

Review

Neurosurg Rev. 2025 May 29;48(1):459. doi: 10.1007/s10143-025-03632-9.

Efficacy of combined therapy with gamma knife radiosurgery and bevacizumab on survival outcomes in patients with recurrent high-grade glioma: a systematic review and meta-analysis

Mehrdad Aghedi¹, Amirhossein Larijani^{2 3}, Ali Baradaran Bagheri⁴, Hossein Rafiemanesh^{5 6}, Ehsan Saraee^{7 8}, Shayan Mardi⁹, Mohammad Shirani^{10 11}

Affiliations

PMID: 40439764 DOI: 10.1007/s10143-025-03632-9

Abstract

High-grade gliomas represent one of the most formidable challenges in neuro-oncology, characterized by rapid progression and poor prognosis despite aggressive multimodal interventions. The combination of Gamma Knife radiosurgery and bevacizumab has emerged as a promising therapeutic approach for extending survival in patients with recurrent high-grade gliomas. A systematic review and meta-analysis followed PRISMA guidelines, drawing on comprehensive searches of PubMed, Scopus, and Web of Science databases. Studies assessing the efficacy of Gamma Knife radiosurgery in conjunction with bevacizumab for recurrent high-grade gliomas were identified and subjected to rigorous quality assessment using the modified Newcastle-Ottawa Scale. Pooled hazard ratios (HRs) for progression-free survival and overall survival were calculated using a random-effects model to account for variability across studies. Six studies were included in the systematic review, among which four provided sufficient data for quantitative synthesis in the meta-analysis. The pooled analysis revealed that combined therapy significantly improved progression-free survival (HR: 0.712, CI: 0.467-0.956, $p < 0.001$) compared to monotherapy. However, the two groups had no significant difference in overall survival (HR: 1.069, CI: 0.395-1.742, $p = 0.097$). Sensitivity analyses confirmed the robustness of these findings. High heterogeneity was noted for overall survival ($I^2 = 98.24\%$), warranting cautious interpretation. This meta-analysis suggests that while Gamma Knife combined with bevacizumab significantly prolongs progression-free survival in patients with recurrent high-grade glioma, it does not confer an overall survival advantage.

Keywords: Bevacizumab; Gamma knife; Glioma; Meta-analysis.

© 2025. The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature.

[PubMed Disclaimer](#)