

# Long-Term Management Outcomes of Hypoglossal Schwannomas: A Comprehensive Single-Institution Experience

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## INTRODUCTION

- Hypoglossal schwannomas (HS) are rare benign tumors stemming from the Schwann cells of the twelfth cranial nerve. While surgery has traditionally been the treatment of choice, stereotactic radiosurgery (SRS) is emerging as a viable alternative.

## OBJECTIVES

- This study aims to evaluate the efficacy and safety of SRS compared to other methods for managing HS.

## METHODS

- We performed a retrospective analysis of patients diagnosed with HS at our institution between 1999 and 2024. Demographic, clinicopathologic, radiologic and treatment data were collected.
- Statistical analyses included Fisher's Exact test and ANOVA where appropriate. A review of the literature was also conducted using the PRISMA guidelines.

## RESULTS

- We identified 20 cases (16 primary, 3 recurrent & 1 residual) across 16 patients. Ten tumors were treated with SRS, seven surgically resected, and three monitored without intervention.
- Statistically significant differences were observed in patient age between surgery and observation groups, and tumor size across treatment groups, as well as in genetic markers and initial neurological deficits.
- SRS achieved a 100% local control rate over 5-17 years of follow-up, compared to surgical outcomes showing local tumor control rates of 85.71%, 71.42%, and 57.14% at 2, 6, and 10 years, respectively.
- There was a statistically significant difference in tumor recurrence between the groups, with SRS showing better local tumor control.
- No difference was noted in CNXII symptoms at follow-up or in symptom resolution, although results slightly favored SRS (p=0.093).

