



Preoperative Embolization for Skull Base Meningioma: Vestibulocochlear Outcomes and Predictors



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INTRODUCTION

Skull base tumors present a significant surgical challenge due to their proximity to critical neurovascular structures, including the vestibulocochlear nerve (CN VIII). Preoperative embolization has become an increasingly utilized adjunct to reduce intraoperative blood loss and facilitate tumor resection in hypervascular skull base lesions. However, concerns remain regarding the potential for embolization-related complications affecting the vestibulocochlear apparatus, given the delicate vascular supply to the inner ear and the anatomic relationship between feeding vessels and CN VIII. The anterior inferior cerebellar artery (AICA), which may serve as a tumor feeder in posterior fossa lesions, also supplies the labyrinthine artery—the sole blood supply to the cochlea and vestibular apparatus. Despite these theoretical risks, limited data exist characterizing vestibulocochlear outcomes following preoperative embolization of skull base tumors. Understanding the relationship between embolization variables, tumor characteristics, and vestibulocochlear function is essential for patient counseling and procedural planning.

AIMS

This study aimed to analyze vestibulocochlear symptom prevalence, trajectory, and risk factors in patients undergoing preoperative embolization for skull base tumors, with specific attention to the influence of tumor volume and embolization variables on outcomes.

METHODS

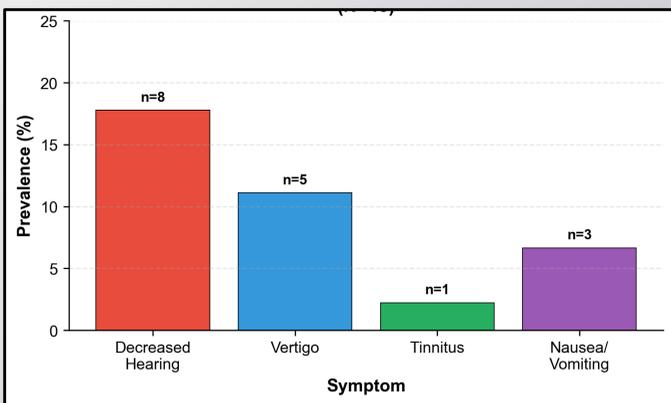
A retrospective analysis was performed on 45 consecutive patients who underwent preoperative embolization followed by surgical resection of skull base tumors, evaluating vestibulocochlear symptoms (hearing loss, vertigo, tinnitus) and CN VIII function at baseline and 3, 6, and 12 months postoperatively, with univariate analyses examining associations between outcomes and tumor volume, embolic agent, embolization extent, procedure timing, and vascular characteristics.

CONCLUSION

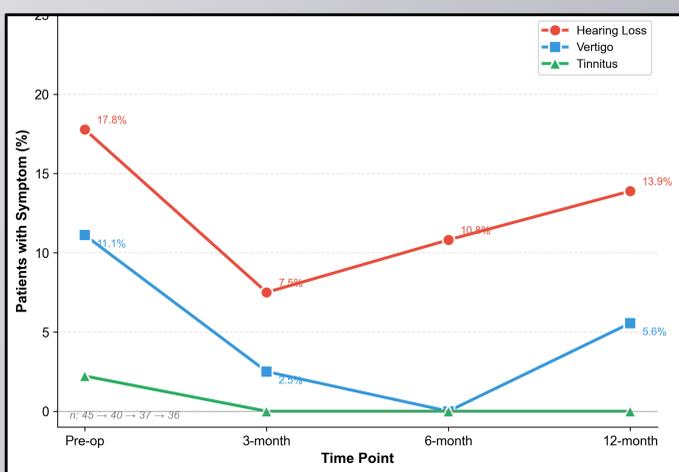
Preoperative embolization for skull base tumors demonstrates an excellent vestibulocochlear safety profile, with 100% symptom resolution among patients with pre-existing deficits, a low rate of new CN VIII involvement (2.4%), and no significant association between tumor volume or embolization variables and adverse vestibulocochlear outcomes, though petroclival/CPA location may warrant closer monitoring.

