The impact of the molecular and genetic properties of glioblastoma on patient outcomes following stereotactic radiosurgery at recurrence

Research Published: 23 December 2025

Volume 176, article number 132, (2026) Cite this article

Journal of Neuro-Oncology

Aims and scope

Submit manuscript

Johnathon W. Evers Smith, Juan D. Alzate, Landon Power, Wei Wei, Samuel T. Chao, Mustafa Siddiq, Richard Prayson, Gene H. Barnett, Alireza M. Mohammadi, Matthew M. Grabowski, John H. Suh, Erin S. Murphy, Jennifer S. Yu, Ehsan Balagamwala, Gennady Neyman, Glen H. J. Stevens, David Peereboom, Andrew Dhawan & Lilyana Angelov

Abstract

Purpose

The role of stereotactic radiosurgery (SRS) in the management of recurrent glioblastoma (rGB) is controversial. Here, we investigate how tumor characteristics impact patient outcomes following SRS.

Methods

An IRB-approved retrospective review of SRS-treated rGB patients was performed. Clinical, histological, molecular, imaging, and radiosurgical data were collected. Overall survival (OS) and progression free survival (PFS) were analyzed using Cox models.

Results

Forty-nine rGB patients (83 lesions) were treated; median age was 61 years (range: 21–78), median post-SRS follow-up was 9.2 months (range: 2.8–77.3). Median tumor volume and diameter at SRS were 2.0 cm^3 and 1.4 cm, respectively. Median prescription dose was 24 Gy. Post-SRS, median OS and PFS was 10.7 (95% CI 8.3–13.0) and 3.8 months (95% CI 2.8–5.6), respectively. Multivariate analysis demonstrated improved OS with tumor volume ≤ 2 cm^3 ($p = 0.006$), > 8 months from diagnosis to recurrence ($p = 0.0003$), and no loss of heterozygosity in tumor-suppressor rich chromosome 19q13 ($p = 0.001$). Median OS for patients with and without ≥ 2 of these features was 15.1 (95% CI 11.5–39.5) and 7.56 months (95% CI 5.3–11.8), respectively. Improved PFS was associated with Ki-67 index > 50% ($p = 0.003$), p53 staining $\geq 30\%$ ($p = 0.03$), and > 8 months between diagnosis and recurrence ($p = 0.05$). Median PFS for patients with and without ≥ 2 of these features was 6.7 (95% CI 4.6–9.4) and 2.8 months (95% CI 2.3–4.1), respectively.

Conclusions

SRS may be especially promising for rGB patients with favorable prognostic features, as patients with ≥ 2 of the identified favorable OS/PFS prognostic features experienced a 2x and 2.4x increase in OS/PFS, respectively.