NOT YOUR AVERAGE “EU-TUBE” LINK:
A Novel Multidisciplinary Treatment of Inverted Papilloma within the Middle Ear and Eustachian Tube

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ABSTRACT

Objectives: To describe a collaborative surgical technique—simultaneous expanded endonasal and transmastoid approaches—employed to resect a unique tumor encountered at our institution.

Study design: Technical case report of a novel surgical resection.

Methods: We describe a 69-year-old woman with a history of inverted Schneiderian papilloma (ISP) who presented with a middle ear mass and resultant conductive hearing loss. Middle ear biopsy revealed ISP with possible squamous cell carcinoma (SCC), and imaging was consistent with tumor migration through the Eustachian tube (ET). Combined subtotal petrosectomy and expanded endonasal approaches were employed to resect the tumor completely, with negative margins. Resection of the osseous and cartilaginous ET by lateral and anterior skull base surgical approaches is described in detail. Management of the infratemporal fossa during ET resection and issues with the neighboring carotid artery are also discussed.

Results: The patient has been followed with serial endoscopic examinations, second-look transtemporal surgery, and serial imaging without evidence for recurrence after 3 years. She received no adjuvant treatment and experienced no complications except for the expected ipsilateral conductive hearing loss.

Conclusions: ISP presenting as a middle ear mass is exceedingly rare. This case illustrates successful complete resection via combined transtemporal and expanded endonasal surgical approaches. Importantly, this case underscores the need for a combined, multidisciplinary team approach to skull base lesions. A variety of seemingly unrelated management options can be combined to serve the patient’s best interests. Lesions of the petrous apex, clivus, and infratemporal fossa fall within the purview of both otologic and rhinologic skull base surgeons and mutual cooperation through team integration is critical for successful patient care.

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INTRODUCTION

Inverted Schneiderian Papilloma (ISP)
- Rare tumor of epithelial origin
- 0.5-4% of sinonasal tumors
- Benign but locally aggressive
- May undergo malignant transformation
- 11.15% incidence of squamous cell carcinoma (SCC)
- High rates of recurrence after resection
- Has been linked with human papilloma virus (HPV) and with cell cycle regulatory proteins (p53, p16, E6, E7, Cyclin D)

ISP of the Middle Ear
- Fewer than 25 cases of ISP of the middle ear described
- Surgical management = treatment of choice
- Most commonly mastoidectomy
- Mastoidectomy alone only addresses disease within the middle ear and temporal bone

TECHNIQUE

Single-stage, Two-team Operation
1. Neuro-otologic team: transmastoid, trans-middle ear approach
   - Tumor resection
   - Resection of ossicles
   - Drilled excavation of bony ET
   - Oversizing of ear canal
2. Endoscopic anterior skull base team: endonasal approach with complete resection of
   - Pterygopalatine fossa (PPF)
   - Pterygoid plates
   - Cartilaginous ET
   - Targeted intraoperative radiotherapy
   - Thorous preoperative planning for management in the event of carotid injury
   - Involved anesthesia, OR staff, both surgical teams
   - No carotid or cranial nerve injuries noted

PRESENTATION

Patient History
- 69-year-old Caucasian female
- Previous surgery for presumed nasal polyps
- Resection revealed invasive SCC which appeared to arise from ISP
- Postoperative CT and MRI scans suggested residual R-sided disease
- Received postoperative adjunctive therapy
- 12 months post-op: patient returned with progressive conductive hearing loss
- No weight loss, pain, headache, visual changes, diplopia, or changes in facial sensation
- Deemed inoperable at outside hospital

Physical Examination
- Ear Exam:
  - Medial third of R external auditory canal (EAC) filled with polypoid mass resembling granulation tissue
  - Biopsy consistent with SCC
- Middle ear (ME) full of tumor
- L canal clear, tympanic membrane (TM) mobile
- External Nasal Examination:
  - no abnormalities bilaterally
- Endoscopic Exam:
  - Postoperative changes on R
  - Polyoid changes noted along the superior aspect of the inferior turbinate extending up from the uncinate process
  - Maxillary sinus poorly visualized
  - Eustachian tube (ET) orifice showed no obvious abnormalities
  - No evidence of gross tumor upon driving endoscope approximately 1cm into ET

Imaging
- PET CT: intense activity near R maxillary sinus
- Superior extension along orbit in the right skull base to the tympanic canal and mastoid region
- MRI, CT sinus, and temporal bone CT (Figure 1)
  - Middle ear mass expanding in the EAC without significant bony erosion
  - Temporal bone CT (Figure 1D): suggested invasion of ET
  - Opacification of mastoid air cells at the petrous apex
- