

GAMMA KNIFE RADIOSURGERY FOR VESTIBULAR SCHWANNOMA



A vestibular schwannoma (**Acoustic Neuroma**) is a benign tumor predominantly originating from the balance portion of cranial nerve VIII, with an incidence of 2/100,000. The tumor location often leads hearing deficits, tinnitus, balance issues and facial nerve deficits. Radiosurgery is the primary management in smaller to moderate volume tumors followed by microsurgery and observation.

Key Points

- Tumor control can be obtained in greater than 98% of patients
- Facial nerve and hearing function have a high rate of preservation with GKSRS
- Small to medium size vestibular schwannomas should be treated by GKSRS. Large tumors may benefit from deliberate sub-total resection followed by GKSRS after recovery from microsurgery.

Gamma Knife Radiosurgery

GKSRS is not only supported by academic and clinical peer reviewed publication, but has been utilized to treat over 85,324 vestibular schwannoma patients worldwide during the last 30 years, with 7,632 patients being treated in 2014 alone. GKSRS for vestibular schwannomas is conducted in a single session due to the unparalleled accuracy and dose fall off, in contrast to other radiation treatments. Comparative studies with microsurgery have demonstrated that GKSRS is 32-44% more cost effective (1,2).

Clinical Data

Tumor Control:	Multiple peer-reviewed publications with clinical and radiological follow-up greater than 10 years demonstrate progression free survival ranging from 93-98% with a median of 97% (3,4,5,6,7).
Large size:	GKSRS for vestibular schwannomas >3cm in diameter have a control rate of 81.8- 92% at 5 years (8,9).
Repeat GKSRS:	Only a small fraction of patients require retreatment; however 85-92.3% of these patients will obtain tumor control with a second GKSRS procedure (10,11).
Hearing:	Patients with normal hearing at GKSRS have an 80-100% rate of maintaining serviceable hearing. GKSRS for patients with >70% of their hearing preserved (Gardener-Robertson class 1) results in serviceable hearing levels in 81% of patients at 1 year, 57% at 3 years and 44.5% at >10 years (12,7).
Facial nerve:	GKSRS preserves normal facial motor function in 98.5% of patients (House-Brackmann grade 1) (13,14).
Surveillance:	74% of patients managed with observation alone required treatment within 4 years due to tumor growth (15). In addition, hearing preservation at 5 years with surveillance is 41%, compared to 64% at 5 years after GKSRS (15).
Quality of life:	GKSRS patients have higher quality of life scores compared to microsurgery based on standard questionnaires (16,17). GKSRS patients took an average of 7 days off work at the time of treatment and 99% returned to work, whereas surgical patients were off work for 130 days on average, and only 66% of patients returned to work (18).

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Risks

- Tumor control is not achieved in 2%-3% of patients after a single GKSRS procedure. Repeat GKSRS or surgery depending on tumor size can be utilized in this scenario (3,6).
- GKSRS can result in a diminished level of hearing over time. However, the risk of hearing damage is lower with GKSRS than for surveillance, surgical approaches or other radiosurgery options.
- The risk of a facial neuropathy is less than 1-1.5% (3,19).
- Trigeminal symptoms are detected in 0.6-3% of patients with tumor contacting the nerve (3, 6).

Referral Recommendations

- GKSRS is first-line management for all small to medium size vestibular schwannomas.
- Large tumors with brainstem compression should have deliberate sub-total resection to remove the mass effect, followed by GKSRS for the residual tumor.
- Patients should be referred at the time of diagnosis as early treatment provides the highest rate of neurological preservation.
- If you are unsure whether a patient would be a candidate for GKSRS, our team would be happy to provide a consultation.

What your Patient should know

Gamma knife radiosurgery provides the highest level of tumor control and lowest level of associated side effects. This is a single procedure done as an out-patient with local anesthetic and relaxation medication. It is designed to halt the growth of the vestibular schwannoma. There are no incisions and the patient does NOT experience perceived radiation side effects such cognitive decline or hair loss. Patients can maintain their current medications.

Radiosurgery Technique Protocol for Vestibular Schwannoma

1. Patients are treated in a single outpatient procedure
2. A Leksell stereotactic frame is applied under mild sedation / local anaesthetic.
3. High-resolution axial imaging (MRI or CT) is conducted.
4. Radiosurgery dose planning (12-13Gy margin dose) is created emphasizing conformality and selectivity. The planning is based on multifactorial tumor characteristics including location, volume, cranial nerve status, and anatomic consideration.
5. The patient is positioned in the Gamma Knife unit and the radiosurgery treatment is administered.
6. Patients are usually discharged within 2 hours of a completed procedure.
7. Clinical, imaging and audiogram follow-up is requested at 6-months and is then extended based on the results. Patients that have tumor progression can be retreated with radiosurgery and remain viable candidates for other interventional strategies.

The expanded technical elements of this procedure are detailed in previous publications (3,12).

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