



Long-Term Outcomes of Vestibular Schwannoma Treated with Stereotactic Radiosurgery: A Retrospective Study from a Single Institution

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Objectives: Vestibular schwannoma (VS) is a benign tumor arising from cranial nerve VIII, commonly affecting the internal auditory canal and the cerebellopontine angle. This study evaluates the long-term efficacy and safety of stereotactic radiosurgery (SRS) using CyberKnife, a platform pioneered at Stanford, highlighting our institution's extensive long-term experience and data.

Methods: We retrospectively analyzed a total of 344 VS cases treated with CyberKnife SRS from 1998 to 2014. Data included patient demographics, clinicopathology, radiology, and treatment details. Statistical analyses included Chi-square tests, Mann-Whitney U tests, independent t-tests, and Kaplan-Meier analysis.

Results: The median follow-up was 157 months, representing one of the longest follow-up periods reported. The mean age was 51.9 years, with 50.9% female patients. The median tumor size was 1.7 cm, with a median target volume of 0.94 cc. Median maximum and prescribed doses were 22.5 Gy and 18 Gy, respectively. NF2 patients received higher doses ($P=0.016$) and had longer follow-up ($P=0.012$). NF2-associated tumors more frequently presented with higher Koos grades and required additional interventions ($P=0.025$). CN V deficits correlated with CN VIII symptom resolution ($P=0.002$). Notably, smokers ($P=0.001$) and non-hypertensive patients ($P=0.001$) had higher symptom resolution rates. Local recurrence was higher in those with prior surgery ($P=0.048$). Remarkably, local control rates were 100% at 2 years, 98.8% at 5 years, 94.2% at 15 years, and 89.3% at 25 years. Overall survival was 100% at 10 years and remained at 97.1% at 25 years.

Conclusion(s): Our extensive long-term data confirm that CyberKnife SRS provides sustained local control and safety for VS treatment over decades, reinforcing its role as a reliable and effective management strategy pioneered at Stanford.

