

Salvage Microsurgery of Sporadic Vestibular Schwannoma Following Primary Radiosurgery



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Key Takeaway:

Long-term risk of facial paresis following primary SRS more closely approximates microsurgery than traditionally considered.

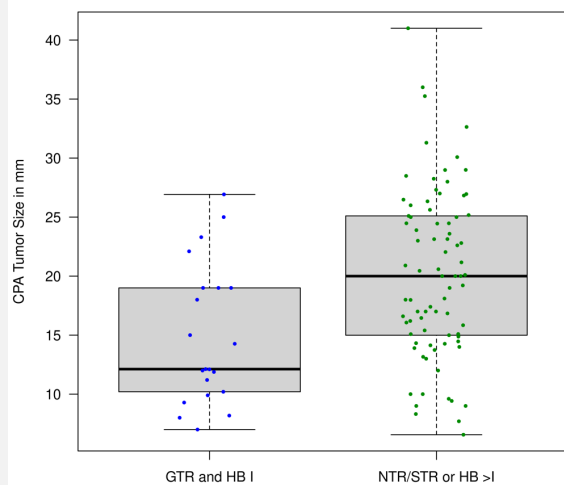


Figure 1. Box plot comparing tumor size within the cerebellopontine angle (CPA) for patients who underwent gross total resection (GTR) and achieved most recent postoperative House-Brackmann (HB) grade I facial function compared with those who underwent near-total resection (NTR), subtotal resection (STR), or experienced long-term HB grade >I facial function.

Table 1. Postoperative complications following salvage microsurgery.

Immediate HB grade	
I	8 (21)
II	8 (21)
III	11 (29)
IV	3 (8)
V	5 (13)
VI	3 (8)
Most recent HB grade	
I	18 (47)
II	8 (21)
III	7 (18)
IV	2 (5)
V	2 (5)
VI	1 (3)
Complications within 30 days	
CSF leak	4 (11)
Other CN deficit	5 (13)
Stroke	0
Meningitis	1 (3)
Hydrocephalus	1 (3)
Other	6 (16)
Tumor growth	1 (3)
Additional salvage treatment	1 (3)
Vital status	
Alive	35 (92)
Death from non-VS causes	3 (8)
Years from salvage treatment to follow-up	3.7 (1.8-7.2)

*Summarized with n (%), median (IQR), or n if N<5.

Objective & Study Design

With generally good long-term control rates of sporadic vestibular schwannoma (VS) following primary stereotactic radiosurgery (SRS), there exist limited data characterizing post-treatment outcomes surrounding salvage therapy in the setting of failed primary radiation treatment. The aim of the current work was to describe the clinical outcomes of salvage microsurgery (MS) following failed primary SRS/FSRT. Therefore, a retrospective analysis of all patients undergoing salvage MS following SRS with modern dose-planning at Mayo Clinic were reviewed (2004-2021).

Results

Thirty-eight patients underwent salvage MS following failed primary SRS. At time of primary SRS, the median (IQR) age was 56 (50-63) with 83% harboring tumors with cerebellopontine angle extension (median 1.65 cm; IQR 0.99-2.05) and 17% having tumors confined to the internal auditory canal (median 0.63 cm; IQR 0.6-0.7). Most (82%) patients underwent salvage MS following evidence of growth on serial MRI scans (≥ 2 mm on ≥ 2 post-treatment MRI scans) while intractable trigeminal neuropathy prompted salvage MS in the remaining patients. Symptoms typically worsened by time of salvage, with 24% experiencing worsening dizziness/imbalance, 21% trigeminal neuralgia, and 16% trigeminal hypesthesia. HB 2 facial nerve function was seen in 5%. Gross total resection (GTR) during salvage MS was achieved in 47%, with 68% retaining HB ≤ 2 facial nerve function postoperatively (Table 1). Trigeminal neuralgia improved in 88%. Four patients developed a postoperative CSF leak; 1 patient developed meningitis; no patients suffered a stroke. At a median of 3.7 years of follow-up following salvage MS, 1 patient exhibited further tumor growth and required additional salvage MS.

Conclusions

Over half of patients who require salvage microsurgery following primary SRS/FSRT undergo less than gross total resection or experience some degree of facial paresis long-term. These data suggest the cumulative risk of developing facial paresis following primary SRS/FSRT by the end of the patient's journey with treatment approximates 2.5-7.5%, when using published primary SRS/FSRT long-term tumor control rates.

Further Discussion

As a consequence of durable long-term tumor control following primary radiosurgery, limited data characterize postoperative outcomes after salvage microsurgery for failed primary radiosurgery. The current work identifies tumor size as the primary driver of poorer postoperative outcomes during salvage microsurgery. This claim is substantiated by an ongoing multi-center study which showed similar findings with comparable GTR versus STR/NTR rates (Figure 1).¹ Notably, a significant proportion of patients experience less than gross total resection or long-term facial nerve paresis when compared to primary microsurgery. In these ways, the current study supports the notion that salvage microsurgery following primary radiosurgery increases technical difficulty during surgery. This analysis, combined with ongoing work, illustrates that the aggregate risk of facial paresis following primary radiosurgery is higher than the typically quoted $\leq 1\%$ risk when considering potential tumor control failure and necessary salvage microsurgery, despite salvage only being required in a minority of all treated patients.

I. Marinelli, J. Heberg, H.A. Moore, L.S. et al. Salvage Microsurgery Following Primary Radiosurgery: A Multi-Institutional Study, 2023. Under Review.

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