

## Volumetric Changes of Vestibular Schwannoma after Gamma Knife Radiosurgery

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### Abstract

**Objectives:**

Vestibular schwannomas (VS) are benign tumors that can be treated with observation, surgical resection, or radiation therapy. Following SRS, the time to volumetric response can vary and serial MRI should be done for proper assessment.

**Methods:**

382 consecutive patients over 20 years treated with GKRS, all treatments were delivered in a single session. Typical follow-up includes contrasted MRI brain imaging at 3, 6, and 12 months following treatment, after which patient would be transitioned to annual imaging. Initial tumor volume was obtained based on target volume using GammaPlan. Follow up MRIs were imported into GammaPlan, overlaid with the treatment MRI, and residual tumor volumes measured.

**Results:**

There was a statistically significant relative reduction in tumor volume starting at 12-months post-treatment which continued through subsequent imaging. At 76 months, the median reduction in tumor volume was 60.6% [IQR 46.4-72.9%]. Of these patients, 69 (39.4%) had pseudoprogression of their tumor. In 34 (49.3%) patients, pseudoprogression was first observed at 3-months followed by 29 (42.0%) occurring at 6 months post-treatment. The maximum median increase in tumor volume was 36.1% [IQR 23.5-62.0%]. The median volume of pseudoprogressed tumors remained elevated compared to pretreatment values for nearly 24 months. As compared to tumors without pseudoprogression, pseudoprogressed tumors remained significantly elevated for at least 36 months, with relative median tumor volumes approximating each other at 76 months. The tumors of 11 patients with pseudoprogression were still elevated beyond 36 months however none required retreatment. Other treatment variables, such as age, sex, Koos grade, prior surgery, dose, isodose line, gradient index, and tumor volume were not associated with the development of pseudoprogression on Pearson's correlation.

**Conclusion(s):**

Following SRS for vestibular schwannoma, tumor reduction can be seen within 12 months with a median volumetric decrease of over 60% with long term follow up. Approximately 40% of patients experience pseudoprogression following SRS. Most pseudoprogressed tumors shrink below pretreatment values by 24 months and pseudoprogression is not associated with treatment failure.