Utility of an Ultrasonic Aspirator in Transcanal Endoscopic Resection of Temporal Bone Paraganglioma

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Abstract

The objective of this study was to evaluate the role of removing middle ear paragangliomas using an ultrasonic aspirator (UA) through a transcanal, exclusively endoscopic approach. Three consecutive patients undergoing transcanal endoscopic resection of middle ear paragangliomas using an UA were retrospectively studied. The primary outcome measure was achieving gross total tumor resection. Secondary outcomes included postoperative hearing and early convalescence. Two glomus tympanicum tumors and one small glomus jugulare were included, and complete tumor resection was achieved endoscopically in all cases. All patients demonstrated intact tympanic membranes and normal facial nerve function at the initial postoperative visit. There were no cases of bone-conduction pure tone threshold increases of more than 15 dB. The UA was helpful when performing exclusively endoscopic transcanal resection of middle ear paraganglioma given its simultaneous suction-aspiration capability.

Keywords

- ▶ glomus tympanicum
- ▶ paraganglioma
- ▶ Sonopet
- ▶ ultrasonic aspirator
- ▶ endoscopic

Introduction

While both glomus jugulare (GJ) and glomus tympanicum (GT) tumors arise from glomus bodies, the former are associated with the jugular bulb adventitia, while the latter originate within the middle ear cleft along the tympanic plexus. The operating microscope is most commonly used to resect GT tumors, through either a transmastoid extended facial recess or postauricular transcanal hypotympanotomy.^{1,2} With recent advances in endoscopic ear surgery, resection of benign middle ear neoplasms via an endoscopic transcanal approach is possible.³ We sought to evaluate the role of removing middle

ear paraganglioma through a transcanal endoscopic approach using an ultrasonic aspirator (UA). The application of a tool capable of simultaneous suction and tumor ablation is potentially advantageous for endoscopic middle ear surgery.

Materials and Methods

Three consecutive adult patients undergoing transcanal endoscopic resection of middle ear paraganglioma, using the Sonopet Ultrasonic Aspirator (Stryker, Kalamazoo, Michigan), between October 2015 and December 2015 at Vanderbilt

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University Medical Center were analyzed. The Vanderbilt Institutional Review Board approved this study.

Surgical Technique

Utilizing a 0-degree 4.0-mm endoscope, the posterosuperior and posteroinferior quadrants of the external auditory canal are injected with 2% lidocaine, 1:50,000 epinephrine. A tympanomeatal flap incision is made 3 to 5 mm from the annulus and the middle ear is entered. The UA is used to debulk and remove middle ear tumor. The 25-kHz universal angled handpiece with a straight micro diameter tip is used. The suction component of the UA facilitates removal of tumor around the ossicular chain without directly touching the ossicles. Once the majority of gross tumor in the middle ear is debulked, an angled endoscope provides visualization and access to the anterior mesotympanum, hypotympanum, and posterior recesses. If a feeding vessel is identified, laser or bipolar cautery can be used to achieve hemostasis.

Outcome Measures

The primary outcome measure was achieving gross total tumor resection through a fully endoscopic approach. Secondary outcomes included postoperative hearing and early convalescence. Audiologic outcomes were assessed at the preoperative and first postoperative visits and included air-conduction pure tone average, bone-conduction PTA, and air-bone gap.

Results

Three patients underwent a transcanal endoscopic approach for resection of middle ear paraganglioma using the UA. Demographics and operative details are described in ►Table 1. Supplemental ►Video 1 for case 3 is available online. In case 3, the UA was used to remove the free hypotympanic component of tumor down to the level of the jugular bulb. Laser and microinstruments were then used to resect tumor infiltrating the hypotympanic air cells adjacent to the jugular bulb, as the caliber of the UA tip precluded removal in this region. In all cases, complete tumor resection was achieved and canalplasty was not required. All patients demonstrated intact tympanic membranes and normal facial nerve function at the initial postoperative visit. Audiometric data are listed in ►Table 2.

Table 2 Preoperative and postoperative audiometric data

Case	Preoperative			Postoperative		
	AC PTA (dB)	BC PTA (dB)	ABG (dB)	AC PTA (dB)	BC PTA (dB)	ABG (dB)
1	24	19	5	28	24	4
2	62	41	21	16	20	−4
3	56	45	11	58	56	2

Abbreviations: ABG, air-bone gap; AC PTA, air-conduction pure tone average; BC PTA, bone-conduction pure tone average; dB, decibel.

Video 1

Transcanal endoscopic resection of a left middle ear paraganglioma utilizing an ultrasonic aspirator. Online content including video sequences viewable at: www.thiemeconnect.com/products/ejournals/html/10.1055/s-0036-1585090.

Discussion

In this study, we describe the utility of using an UA in resecting GT and GJ tumors through an exclusively endoscopic transcanal approach. The endoscopic transcanal approach is potentially advantageous when compared with a microscopic approach for several reasons. The endoscope bypasses the narrow segment of the ear canal, offering a wider viewing angle when compared with the microscope.⁴ With improved visualization, the need for canalplasty or postauricular incision is minimized. This notion is supported by this study in which removing bone of the inferior tympanic ring was not needed despite the presence of considerable hypotympanic disease (cases 2 and 3). Complete tumor resection was achieved in all cases, and conversion to an open microscopic approach was not required.

The major drawback of endoscopic surgery is that one-handed surgery is required. The concurrent microsuction and irrigation capability of the UA in a single handpiece makes it an attractive instrument. In cases 1 and 2, the surgical field was remarkably dry throughout the entire procedure. The bleeding encountered was easily controlled by the

Table 1 Demographic information, tumor size, and operative details of three patients who underwent endoscopic removal of middle ear paraganglioma using the Sonopet Ultrasonic Aspirator

Case	Age (y)	Gender	Tumor size ^a (mm)	Tumor classification ^b	Blood loss (cc)	Operative time (mins)
1	64	Male	3	Grade 1 GT	5	52
2	53	Male	12	Grade 2 GT	15	96
3	69	Female	8	GJ	50	95

Abbreviations: GJ, glomus jugulare; GT, glomus tympanicum.

^aTumor size is reported as greatest single linear dimension on computed tomography.

^bGlasscock-Jackson classification.

microsuction of the UA. The small GJ (case 3), however, was associated with more significant bleeding, which was not unexpected given the more extensive nature of disease.

Although our cohort was small, the preliminary complication profile was favorable; however, more data are required to ascertain device safety with regard to this application. Sound emission from the UA could potentially cause acoustic trauma resulting in hearing loss, particularly when using the device close to the ossicles and cochlea. There were no detectable bone-conduction threshold shifts or perioperative complications in any case.

Several limitations of the UA deserve mention. The instrument tip incorporates a sheath that delivers irrigation; however, this component is bulky and can limit visualization. To overcome this, we removed the distal most portion of the sheath, which improved visualization. Another limitation of the UA is that the irrigation often sprays the lens of the endoscope, which negatively impacts visualization. Clearing the lens by running irrigation down the shaft of the endoscope can help clear splatter.

Limitations of this report include the retrospective design and small cohort. The study is subject to selection bias as the authors chose patients who were deemed candidates for the reported technique. Lastly, there is a learning curve with endoscopic ear surgery, and our results may not be generalizable to centers with limited endoscopic experience.

Conclusion

This report demonstrates the utility of an UA during endoscopic transcanal resection of middle ear paraganglioma.

Larger studies are needed to further examine the safety and efficacy of this technique.

Conflict of Interest

There are no relevant conflicts of interest to disclose.

Financial Material and Support

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Note

Vanderbilt IRB Approval #160546.

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