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Risk factors for and molecular pathology characteristics of systemic metastasis of adult cerebral glioblastoma: A pooled individual patient data analysis and systematic review

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Abstract

Object The risk factors for and molecular mechanisms of systemic metastasis of cerebral glioblastoma (GBM) remain to be evaluated. Patients and Methods Literature about adult GBM patients with systemic metastasis published before December 31, 2022, was searched in "PubMed" and "Web of Science," and the patients' clinical data were collected and compared with those of patients without metastasis to evaluate the risk factors. The molecular pathology results were summarized to evaluate the mechanism. Results One hundred forty-seven patients with metastasis in 113 papers published from 1928 to 2022 were included. Two hundred forty-nine patients without metastasis who underwent surgery in our department in 2017 were included. Comparison of the two groups showed that age ≤ 40 years was significantly correlated with metastasis (HR: 2.086, 95% CI: 1.124-3.871, P=0.020) and better overall survival (HR: 1.493, 95% CI: 1.067-2.083, P=0.019). Molecular pathology results were reported in 39 cases (39/147, 26.5%). The genetic results showed obvious heterogeneity. According to the frequency and positive ratio, IDH-wild type (positive rate 27/30), TERT promoter mutation (11/13), PTEN mutation (10/11), TP53 mutation (10/13) and RB1 mutation (8/9) were common gene changes. Conclusion In young adult GBM patients, especially those ≤ 40 years of age with long survival, attention should be given to the development of systemic metastases. Metastasis can be the result of multiclonal gene mutations, in which proliferation- and invasion-related gene changes, such as oncogene or tumor suppressor gene mutations and epithelial-mesenchymal transition-related genes, may play an important role in metastasis.