Niranjana³, L Dade Lunsford³

Affiliations

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Abstract

Background: Stereotactic radiosurgery (SRS) for the management of small and medium-sized intracranial meningiomas is well defined. However, limited studies evaluating long-term outcomes following SRS for large-volume meningiomas (LVMs) exist. Here, we report a large single-institution experience in using upfront single-session SRS to manage LVMs.

Methods: This retrospective review included 112 patients (83 female, 74%) managed with single-session SRS for LVMs (> 10 cc) between 1987 and 2022. Exclusion criteria consisted of prior meningioma surgical resection or follow-up < 2 years. Tumors were classified as supratentorial (35%) or skull-base (65%). The median tumor volume was 13 cc (range: 10-24.7), and the median margin dose was 12 Gy (range: 10-15). Overall, 101 (90%) patients were neurologically symptomatic at SRS.

Results: The median follow-up was 106 months (range: 24-307). Sixteen (14%) LVMs demonstrated tumor progression at a median time of 43 months (range: 7-181) following SRS. Local tumor control (LTC) rates at 3-years, 5-years, and 10-years were 98% (95%CI: 91-99), 97% (95% CI: 94-100) and 88% (95% CI: 80-96), respectively. Tumor volume > 17 cc (HR: 3.26, 95% CI: 1.17-9.08, p = 0.023) was significantly associated with worsened LTC. Seven (6%) patients developed peritumoral edema adverse radiation effects (AREs) at a median time of 35 months (range: 4-182) following SRS. Meningiomas located in supratentorial regions (OR: 1.11, 95% CI: 1.01-1.22, p = 0.031), as compared to skull base tumors, had a significantly greater risk of peritumoral edema ARE development.

Conclusions: In this select patient cohort, upfront single-session SRS provides durable long-term LTC and minimizes ARE risk for patients with LVMs.

Keywords: Adverse radiation effects; Gamma knife; Large volume meningiomas; Local tumor control; Single-session; Stereotactic radiosurgery.

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