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Leptomeningeal metastases at recurrence in IDH-wildtype glioblastomas: incidence, risk factors, and prognosis based on postcontrast FLAIR imaging

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Abstract

Objectives: To comprehensively investigate the incidence, risk factors, and prognosis of leptomeningeal metastases (LM) diagnosed at recurrence in IDH-wildtype glioblastoma patients.

Materials and methods: A total of 734 IDH-wildtype glioblastoma patients were enrolled between 2005 and 2022. LM at recurrence was diagnosed with MRI including postcontrast FLAIR. Logistic analysis for development of LM at recurrence was performed with clinical, molecular, imaging (including tumor volume and distance to subventricular zone via automatic segmentation), and surgical data including extent of resection and ventricular entry. The overall survival (OS) was compared between patients with and without LM at recurrence.

Results: The incidence of LM at recurrence based on postcontrast FLAIR was 10.8% (79 patients). On multivariable analysis, younger age at diagnosis (odds ratio (OR) = 0.98, $p = 0.011$) and ventricular entry (OR = 3.15, $p < 0.001$) were independent predictors of LM at recurrence. However, patients with LM at recurrence showed no significant difference in OS from patients without LM (log-rank test; $p = 0.461$), with median OS of 18.0 (95% confidence interval (CI) 16.2-19.8) and 18.5 (95% CI 16.4-20.7) months in patients with and without LM at recurrence, respectively.

Conclusion: The incidence of LM at recurrence is relatively high in IDH-wildtype glioblastoma patients. Younger age and ventricular entry during surgery warrant imaging surveillance for LM at recurrence. As LM at recurrence showed no significant OS compromise and larger extent of resection (EOR) is associated with survival benefits, ventricular entry during maximal safe resection may be acceptable.

Key points: Question The incidence, risk factors, and prognosis of leptomeningeal metastases (LM) diagnosed at recurrence in IDH-wildtype glioblastoma patients are currently unknown. Findings LM at recurrence occurred in 10.8% of cases, with younger age and ventricular entry as risk factors, but no significant difference in survival outcomes between groups. Clinical relevance The incidence, risk factors, and prognosis of LM at recurrence were investigated in IDH-wildtype glioblastoma patients with postcontrast FLAIR. Younger age and ventricular entry warrant surveillance of LM at recurrence, while the overall survival is not as discouraging as expected.

Keywords: Glioblastoma; Leptomeningeal metastases; Magnetic resonance imaging; Prognosis; Risk factors.