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Supramaximal resection based on en-bloc technique reduces tumor burden and prolongs survival in primary supratentorial lobar glioblastoma

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Abstract

Purpose: Resection beyond the contrast-enhanced zone contributed to reduce tumor burden and prolong survival in glioblastomas. The optimal extent of resection (EOR) and how to achieve it are worthy of continuous investigation for obtaining a satisfactory balance between maximal resection and the preservation of neurological function.

Methods: A total of 340 adult supratentorial lobar glioblastomas (included astrocytoma, WHO 4, IDH mutation and glioblastoma) were retrospectively evaluated. The clinical data, EOR, technique of resection, postoperative complications, overall survival (OS) and progression-free survival (PFS) were assessed by univariate, multivariate and propensity score matched analysis. Histological staining was performed to comprehend the effect of the membranous structures and the cell distribution in tumoral and peritumoral regions.

Results: Supramaximal resection (SMR) was confirmed as resection with 100% EOR_{CE} and > 50% EOR_{nCE} in glioblastomas by Cox proportional hazards model. Histological results showed SMR reduced the cell density of surgical edge compared to total resection. En-bloc technique based on membranous structures, which had blocking effect on tumoral invasion, contributed to achieve SMR. Moreover, applying en-bloc technique and achieving SMR did not additionally deteriorate neurological function and had similarly effects on the improvement of neurological function. Multivariate analysis confirmed that IDH1 status, technique of resection and EOR were independently correlated with PFS, and > 64 years old, IDH1 status, technique of resection, EOR and preoperative NIHSS were independently correlated with OS.

Conclusions: Applying en-bloc technique and achieving SMR, which could reduce tumor burden and did not increase additional complications, both had remarkably positive effects on clinical outcomes in patients with primary supratentorial lobar glioblastomas.

Keywords: Clinical outcomes; En-bloc technique; Glioblastoma; Membranous structures; Supramaximal resection.

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