

ABSTRACT

J Neurosurg Pediatr. 2021 Oct 22;1-9. doi: 10.3171/2021.7.PEDS21312. Online ahead of print.

Dosimetric parameters associated with the long-term oncological outcomes of Gamma Knife surgery for sellar and parasellar tumors in pediatric patients.

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OBJECTIVE: The authors aimed to investigate the dosimetric parameter and the minimally required dose associated with long-term control of sellar and parasellar tumors after Gamma Knife surgery (GKS) in children.

METHODS: A retrospective analysis was performed on pediatric patients younger than 19 years of age who were diagnosed with sellar and parasellar tumors and received GKS at the authors' institution from 1998 to 2019. Cox proportional hazards regression analyses were used to investigate the dosimetric parameters associated with treatment outcome. The Kaplan-Meier method was used to analyze tumor control rates after GKS.

RESULTS: Overall, 37 patients with 40 sellar and parasellar tumors, including 22 craniopharyngiomas and 12 pituitary adenomas, had a mean follow-up of 85.8 months. The gross target volume was 0.05 cm³ to 15.28 cm³, and the mean marginal dose was 15.8 Gy (range 9.6-30.0 Gy). Ten patients experienced treatment failure at a mean of 28.0 ± 26.7 months. The actuarial 5- and 10-year tumor control rates were 79.0% and 69.8%, respectively. D98% was an independent predictive factor of tumor control (HR 0.846 [95% CI 0.749-0.956], p = 0.007), with a cutoff value of 11.5 Gy for the entire cohort and 10 Gy for the craniopharyngioma group. Visual deterioration occurred in 2 patients with the maximum point dose of 10.1 Gy and 10.6 Gy to the optic apparatus.

CONCLUSIONS: In pediatric patients, D98% was a reliable index of the minimum required dose for long-term control of sellar and parasellar tumors after GKS. The optimal D98% value for each tumor diagnosis needs to be elucidated in the future.

DOI: 10.3171/2021.7.PEDS21312

PMID: 34678777