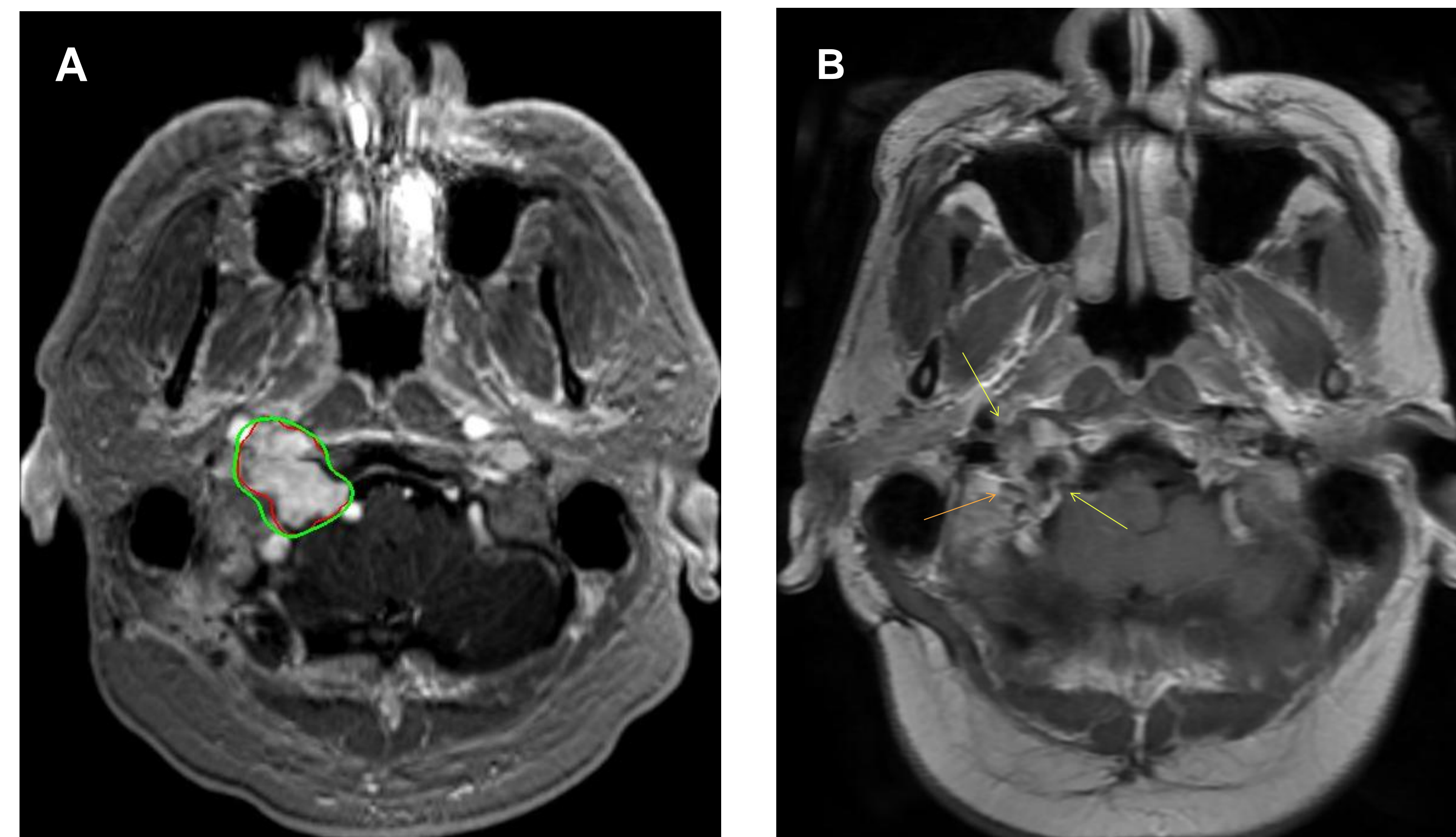


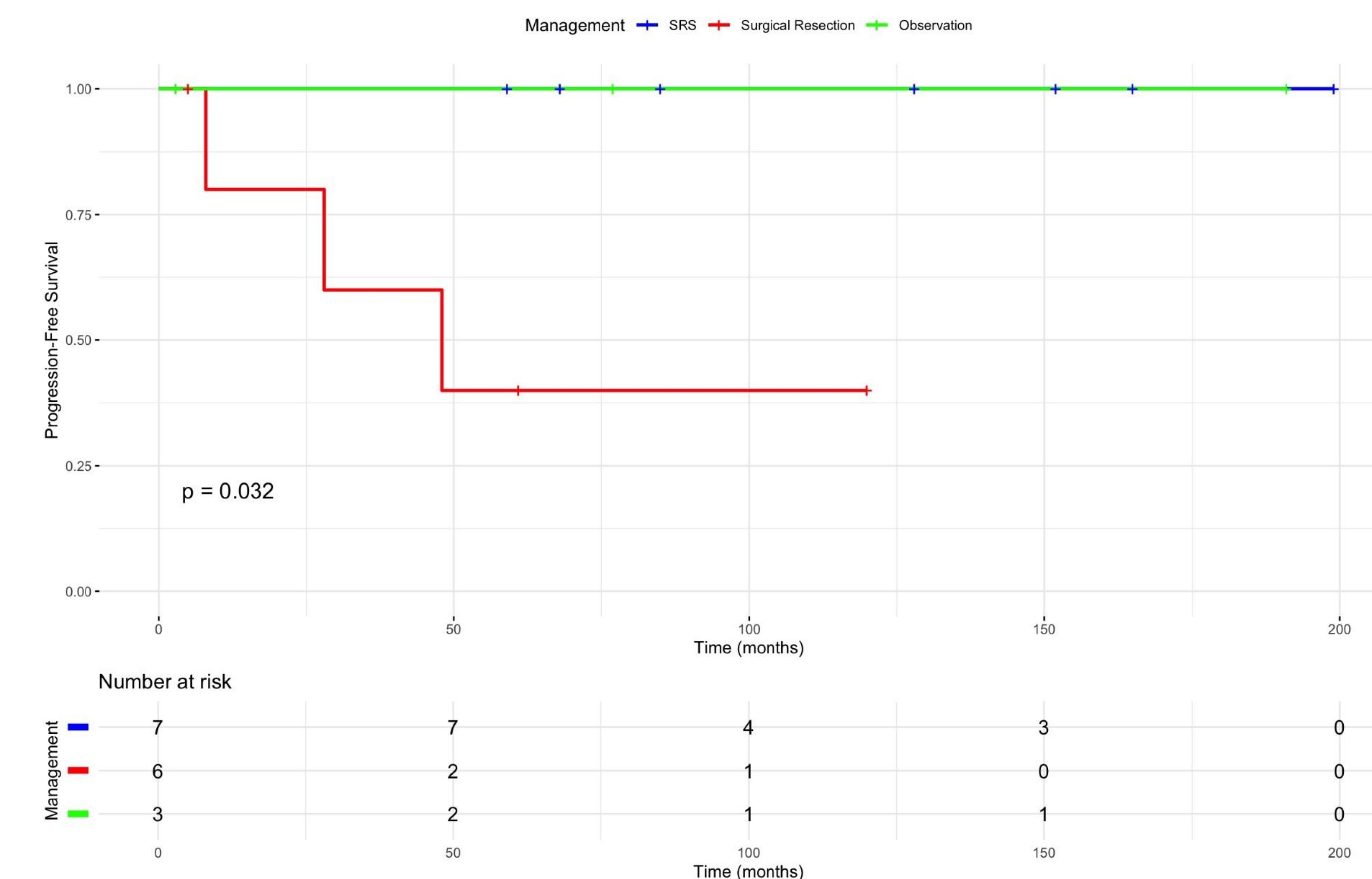
Figure 1. MRI studies of patient #10.