RESULTS

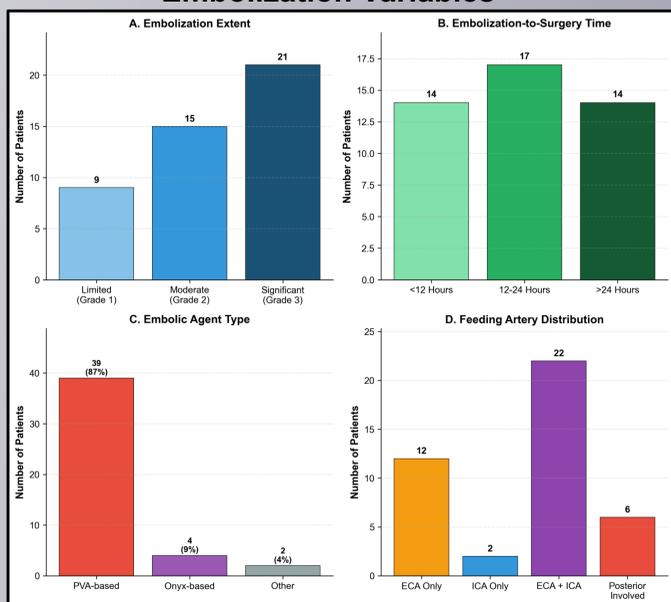
Pre-Operative Symptom Prevalence



Vestibulocochlear Symptom Prevalence Over Time



Embolization Variables



Post-operative Vestibulocochlear Symptom Outcomes by Category

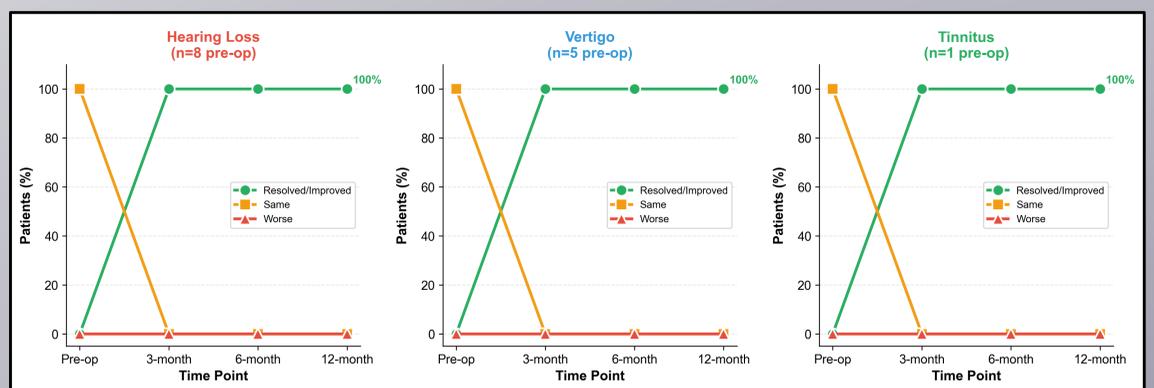


Figure 2. Postoperative vestibulocochlear symptom outcomes by category. Longitudinal outcomes of hearing loss, vertigo, and tinnitus following embolization and surgical resection, assessed preoperatively and at 3, 6, and 12 months. All patients with preoperative vestibulocochlear symptoms demonstrated symptom resolution or improvement by 3 months.

