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Rethinking extent of resection of contrastenhancing and non-enhancing tumor: different survival impacts on adult-type diffuse gliomas in 2021 World Health Organization classification

Yae Won Park ¹, Sooyon Kim ², Kyunghwa Han ¹, Sung Soo Ahn ³, Ju Hyung Moon ⁴, Eui Hyun Kim ⁴, Jinna Kim ¹, Seok-Gu Kang ⁴, Se Hoon Kim ⁵, Seung-Koo Lee ¹, Jong Hee Chang ⁶

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Abstract

Objectives: Extent of resection (EOR) of contrast-enhancing (CE) and non-enhancing (NE) tumors may have different impacts on survival according to types of adult-type diffuse gliomas in the molecular era. This study aimed to evaluate the impact of EOR of CE and NE tumors in glioma according to the 2021 World Health Organization classification.

Methods: This retrospective study included 1193 adult-type diffuse glioma patients diagnosed between 2001 and 2021 (183 oligodendroglioma, 211 isocitrate dehydrogenase [IDH]-mutant astrocytoma, and 799 IDH-wildtype glioblastoma patients) from a single institution. Patients had complete information on IDH mutation, 1p/19q codeletion, and O⁶-methylguanine-methyltransferase (MGMT) status. Cox survival analyses were performed within each glioma type to assess predictors of overall survival, including clinical, imaging data, histological grade, MGMT status, adjuvant treatment, and EOR of CE and NE tumors. Subgroup analyses were performed in patients with CE tumor.

Results: Among 1193 patients, 935 (78.4%) patients had CE tumors. In entire oligodendrogliomas, gross total resection (GTR) of NE tumor was not associated with survival (HR = 0.56, p = 0.223). In 86 (47.0%) oligodendroglioma patients with CE tumor, GTR of CE tumor was the only independent predictor of survival (HR = 0.16, p = 0.004) in multivariable analysis. GTR of CE and NE tumors was independently associated with better survival in IDH-mutant astrocytoma and IDH-wildtype glioblastoma (all ps < 0.05).

Conclusions: GTR of both CE and NE tumors may significantly improve survival within IDH-mutant astrocytomas and IDH-wildtype glioblastomas. In oligodendrogliomas, the EOR of CE tumor may be crucial in survival; aggressive GTR of NE tumor may be unnecessary, whereas GTR of the CE tumor is recommended.

Clinical relevance statement: Surgical strategies on contrast-enhancing (CE) and non-enhancing (NE) tumors should be reassessed considering the different survival outcomes after gross total resection depending on CE and NE tumors in the 2021 World Health Organization classification of adult-type diffuse gliomas.

Key points: The survival impact of extent of resection of contrast-enhancing (CE) and non-enhancing

(NE) tumors was evaluated in adult-type diffuse gliomas. Gross total resection of both CE and NE tumors may improve survival in isocitrate dehydrogenase (IDH)-mutant astrocytomas and IDH-wildtype glioblastomas, while only gross total resection of the CE tumor improves survival in oligodendrogliomas. Surgical strategies should be reconsidered according to types in adult-type diffuse gliomas.

Keywords: Extent of resection; Glioma; Magnetic resonance imaging; Molecular diagnostics; Survival.

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