Impact of Tumor Size and Patient Demographics on Surgical Outcomes in Vestibular Schwannoma Resection

Evan A. Patel, MS; Sushanth Neerumalla, BS; Russell Whitehead, MD; Elias Michaelides, MD

RUSH OTOLOGY

Background

• Vestibular schwannoma (acoustic neuroma) is a benign, slow-growing tumor that develops within the inner ear. The tumor is caused by an overproduction of Schwann cells on CN VIII (vestibulocochlear nerve).[1, 2]

• Can cause asymmetric hearing loss, tinnitus, and dizziness, as well as facial numbness, weakness or paralysis.[3, 4]

• If the tumor becomes large, it can compress the brainstem and cerebellum, becoming life-threatening.[5]

• Larger vestibular schwannomas present unique challenges during surgical resection, potentially affecting various surgical outcomes.[6, 7]

• Identifying the relationships between tumor size, patient demographics, and perioperative outcomes is essential to improve risk stratification and surgical planning.[8]

• This study examines the association between maximum tumor size on MRI and outcomes such as estimated blood loss (EBL), surgical time, and specific patient factors, including sex.

Methods

• Retrospective review of patients undergoing vestibular schwannoma resection at RUMC from 2014 to 2024.

• The primary independent variable was maximum tumor length on MRI.

• Outcome measures included:
  • Estimated Blood Loss (EBL)
  • Surgical time
  • Demographic variables

• Spearman correlation and Kruskal-Wallis tests were used to evaluate associations between tumor size and outcomes, with a focus on statistically significant relationships ($p<0.05$).

AMERICAN ACADEMY OF OTOLARYNGOLOGY-HEAD AND NECK SURGERY

Results

• Larger tumor size was positively correlated with:
  • Increased EBL (correlation 0.264, $p = 0.0023$, $n = 131$)
  • Prolonged surgical time (correlation 0.426, $p < 0.0001$, $n = 110$)

• Male sex was positively correlated with higher EBL during surgery, regardless of tumor size (Kruskal-Wallis $H = 4.679$, $p = 0.0305$, $n = 153$)

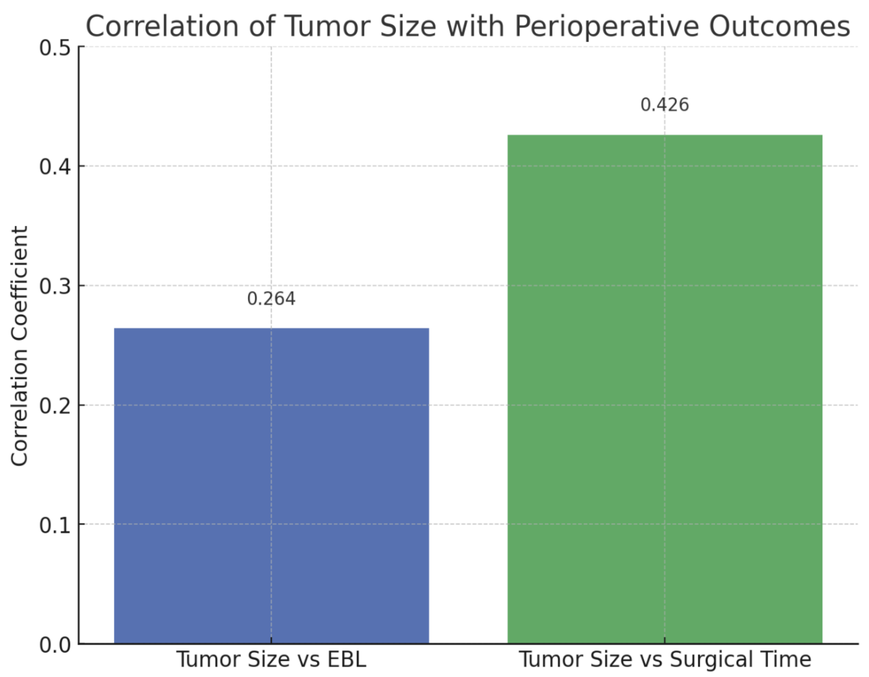
In summary:

• Larger tumors lead to higher levels of intraoperative blood loss

• Larger tumors take more operative time to remove

• Males are more likely to have higher intraoperative blood loss than females.

• These findings highlight the combined impact of tumor size and patient sex on perioperative demands and risks.



Variable	Correlation / H Value	p-value	Sample Size (n)
Tumor Size vs EBL	0.264	0.0023	131
Tumor Size vs Surgical Time	0.426	< 0.0001	110
Sex (Male) vs EBL	H = 4.679	0.0305	153

Conclusion

• This study underscores the influence of larger tumor size on increased EBL and extended surgical duration in vestibular schwannoma resections.

• The association between male sex and higher EBL further emphasizes the need for patient-individualized preoperative planning.

• These insights can guide surgical teams in anticipating challenges associated with larger tumors and specific patient demographics, enhancing patient safety and surgical efficiency.

• Further research is warranted to explore strategies that may mitigate these risks in patients with larger tumors and male sex.

Citations

•Joshi R. Learning from eponyms: Jose Verocay and Verocay bodies, Antoni A and B areas, Nils Antoni and Schwannomas. Indian Dermatol Online J. 2012 Sep;3(3):215-9. [PMC free article] [PubMed]
•Kondo RN, Pontello R, Taguti PDS. Cutaneous schwannoma: an atypical presentation. An Bras Dermatol. 2017 May-Jun;92(3):441-442. [PMC free article] [PubMed]
•Lee SU, Bae YJ, Kim HJ, Choi JY, Song JJ, Choi BY, Choi BS, Koo JW, Kim JS. Intralabyrinthine Schwannoma: Distinct Features for Differential Diagnosis. Front Neurol. 2019;10:750. [PMC free article] [PubMed]
•Coy S, Rashid R, Stemmer-Rachamimov A, Santagata S. Correction to: An update on the CNS manifestations of neurofibromatosis type 2. Acta Neuropathol. 2020 Apr;139(4):667. [PMC free article] [PubMed]
•Ahlawat S, Blakeley JO, Langmead S, Belzberg AJ, Fayad LM. Current status and recommendations for imaging in neurofibromatosis type 1, neurofibromatosis type 2, and schwannomatosis. Skeletal Radiol. 2020 Feb;49(2):199-219. [PubMed]
•Vindhyal MR, Elshimy G, Haq N, Elhomsy G. StatPearls [Internet]. StatPearls Publishing; Treasure Island (FL): Mar 3, 2024. Carney Complex. [PMC free article] [PubMed]
•Paganini I, Capone GL, Vitte J, Sestini R, Putignano AL, Giovannini M, Papi L. Double somatic SMARCB1 and NF2 mutations in sporadic spinal schwannoma. J Neurooncol. 2018 Mar;137(1):33-38. [PubMed]
•Propp JM, McCarthy BJ, Davis FG, Preston-Martin S. Descriptive epidemiology of vestibular schwannomas. Neuro Oncol. 2006 Jan;8(1):1-11. [PMC free article] [PubMed]