Can MRI-derived factors predict the survival in glioblastoma patients treated with postoperative chemoradiation therapy?

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Abstract

Background Advanced diagnostic and therapeutic developments may yield novel prognostic factors in patients with glioblastoma multiforme (GBM).

Purpose To validate the predictive values of pretreatment quantitative diffusion-weighted (DW) magnetic resonance imaging (MRI) and MRI performed within 72 h after surgery in patients with GBM.

Material and Methods Between January 2000 and September 2009, 138 patients with GBM underwent postoperative chemoradiation therapy (chemo-RT) and longitudinal MRI before surgery, in the early postoperative period, and at 1-month intervals thereafter. The role of the patient age, Karnofsky performance scale (KPS) score, minimum apparent diffusion coefficient (ADC) on pretreatment DW-MRI, and gross residual tumor on early postoperative MRI were assessed by factor analysis of overall survival (OS). Survival curves were calculated using the Kaplan-Meier method; the multivariate Cox's proportional hazards model was used to adjust for the influence of prognostic factors. Radiation Therapy Oncology Group-recursive partitioning analysis (RTOG-RPA) criteria were used to validate the predictive value of the MRI-derived factors.

Results Substantial independent prognostic factors were the KPS score (hazard ratio [HR], 1.812), minimum ADC (HR, 2.365), and gross residual tumor (HR, 1.777). Based on MRI-derived factors, we assigned the patients to different prognostic groups in the RTOG-RPA classification and grouped them according to the level of risk, i.e. a high-risk group with low minimum ADCs (<0.93 × 10(-3) mm(2)/s) with gross residual tumor and a low-risk group with high minimum ADCs (≥0.93 × 10(-3) mm(2)/s) without gross residual tumor; the other patients were assigned to the intermediate-risk group. Median OS for the low-, intermediate-, and high-risk groups were 28.2, 14.7, and 10.8 months, respectively (P < 0.001).

Conclusion The minimum ADC on pretreatment DW-MRI and gross residual tumor on early postoperative MRI can predict the survival in GBM patients treated with postoperative chemo-RT.

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