Extent of resection in patients with glioblastoma: limiting factors, perception of resectability, and effect on survival.

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Abstract
Object The extent of resection (EOR) is a known prognostic factor in patients with glioblastoma. However, gross-total resection (GTR) is not always achieved. Understanding the factors that prevent GTR is helpful in surgical planning and when counseling patients. The goal of this study was to identify demographic, tumor-related, and technical factors that influence EOR and to define the relationship between the surgeon's impression of EOR and radiographically determined EOR. Methods The authors performed a retrospective review of the electronic medical records to identify all patients who underwent craniotomy for glioblastoma resection between 2006 and 2009 and who had both preoperative and postoperative MRI studies. Forty-six patients were identified and were included in the study. Image analysis software (FIJI) was used to perform volumetric analysis of tumor size and EOR based on preoperative and postoperative MRI. Using multivariate analysis, the authors assessed factors associated with EOR and residual tumor volume. Perception of resectability was described using bivariate statistics, and survival was described using the log-rank test and Kaplan-Meier curves. Results The EOR was less for tumors in eloquent areas (p = 0.014) and those touching ventricles (p = 0.031). Left parietal tumors had significantly greater residual volume (p = 0.042). The average EOR was 91.0% in this series. There was MRI-demonstrable residual tumor in 69.6% of cases (16 of 23) in which GTR was perceived by the surgeon. Expert reviewers agreed that GTR could be safely achieved in 37.0% of patients (17 of 46) in this series. Among patients with safely resectable tumors, radiographically complete resection was achieved in 23.5% of patients (4 of 17). An EOR greater than 90% was associated with a significantly greater 1-year survival (76.5%) than an EOR less than 90% (p = 0.005). Conclusions The authors' findings confirm that tumor location affects EOR and suggest that EOR may also be influenced by the surgeon's ability to judge the presence of residual tumor during surgery. The surgeon's ability to judge completeness of resection during surgery is commonly inaccurate. The authors' study confirms the impact of EOR on 1-year survival.

PMID: 22978537 [PubMed - as supplied by publisher]