

# GAMMA KNIFE RADIOSURGERY FOR MENINGIOMAS



Meningiomas are the most frequently diagnosed primary intracranial tumor with an estimated prevalence of 97.5 per 100,000 people (1). The pathological classification is benign (WHO grade I) in 90% of patients but atypical and malignant forms occur. Management options include surgical resection or radiation.

## Key Points

- Gamma Knife Radiosurgery (GKSRS) is minimally invasive and provides long-term meningioma growth prevention, at a rate often greater than microsurgical outcomes.
- The risk of neurological morbidity is low which facilitates a rapid return to current activity levels.

## Gamma Knife Radiosurgery

GKSRS is an established and globally recognized procedure for managing meningiomas, with supporting evidence from several hundred peer reviewed publications. Over 125,760 patients have had their meningiomas managed with GKSRS over the last 30 years with 13,031 patients being treated worldwide in 2014 alone.

## Clinical Data

<b>Tumor Control:</b>	<p><b>Benign:</b> WHO grade 1 meningioma control rates consistently range from 95% to 97% at 5 years. The 10-year tumor control rates are between 89% and 91% (2,3,4), and at 20-years 87.2% of tumor are stable (5).</p> <p><b>Atypical:</b> WHO grade II meningiomas are controlled in 83-88.3% of cases at 5 years (11,12).</p> <p><b>Anaplastic:</b> WHO grade III meningiomas have a 5-year progression free survival of 66.7-72% (11,12).</p>
<b>Location:</b>	5-year progression free survival rates can fluctuate based on location, ranging from 71% to 95% (9,10).
<b>Volumetric response:</b>	A decrease in meningioma size is observed in 44-67% of patients after GKSRS (3,6).
<b>GKSRS vs Resection:</b>	<p>Meningioma control after complete tumor and dura removal (Simpson grade 1) is essentially equivalent to GKSRS at 7-years follow-up (96% vs 95%) (7).</p> <p>GKSRS has a statistical significant higher rate of tumor control compared to less aggressive meningioma resections or skull base areas where complete resection is not viable (Simpson Grade 2-4) (7).</p> <p>Microsurgery results in a mean time interval away from employment of 160 days compared to 8 days for GKSRS (8).</p>

## Risks

- Morbidity rates range predominantly from 3-8% depending on the tumor location, tumor volume, and dose prescribed (2,3,13).
- Repeat radiosurgery or open surgical resection may be required in a subset of patient, particularly when managing an aggressive meningioma.

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## Referral Recommendations

- WHO grade I-III meningiomas regardless of resection status
- Meningiomas that are large or have symptomatic mass effect should be preferentially managed by microsurgical intervention.
- 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 is a safe and proven effective procedure, which remains the least invasive of surgical approaches for meningioma treatment. This is a single procedure, designed to inactivate the tumor cells resulting in an absence of growth or shrinkage of the meningioma. There are no incisions and the patient does NOT experience perceived radiation side effects such as cognitive decline or hair loss. Patients do not require an anesthetic and can maintain their current medications.

## Radiosurgery Technique Protocol for Meningiomas

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 (12-14Gy margin dose) is created emphasizing conformality and selectivity. The planning is based on multifactorial tumor characteristics including location, volume 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. Follow-up is requested at 6-months and is then extended based on clinical and imaging findings. 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 (5,10).

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