Treatment Outcomes and Prognostic Factors of Pediatric Glioblastoma Multiforme

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Introduction

Glioblastoma Multiforme (GBM) remains a very rare tumor in the pediatric population. The description of these tumors is currently limited to case reports and small case series, precluding an understanding of their natural history and prognostic factors. There is paucity of data evaluating surgical outcomes following treatment of pediatric GBM. In this study, we have performed a population-based analysis of patients with pediatric GBMs to characterize patient outcomes and evaluate the efficacy of surgical resection and radiotherapy.

Methods

The Surveillance, Epidemiology, and End Results (SEER) database was utilized to identify pediatric patients with GBMs. Patient, tumor, and treatment characteristics were summarized and analyzed to identify prognostic factors for survival.

Results

A total of 466 patients met the inclusion criteria. The median age was 11.0 years, with males accounting for 57.51% of patients. The median tumor size was 5.0cm. The majority of patients underwent surgical resection (86.0%) and radiotherapy (73.22%). The median overall survival for all patients was 12.0 months, Table 1. Univariate analysis revealed that resection (13months vs biopsy: 8months, p<0.0001), gross total resection (18months vs. subtotal resection: 12 months, p=0.0005) and Radiotherapy (13months vs no-radiotherapy: 6months, p<0.0001) significantly affected survival, Table 2. Using multivariate analysis when controlling for age and gender, surgical resection (HR: 0.58; 95%CI 0.439, 0.767; p=0.0001) and radiotherapy (HR: 0.655; 95%CI 0.516, 0.832; p=0.0005) significantly increased survival, Table 3. However, when controlling for gross total resection, only the extent of resection (HR: 0.626; 95%CI 0.49, 0.80, p=0.0002) and not radiotherapy (HR: 0.831; 95%CI 0.621, 1.111; p=0.212) affected survival, Table 4.

Impact on Surgery or Radiation Therapy on Survival

Table 2: Impact on Surgery or Radiation Therapy on Survival

Procedure	Mean survival time (months)	p-value
Resection vs biopsy months	13 vs. 8	p < 0.0001
Gross total resection vs subtotal resection	18 vs. 12 months	p = 0.0005
Radiotherapy vs no radiotherapy	13 vs. 6 months	p < 0.0001
Resection + radiotherapy	15 months	
STR + radiotherapy	13 months	
GTR + radiotherapy	18 months	
GTR without radiotherapy	17 months	

Baseline Patient and Tumor Characteristics

Table 1: Baseline Patient and Tumor Characteristics

Total No. of Patients	466
Age (years)	
Mean	10.1
Median	11.0
Gender	
Female	42.49%
Male	57.51%
Median tumor size	5.0cm
Resection	86.0%
Biopsy	14.0%
Radiation	73.22%
No radiation	26.78%
Median survival	12.0mths

Learning Objectives

In this study, pediatric GBM patients benefit significantly from surgery and radiotherapy. However, when receiving gross total resection, we found no benefit in survival time with adjuvant radiotherapy

Multivariate Regression looking at everything with resection vs biopsy

Table 3: Multivariate Regression looking at everything with resection vs biopsy

Parameter	P value	Hazard Ratio	95% Hazard Ratio Confidence Limits	
age	0.8555	1.002	0.982	1.022
female	0.9861	1.002	0.823	1.219
radiotherapy	0.0005	0.655	0.516	0.832
resection	0.0001	0.580	0.439	0.767

Multivariate Regression looking at impact of extent of resection

Table 4: Multivariate Regression looking at impact of extent of resection

Parameter	P value	Hazard Ratio	95% Hazard Ratio Confidence Limits	
age	0.3124	1.013	0.988	1.039
female	0.4432	0.909	0.713	1.160
radiotherapy	0.2120	0.831	0.621	1.111
Extent of resection	0.0002	0.626	0.490	0.800

Conclusions

In this study, pediatric GBM patients benefit significantly from surgery and radiotherapy. However, when receiving gross total resection, we found no benefit in survival time with adjuvant radiotherapy. Therefore, patients should be carefully evaluated to assess impact of treatment modalities on outcomes.