Endoscopic Assisted Middle Fossa Craniotomy for Resection of Vestibular Schwannoma

Brian S. Chen, MD; Daniel S. Roberts, MD, PhD; Gregory P. Lekovic, MD, PhD

House Clinic
Los Angeles, CA

ABSTRACT

Introduction
Rates of hearing preservation following vestibular schwannoma (VS) resection via middle fossa craniotomy (MFC) in patients harboring tumors with unfavorable characteristics are significantly lower than for patients with favorable tumors. Unfavorable characteristics include non-serviceable preoperative hearing or tumors extending in the lateral internal auditory canal (IAC) without evidence of fundal fluid. A limitation of the MFC is visualization of the most lateral extent of tumors impacted into the fundus of the internal auditory canal (IAC). Residual tumors can hide under the ledges of bone at the distal IAC which is not visualized by the microscope’s line of sight. Furthermore, drilling near the fundus is limited due to the proximity of the cochlea anteriorly and superior canal posteriorly. Blind dissection is often taken to remove tumors in this location. In these cases, endoscopic assistance can be of benefit because it allows the surgeon to fully visualize the fundus and achieve a gross total resection without inadvertent injury to the cochlear or facial nerve.

In this study we present 2 cases with unfavorable conditions, who underwent endoscopic assisted MFC resection of intracanalicular vestibular schwannomas and achieved gross total resection with preserved postoperative hearing.

Methods
Chart reviews were conducted on both patients. Their presentation, intraoperative details and techniques, pre and postoperative audiograms and facial functions are presented.

Results
Patient A had a 5.6 x 6.8 x 13.2 mm intracanalicular tumor with unserviceable hearing (PTA 41, SDS of 47%, Class D) but was blind so hearing preservation was attempted. Postoperative hearing was preserved (PTA 47, SDS of 60%, Class B). Patient B had a 3 mm round intracanalicular tumor immediately adjacent to the vestibule and cochlea without any fundal fluid present. Preoperative audiogram showed serviceable hearing (PTA 48, SDS 88%, Class B). Postoperative audiogram showed minimal change (PTA 51, SDS 76%, Class C) and remained aidsable. Gross total resection was achieved in both patients.

Conclusion
Hearing preservation surgery via MFC can be enhanced with endoscopic assisted dissection, especially in the lateral IAC. The superior optical view allows for preservation of cochlear function and removal of residual tumors not otherwise seen on microscopy. This is the first report of endoscopic assisted dissection in the IAC via MFC to our knowledge.

INTRODUCTION

Rates of hearing preservation following vestibular schwannoma (VS) resection via middle fossa craniotomy (MFC) in patients harboring tumors with unfavorable characteristics are significantly lower than for patients with ‘favorable’ tumors. Unfavorable characteristics include non-serviceable preoperative hearing or tumors extending in the lateral internal auditory canal (IAC) without evidence of fundal fluid.

A limitation of the MFC is visualization of the most lateral extent of tumors impacted into the fundus of the internal auditory canal (IAC). Residual tumors can hide under the ledges of bone at the distal IAC which is not visualized by the microscope’s line of sight. Furthermore, drilling near the fundus is limited due to the proximity of the cochlea anteriorly and superior canal posteriorly. Blind dissection is often taken to remove tumors in this location. In these cases, endoscopic assistance can be of benefit because it allows the surgeon to fully visualize the fundus and achieve a gross total resection without inadvertent injury to the cochlear or facial nerve.

In this study we present 2 cases with unfavorable conditions, who underwent endoscopic assisted MFC resection of intracanalicular vestibular schwannomas and achieved gross total resection with preserved postoperative hearing.

CASE PRESENTATION

Patient A is a blind patient who had a 5.6 x 6.8 x 13.2 mm intracanalicular tumor (Figure 1). His hearing was unserviceable (PTA 41, SDS of 47%, Class D) but due to his blindness, hearing preservation surgery was attempted. Postoperative hearing was preserved (PTA 47, SDS of 60%, Class B) (Figure 3). Although his facial nerve was anatomically and electrically intact, he had delayed postoperative paralysis to a grade 5.

Patient B had a 5 x 5 mm fundal tumor who opted for tumor resection in an attempt to save hearing (Figure 2). His hearing was slightly diminished after surgery but was still aidsable (PTA 51, 76% SDS, Class C) (Figure 3). Postoperatively his face remained a grade 1.

MICROSURGICAL RESECTION

After microscopic resection, micro-cottonoids are placed over the temporal lobe dura to prevent inadvertent injury. A surgical endoscope (3mm x 14mm Hopkins Rod, Storz, Tuttingen, Germany) is brought into the operative field under direct visualization of the microscope. 0, 30 and 70 degree endoscopes are used as dictated by the field of view. Using conventional micro-instruments and micro-dissection techniques, the residual tumor is removed from the fundus of the IAC (Figure 4). After tumor removal, the fundus is inspected for residual tumor (Figure 5).

DISCUSSION

In the English literature, the majority of endoscopic assisted VS resections are published for the retrosigmoid (RS) approach. For this approach, the endoscope allows surgeons to not dissect blindly, which has often been the biggest disadvantage to the RS approach when tumors involve the lateral IAC. These two cases show the clear visual advantage of the endoscope for dissecting in the lateral IAC in MFC approaches.

One criticism of this technique is the potential risk of inadvertent direct injury to nearby structures with the endoscope itself when advancing it into position. This is especially true when trying to navigate an angled scope strictly using the endoscopic display. In order to minimize this, we advance the endoscope under direct visualization of the microscope. Once we are satisfied with the location of the endoscope by checking our view with both the microscope and the endoscopic display, the surgeon transitions attention to the endoscopic display for tumor resection, and the assistant maintains observation of the endoscope tip. The bulk of our tumor resection is still made under the microscope. Endoscopic assistance is only used when we suspect, or cannot confirm, residual disease in the lateral canal.

Another potential pitfall of endoscopic resection is the heat produced by the light source. This is a concern in the retrosigmoid approach but is minimized by reducing the light source intensity (similar to that done for middle ear endoscopy) along with frequent irrigation, either manually with a syringe or with an Endoscrub (Medtronic; Minneapolis, MN, USA).

REFERENCES