

J Neurooncol. 2023 May 31. doi: 10.1007/s11060-023-04340-4. Online ahead of print.

Re-irradiation for recurrent high-grade glioma: an analysis of prognostic factors for survival and predictors of radiation necrosis

Daniel Moore-Palhares ¹, Hanbo Chen ¹, Julia Keith ², Michael Wang ¹, Sten Myrehaug ¹, Chia-Lin Tseng ¹, Jay Detsky ¹, James Perry ³, Mary Jane Lim-Fat ³, Chris Heyn ⁴, Pejman Maralani ⁴, Nir Lipsman ⁵, Sunit Das ⁶, Arjun Sahgal ¹, Hany Soliman ⁷

Affiliations

PMID: 37256526 DOI: 10.1007/s11060-023-04340-4

Abstract

Purpose: Recurrent high-grade glioma (rHGG) is a heterogeneous population, and the ideal patient selection for re-irradiation (re-RT) has yet to be established. This study aims to identify prognostic factors for rHGG patients treated with re-RT.

Methods: We retrospectively reviewed consecutive adults with rHGG who underwent re-RT from 2009 to 2020 from our institutional database. The primary objective was overall survival (OS). Secondary endpoints included prognostic factors for early death (< 6 months after re-RT) and predictors of radiation necrosis (RN).

Results: For the 79 patients identified, the median OS after re-RT was 9.9 months (95% CI 8.3-11.6). On multivariate analyses, re-resection at progression (HR 0.56, $p = 0.027$), interval from primary treatment to first progression ≥ 16.3 months (HR 0.61, $p = 0.034$), interval from primary treatment to re-RT ≥ 23.9 months (HR 0.35, $p < 0.001$), and re-RT PTV volume < 112 cc (HR 0.27, $p < 0.001$) were prognostic for improved OS. Patients who had unmethylated-MGMT tumours (OR 12.4, $p = 0.034$), ≥ 3 prior systemic treatment lines (OR 29.1, $p = 0.022$), interval to re-RT < 23.9 months (OR 9.0, $p = 0.039$), and re-RT PTV volume ≥ 112 cc (OR 17.8, $p = 0.003$) were more likely to die within 6 months of re-RT. The cumulative incidence of RN was 11.4% (95% CI 4.3-18.5) at 12 months. Concurrent bevacizumab use (HR < 0.001 , $p < 0.001$) and cumulative equivalent dose in 2 Gy fractions (EQD2, $\alpha/\beta = 2$) < 99 Gy₂ (HR < 0.001 , $p < 0.001$) were independent protective factors against RN. Re-RT allowed for less corticosteroid dependency. Sixty-six percent of failures after re-RT were in-field.

Conclusion: We observe favorable OS rates following re-RT and identified prognostic factors, including methylation status, that can assist in patient selection and clinical trial design. Concurrent use of bevacizumab mitigated the risk of RN.

Keywords: Corticosteroid dependence; Glioblastoma; Pattern of failure; Radiation necrosis; Re-irradiation; Recurrent high-grade glioma.

© 2023. The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature.