Pediatric Malignant Brainstem Gliomas: A Population-based study

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Introduction

Brainstem gliomas (BSGs) are primarily found in the pediatric population, accounting for 10% of all brain tumors in these patients [1]. These lesions peak in incidence around the first decade of life and have varying prognosis that is dependent on location, morphology, and histological grade [2]. Pediatric malignant BSGs typically present as diffuse pontine lesions and have a median survival less than 1 year [3]. As BSGs in children are primarily diagnosed by appearance on magnetic resonance imaging, current studies have had few cases of pathologically confirmed malignant BSGs.

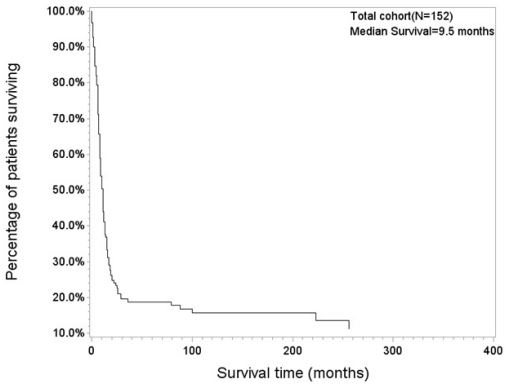
Methods

The Surveillance Epidemiology and End-Results (SEER) database was utilized to identify pediatric patients diagnosed with malignant brainstem gliomas (anaplastic astrocytoma and glioblastoma) between 1973 and 2008 (n = 152). We assessed the impact of various patient, tumor, and treatment factors on survival.

Results

The overall median survival was 9.5 months, with patients with grade III and IV tumors demonstrating significantly different survival (10.5 vs. 9 months, p=0.019). Multivariate stepwise regression analysis of the total cohort only revealed resection to significantly affect survival (HR:0.20; 95%CI:0.08-0.48; p=0.0004), with tumor size approaching significance (HR: 1.04; 95%CI:0.99-1.08; p=0.058). The timing of radiation with respect to surgery, use of external beam radiation, and patient characteristics did not affect survival. Analysis of patients with grade III tumors only revealed resection to function as an independent prognostic factor, significantly improving survival compared to biopsy alone (HR: 0.047; 95% CI: 0.003-0.65; p = 0.047). However, no variables were significant for those with GBM, with resection only trending to be associated with improved survival (HR: 0.26; 95% CI: 0.060-1.11; p = 0.069).

Kaplan Meier overall survival curve for pediatric patients with malignant brainstem gliomas



Multivariate analysis of the impact of patient, tumor, and treatment factors on median overall survival in pediatric malignant brainstem gliomas.

Variables	All patients	
	P value	HR (95% CI)
Age	0.74	0.981 (0.88, 1.10)
Female	0.54	0.751 (0. 30,1. 86)
Black	0. 30	2.237 (0. 48,10.4)
Other	0. 088	3.324 (0. 84,13.2)
Tumor size	0.058	1.039 (0.99,1.08)
Radiation	0. 72	1.295 (0. 32, 5. 28)
Resection	0. 0004	0. 196 (0. 080, 0.48)
Grade 4	0.48	1.349 (0.59, 3.08)

Conclusions

Pediatric malignant brainstem gliomas are aggressive lesions with an overall poor prognosis, with female gender and grade IV pathology predicting worse survival. Resection in select cases may improve survival in patients with these lesions.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of accurate diagnosis and aggressive treatment of pediatric malignant brainstem gliomas, 2) Discuss, in small groups the natural history, prognostic factors, and treatment of pediatric malignant brainstem gliomas, 3) Identify an effective treatment for pediatric brainstem gliomas which may involve resection for select lesions.

References

1. Farwell JR, Dohrmann GJ, Flannery JT. Central nervous system tumors in children. Cancer. Dec 1977;40(6):3123-3132.

2. Tokuriki Y, Handa H, Yamashita J, Okumura T, Paine JT. Brainstem glioma: an analysis of 85 cases. Acta neurochirurgica. 1986;79(2-4):67-73.

3. Farmer JP, Montes JL, Freeman CR, Meagher-Villemure K, Bond MC, O'Gorman AM. Brainstem Gliomas. A 10-year institutional review. Pediatric neurosurgery. Apr 2001;34(4):206-214.