**A:** CyberKnife radiosurgery plan for the right hypoglossal canal and infra-temporal fossa Schwannoma. The tumor volume was 10.4 cc. A marginal dose of 21 Gy, with the maximum dose of 29.17 Gy, was delivered in three fractions to 72% isodose line (T1-Weighted with Contrast Enhancement).

Table 1: CyberKnife Radiosurgery treatment summary of hypoglossal schwannoma

Patient no.	Age at Tx, Sex	CN XII deficit on presentation	Target volume (cc)	Prescribed dose (Gy)	Isodose line (%)	Fraction	BED	SFED	Post SRS CN XII deficit	CN XII deficit on last follow-up
1	66, F	Y	6.5	15	84	1	90	15	Y	Y
2	65, F	N	0.08	15	70	1	90	15	N	N
3	40, M	Y	17.7	18	83	1	126	18	N	N
4	21, M	Y	2.843	18	82	2	72	13.27	N	N
5	38, M	Y	0.235	20	79	1	153.33	20	N	N
6	72, F	Y	8.81	16	80	1	101.33	16	Y	N
7	52, F	Y	1.517	21	80	3	70	13.06	N	N
8	55, M	N	1.07	16	80	1	101.33	16	N	N
9	77, F	Y	40	26	77	4	82.33	14.28	Y	N/A
10	36, M	Y	10.4	21	72	3	70	13.06	Y	N

Dmax, Maximum dose; BED, Biologically effective dose; SFED, Single fraction equivalent dose



**B:** MRI study of 61-month follow-up demonstrates no residual of the right hypoglossal canal and infra-temporal fossa lesion where SRS was delivered (AX T1 post contrast).

## CONCLUSIONS

- SRS not only provides superior long-term control of hypoglossal schwannomas but also results in better symptom improvement post-treatment compared to surgery, with fewer recurrences.
- These findings suggest that SRS should be considered a primary treatment option for HS, offering effective tumor management with minimal adverse effects.

Table 6: Baseline and Outcome Characteristics by Treatment Modality

Baseline Characteristics	SRS	SR	Observation	P-value (overall)
Patient Age at Diagnosis (years)	51.9 ± 17.18	50.71 ± 11.17	25 ± 4.54	< 0.043 {(SR vs observation) P = 0.043}
Tumor Size (cm)	2.14 ± 0.98	5.5 (4.5 -5.9)	0.57 ± 0.15	0.002 {(SR vs SRS) P = 0.013} {(SR vs observation) P = 0.044}
Baseline CNXII Deficit (%)	80%	42.85%	0%	0.037
Genetic Markers (NF2) (%)	10%	0%	66.67%	0.021
<b>Outcomes Characteristics</b>				
Final CNXII Deficit (%)	11.10%	71.42	0%	0.028
Local control (%)	100%	42.85	0%	0.001
Symptom's resolution (%)	85.71%	0%	0%	0.015
CTCAE Grading (1-5)	Grade 1: 100%	Grade 4: 28.6%, Grade 3: 14.8%, Grade 2: 14.8%, Grade 1: 42.9%		0.009

SRS, stereotactic radiosurgery; SR, surgical resection; CN XII, Cranial nerve XII; CTCAE, Common Terminology Criteria for Adverse Events

