

A Comparative Study of Frame-Based vs Mask-based Fixation for Gamma Knife Treatment of Vestibular Schwannoma

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Background

- Gamma Knife Radiosurgery (GKRS)** is a well-established treatment for vestibular schwannomas.
- Traditionally, **rigid stereotactic Leksell frames** ensure precision in GK treatment.
- The **Gamma Knife Icon** (Elekta AB, Stockholm, Sweden) introduced a **frameless thermoplastic mask-based fixation** for improved patient comfort and workflow.

Objective

- To compare **recurrence rates** and **time to recurrence** in **vestibular schwannomas** treated with **GKRS** using **frame-based versus frameless thermoplastic mask-based fixation**.
- To our knowledge, this is the **first study** to directly compare these fixation techniques in patients with vestibular schwannomas.

Methods

Study Design: Retrospective observational cohort study
Patients Included: Patients with vestibular schwannomas treated with GKRS at UT Southwestern Medical Center between 2015 and 2022

- Cohorts:**
- Cohort 1: Fixation Frame-Based Fixation
 - Cohort 2: Frameless Thermoplastic Mask-Based Fixation

- Data Collected:**
- Patient & Tumor Data: Demographics, laterality, tumor diameter.
 - Treatment Details: GK dose, immobilization type (frame vs. mask).
 - Recurrence: Confirmed tumor growth on imaging (excluding pseudoprogression) and time to recurrence

- Statistical Analyses:**
- Multivariable Logistic & Cox Regression: Assessed recurrence rates, time to recurrence, and risk factors, adjusted for age, gender, and tumor diameter.
 - Log-Rank Test: Compared recurrence-free survival between fixation groups.

Results

Variable: n(%) or median (range)	Frame	Mask	Total Cohort	p-value
Number of Patients	60 (73.2)	22 (26.8)	82	-
Age (years)	72.6 (37-91)	72.0 (55-83)	73.5 (37-91)	0.582
Sex Distribution				0.228
Female	32 (46.7)	15 (68.2)	47 (57.3)	-
Tumor Diameter (mm)	17.6 (7.0-31.0)	16.4 (6.0-33.0)	17.0 (6.0-33.0)	0.418
Laterality				0.388
Left	31 (51.7)	9 (40.9)	40 (48.8)	-
Gamma Knife Dose (cGY)	1302.5 (1252-1402)	1302.0 (1201-2502)	1302.0 (1201-2502)	0.430
Follow-Up Duration (months)	51.5 (5-98)	24.5 (5-79)	41.5 (5-98)	<0.001

Variable	Frame	Mask	Total Cohort	p-value
Recurrence (n (%))	5 (8.3)	2 (9.1)	7 (8.5)	1.000
Recurrence-Free Survival (months) (mean (SD))	91.1 (3.3)	72.6 (4.5)	90.5 (3.0)	0.697 (log rank)
Multivariable Logistic Regression		OR (95% CI)		p-value
Recurrence				
Immobilization: Frame (0) or Mask (1)		0.61 (0.06 – 6.09)		0.672
Multivariable Cox Regression -		HR (95% CI)		p-value
Recurrence				
Immobilization: Frame (0) or Mask (1)		1.00 (0.11 - 9.03)		1.000

Conclusion

- No significant difference** in **recurrence rates** or **time to recurrence** between **frame-based and mask-based fixation** for vestibular schwannomas treated with GKRS.
- Findings suggest **both immobilization methods are safe and effective** for vestibular schwannoma management.
- Immobilization choice can be based on **patient comfort, procedural efficiency, and need for repeatability** rather than recurrence risk.