

Evaluation of Pediatric Glioma Outcomes using Intraoperative MRI: A Multi-Center Cohort Study

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Introduction

Gliomas in pediatric patients remain challenging to treat. Intraoperative MRI (iMRI) may increase extent of resection (EOR), decrease need for early reoperation, and increased progression free and overall survival, but has not been fully validated, particularly in the pediatric population.

Methods

A retrospective analysis was performed of a multicenter (e.g. 10 centers) database of pediatric patients (age \geq 18 years) who underwent resection of pathologically confirmed gliomas.

Results

A total of 327 patients (mean age 9.7 ± 4.6 years, 56.3% male) with median follow-up, 37.7 months, (range 0-182.1 months) were identified who underwent surgery by 1 of 13 neurosurgeons. There were 207 (63.3%) World Health Organization (WHO) grade I tumors, 62 (19%) grade II, 25 (7.6%) grade III, 10 grade IV (3.1%), and 23 (7.0%) not classified. Three hundred patients underwent iMRI, and residual tumor was identified at the time of iMRI leading to additional resection for 140 patients (42.8%). Of the 37 patients with additional specimen sent for pathological analysis after iMRI, 33 showed positive tumor pathology (89.2%). The average surgery and room times were 5.6 ± 2.1 (range 1-13.8 hours) and 7.6 ± 2.2 (range 2.3-15.3 hours) hours, respectively. Overall survival (OS) for WHO grade I, II, III, and IV tumors was 35.4 ± 31.2 , 20.1 ± 18.6 , 19.2 ± 11.4 , and 10.1 ± 10.6 months, respectively. On survival analysis, extent of resection impacted OS for grade II and IV tumors only ($p < 0.05$). Furthermore, postoperative patient complications occurring during the treatment of patients in this cohort affected OS ($p < 0.05$) but not PFS. Rates of gross total resection (GTR) were 73.9%, 75.0%, 72.2%, and 37.5% , respectively, for WHO grade I, II, III and IV tumors.

Conclusions

Analysis of the largest multicenter database to date of pediatric gliomas resected using iMRI demonstrated increased EOR in 42.8%, including 72.9% with GTR. Continued refinement of iMRI techniques in the pediatric glioma population may improve outcomes.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Describe the importance of intraoperative MRI during the treatment of patients with pediatric glioma, 2) Summarize the literature regarding the use of intraoperative MRI and other surgical adjuncts during treatment of pediatric brain tumors, 3) Discuss shortcomings of technologies used to treat pediatric gliomas.

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