

Multisession Gamma-knife Radiosurgery: A Preliminary Experience with a Noninvasive, Relocatable Frame

Ching-Jen Chen MD; James Nguyen MD, BA; Cheng-Chia Lee; Chun-Po Yen MD; Zhiyuan Xu MD; David Schlesinger; Jason P. Sheehan MD, PhD, FACS

University of Virginia Health System, Charlottesville, Virginia; Taipei Veterans General Hospital, Taipei, Taiwan



Introduction

To evaluate preliminary outcomes for a cohort of patients who were treated with multisession Gamma Knife radiosurgery (GKRS) using the new noninvasive vacuum-assisted immobilization system.

Methods

A retrospective review was performed of 15 consecutive cases treated with multisession GKRS. Radiosurgical targets included 12 meningiomas, 1 nonfunctioning pituitary adenoma, 1 growth hormone-secreting pituitary adenoma, and 1 pilocytic astrocytoma. GKRS was delivered in 3e5 sessions to a mean tumor volume of 8.55 mL (median, 7.3 mL; range, 1.24e22.7 mL) with a mean margin dose of 19.7 Gy (median, 20 Gy; range, 15e25 Gy). The optic nerves, chiasm, and tracts received mean doses of 3.5 Gy (range, 0.7e5.7 Gy), 3.1 Gy (range, 1e4.4 Gy), and 2.6 Gy (range, 0.83e5.45 Gy) per session. Mean biologic equivalent dose (a/b [2.5) was 60.9 Gy (median, 60 Gy; range, 45e79.8 Gy). Follow-up examinations were performed at 3 - to 6-month intervals.

Conclusions

Preliminary experience with multisession GKRS appears promising, with reasonable tumor control and complication rates. Multisession stereotactic radiosurgery may expand the treatment envelope for intracranial pathologies, including targets with larger volumes and locations in close proximity to radiosensitive structures.

Results

Mean follow-up was 17.7 months (median, 13.8 months; range, 4e44.3 months), and tumor control was noted in all patients, with regression in 5 patients and stability in 10 patients. New neurologic deficits developed in 3 patients after treatment, but none of these deficits were permanent. Resection was performed in 1 patient with expressive aphasia with worsening of peritumoral T2 signal but a stable tumor on follow-up magnetic resonance imaging. The other 2 patients were managed conservatively for minor complications (ptosis, taste dysfunction), and their symptoms resolved. No patients developed deterioration in vision during the follow-up period.

Learning Objectives

By the conclusion of this session, participants should be able to:

- 1) Describe the indications for multisession Gamma Knife radiosurgery using a non-invasive relocatable frame.
- 2) Describe the preliminary results of the new Gamma Knife radiosurgery performed with the new Extend system
- 3) Describe the difference between the new Gamma Knife Extend system and the current stereotactic frame using pins.