Prognostic and predictive impact of abnormal signal volume evolution early after chemoradiotherapy in glioblastoma

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Abstract

Introduction: This study was designed to explore the feasibility of semiautomatic measurement of abnormal signal volume (ASV) in glioblastoma (GBM) patients, and the predictive value of ASV evolution for the survival prognosis after chemoradiotherapy (CRT).

Methods: This retrospective trial included 110 consecutive patients with GBM. MRI metrics, including the orthogonal diameter (OD) of the abnormal signal lesions, the pre-radiation enhancement volume (PRRCE), the volume change rate of enhancement (rCE), and fluid attenuated inversion recovery (rFLAIR) before and after CRT were analyzed. Semi-automatic measurements of ASV were done through the Slicer software.

Results: In logistic regression analysis, age (HR = 2.185, p = 0.012), PRRCE (HR = 0.373, p < 0.001), post CE volume (HR = 4.261, p = 0.001), rCE_{1m} (HR = 0.519, p = 0.046) were the significant independent predictors of short overall survival (OS) (< 15.43 months). The areas under the receiver operating characteristic curve (AUCs) for predicting short OS with $rFLAIR_{3m}$ and rCE_{1m} were 0.646 and 0.771, respectively. The AUCs of Model 1 (clinical), Model 2 (clinical + conventional MRI), Model 3 (volume parameters), Model 4 (volume parameters + conventional MRI), and Model 5 (clinical + conventional MRI + volume parameters) for predicting short OS were 0.690, 0.723, 0.877, 0.879, 0.898, respectively.

Conclusion: Semi-automatic measurement of ASV in GBM patients is feasible. The early evolution of ASV after CRT was beneficial in improving the survival evaluation after CRT. The efficacy of rCE_{1m} was better than that of $rFLAIR_{3m}$ in this evaluation.

Keywords: Chemoradiotherapy; Glioblastoma; Magnetic resonance imaging; Prognosis; Volumetric study.