Radiother Oncol. 2023 Jul 7;109800. doi: 10.1016/j.radonc.2023.109800. Online ahead of print.

Clinicogenetic characteristics and the effect of radiation on the neural stem cell niche in subventricular zone-contacting glioblastoma

Jee Ye Kahng ¹, Byung-Hee Kang ², Soon-Tae Lee ³, Seung Hong Choi ⁴, Tae Min Kim ⁵, Chul-Kee Park ⁶, Jae-Kyung Won ⁷, Sung-Hye Park ⁷, Jaeman Son ⁸, Joo Ho Lee ⁹

Affiliations PMID: 37423479 DOI: 10.1016/j.radonc.2023.109800

Abstract

Background and purpose: Neural stem cells (NSCs) in the subventricular zone (SVZ) are recognized as the cellular origin of glioblastoma (GBM) and a potential therapeutic target. However, the characteristics of SVZ contacting GBM (SVZ+GBM) and radiotherapeutic strategies for NSCs are still controversial. Here, we investigated the clinicogenetic features of SVZ+GBM and evaluated the dose effect of NSC irradiation depending on SVZ involvement.

Materials and methods: We identified 125 patients with GBM treated with surgery followed by chemoradiotherapy. The genomic profiles were obtained by next-generation sequencing targeting 82 genes. NSCs in the SVZ and hippocampus were contoured using standardized methods, and dosimetric factors were analyzed. SVZ+GBM was defined as GBM with SVZ involvement in a T1 contrast-enhanced image. Progression-free survival (PFS) and overall survival (OS) were used as endpoints.

Results: The number of patients with SVZ+GBM was 95 (76%). SVZ+GBM showed lower PFS than GBM without SVZ involvement (SVZ-GBM) (median 8.6 vs. 11.5 months, p = 0.034). SVZ contact was not associated with any specific genetic profile but was an independent prognostic factor in multivariate analysis. In SVZ+GBM, patients receiving high doses to the ipsilateral NSC region showed significantly better OS (HR = 1.89, p = 0.011) and PFS (HR = 1.77, p = 0.013). However, in SVZ-GBM, high doses to the ipsilateral NSC region were associated with worse OS (HR = 0.27, p = 0.013) and PFS (HR = 0.37, p = 0.035) in both univariate and multivariate analyses.

Conclusion: SVZ involvement in GBM was not associated with distinct genetic features. However, irradiation of NSCs was associated with better prognosis in patients with tumors contacting the SVZ.

Keywords: Glioblastoma; Radiotherapy; Subventricular zone; neural stem cell.

Copyright $\ensuremath{\mathbb{C}}$ 2023. Published by Elsevier B.V.