



Facial Nerve and Hearing Outcomes after Vestibular Schwannoma Resection: Using the Subperineurial Versus Extracapsular Dissection Technique



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Abstract

- Preservation of facial nerve (FN) function and hearing remain principal goals in microsurgical resection of vestibular schwannoma (VS).
- The subperineurial dissection plane allows safeguarding of critical perineurial barriers between the tumor and surrounding neurovascular structures. This study compares FN and hearing outcomes between these two techniques.

Introduction

- The VS capsule is composed of the perineurium – a layer of thin connective tissue surrounding the nerve - and the neural envelope, which are degenerated nerve fibers¹.
- A subperineurial dissection technique between the tumor parenchyma and the residual nerve fibers of the adjacent cranial nerves (cochlear and facial nerves) allows preservation of the perineurium of these adjacent nerves².
- Recent data suggests that this dissection technique may lead to lower rates of facial nerve palsy and hearing loss³, however, there is limited data comparing this technique to the extracapsular technique.
- Our goal is to compare facial nerve and hearing outcomes in patients that undergo the extracapsular dissection during tumor resection, as compared to patients that undergo a subperineurial dissection technique.

Methods and Materials

- All patients who underwent VS resection over a 13-year period at a tertiary academic center were retrospectively reviewed
- FN outcomes (measured as HB score at last follow-up) and hearing outcomes (pure tone average [PTA] and speech recognition threshold [SRT] preop compared to 6 weeks postop) were analyzed, comparing patients who underwent subperineurial versus extracapsular operative dissection.
- Good FN function was defined as House-Brackmann (HB) I–III at last follow-up.
- Statistical comparisons used Wilcoxon rank-sum(continuous) and Fisher's exact (categorical) tests.



Figure 1. Intraoperative demonstration of the subperineurial technique for resection of a VS. A) shows the cisternal segment of the facial nerve ventral to the tumor, protected behind the subperineurial layer. B) shows the dissection of the plane between the perineurium of the IVF and the tumor. FN = facial nerve. IVN = inferior vestibular nerve

Results

- Results of surgical technique were analyzed in 184 patients (subperineurial, n=91;extracapsular, n=93).
- Postoperative FN outcomes differed significantly between dissection techniques (HB I-III vs IV-VI; Fisher's exact $p = 0.039$).
- The odds of poor FN outcome were higher with extracapsular resection compared to subperineurial resection (OR 3.53, 95% CI 1.11–11.29).
- Patients undergoing extracapsular resection had 3.5 times higher odds of poor facial nerve outcome (HB IV-VI) compared to subperineurial resection
- There was no significant difference in Δ PTA or Δ SRT between groups

Table 1. Facial Nerve Outcomes in Subperineurial vs Extracapsular Dissection Technique

	Subperineurial (n=91)	Extracapsular (n=93)	p-value
HB I-III	87 (95.6%)	80 (86%)	0.0392
HB IV-VI	4 (4.4%)	13 (14%)	

Table 2. PTA Outcomes in Subperineurial vs Extracapsular Dissection Technique

	Subperineurial (n=38)	Extracapsular (n=29)	p-value
Δ PTA	44.8 \pm 39.9 dB	53.2 \pm 41.6 dB	0.346

Table 3. SBT Outcomes in Subperineurial vs Extracapsular Dissection Technique

	Subperineurial (n=22)	Extracapsular (n=14)	p-value
Δ SRT	-21.4 \pm 32.3 dB	-21.8 \pm 27.9 dB	0.820

Discussion

- Subperineurial operative dissection is associated with higher rates of preserved facial nerve function, which is thought to be due to the anatomic boundary that separates the facial nerve from the tumor allowing for less nerve manipulation.
- There are no significant differences in postoperative hearing, complications, or tumor recurrence between the two dissection techniques.
- The subperineurial technique should be used whenever anatomically feasible given the improved FN outcomes and similar safety profile. Since hearing preservation rates are the similar, this technique should still be employed in trans labyrinthine approaches

Conclusions

The subperineurial operative dissection technique was associated with significantly higher rates of good FN outcome (HB I-III), with no increase in complications or tumor recurrence compared to the extracapsular technique. These findings support the safety and potential advantages of utilizing the subperineurial dissection plane, when anatomically feasible, to optimize FN preservation in VS resection.

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References

1. Sasaki T, Shono T, Hashiguchi K, Yoshida F, Suzuki SO. Histological considerations of the cleavage plane for preservation of facial and cochlear nerve functions in vestibular schwannoma surgery. J Neurosurg. 2009 Apr;110(4):648-55. doi: 10.3171/2008.4.17514. PMID: 18928359.
2. Khaleghi M, Carlstrom LP, Macielak RJ, Adunka OF, Prevedello DM. Modified Subperineurial Cochlear and Facial Nerve Preserving Technique via Translabyrinthine Approach: Nuances for Large Vestibular Schwannomas. World Neurosurg. 2025 Sep;201:124324. doi: 10.1016/j.wneu.2025.124324. Epub 2025 Jul 25. PMID: 40716737.
3. Wu Y, Wei C, Wang P, Zhang Y, Wu Y, Xue Y, Zhao T, Qu Y. Application of Subperineurial Resection Technique in Vestibular Schwannomas: Surgical Efficacy and Outcomes in 124 patients. Front Oncol. 2022 Apr 20;12:849109. doi: 10.3389/fonc.2022.849109. PMID: 35592679; PMCID: PMC9113757.