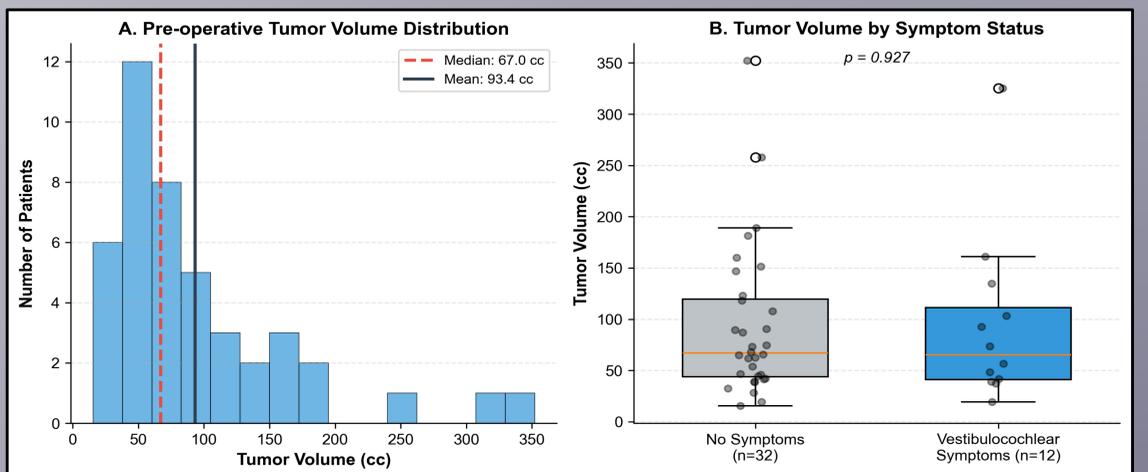


Figure 4. Preoperative tumor volume distribution and Tumor Volume by Symptom Status. Histogram depicting the distribution of preoperative tumor volumes across the cohort. Median and mean tumor volumes are indicated by dashed and solid reference lines, respectively, demonstrating a right-skewed volume distribution. Box-and-scatter plot comparing preoperative tumor volume between patients with and without vestibulocochlear symptoms. No significant difference in tumor volume was observed between groups on univariate analysis.

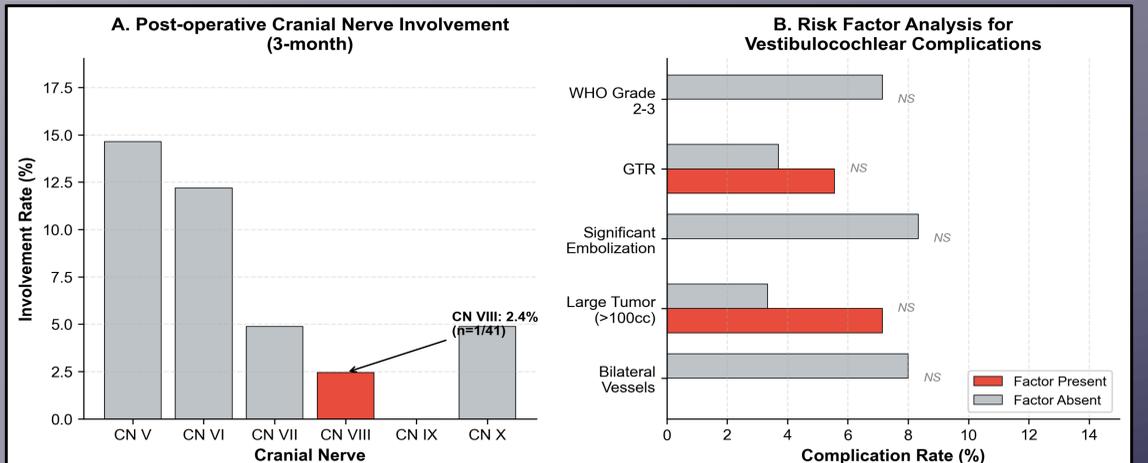


Figure 6. Postoperative cranial nerve involvement at 3 months and Risk factor analysis for vestibulocochlear complications. Bar chart illustrating rates of postoperative cranial nerve deficits at 3-month follow-up. Cranial nerve VII involvement was uncommon, with a low incidence of new or persistent deficits. Plot showing complication rates stratified by tumor grade, extent of resection, embolization extent, tumor size, and vascular characteristics.

