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## Recursive partitioning analysis of prognostic factors in three Radiation Therapy Oncology Group malignant glioma trials.

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### Abstract

**BACKGROUND:** Despite notable technical advances in therapy for malignant gliomas during the past decade, improved patient survival has not been clearly documented, suggesting that pretreatment prognostic factors influence outcome more than minor modifications in therapy. Age, performance status, and tumor histopathology have been identified as the pretreatment variables most predictive of survival outcome. However, an analysis of the association of survival with both pretreatment characteristics and treatment-related variables is necessary to assure reliable evaluation of new approaches for treatment of malignant glioma.

**PURPOSE:** This study of malignant glioma patients used a non-parametric statistical technique to examine the associations of both pretreatment patient and tumor characteristics and treatment-related variables with survival duration. This technique was used to identify subgroups with survival rates sufficiently different to create improvements in the design and stratification of clinical trials.

**METHODS:** We used a recursive partitioning technique to analyze survival in 1578 patients entered in three Radiation Therapy Oncology Group malignant glioma trials from 1974 to 1989 that used several radiation therapy (RT) regimens with and without chemotherapy or a radiation sensitizer. This approach creates a regression tree according to prognostic variables that classifies patients into homogeneous subsets by survival. Twenty-six pretreatment characteristics and six treatment-related variables were analyzed.

**RESULTS:** The years). Patients younger than 50 years old were categorized by histology (astrocytomas with anaplastic or atypical foci [AAF] versus glioblastoma multiforme [GBM]) and subsequently by normal or abnormal mental status for AAF patients and by performance status for those with GBM. For patients aged 50 years or older, performance status was the most important variable, with normal or abnormal mental status creating the only significant split in the poorer performance status group. Treatment-related variables produced a subgroup showing significant differences only for better performance status GBM patients over age 50 (by extent of surgery and RT dose). Median survival times were 4.7-58.6 months for the 12 subgroups resulting from this analysis, which ranged in size from 32 to 256 patients.

**CONCLUSIONS:** This approach permits examination of the interaction between prognostic variables not possible with other forms of multivariate analysis.

**IMPLICATIONS:** The recursive partitioning technique can be employed to refine the stratification and design of malignant glioma trials.

### Comment in

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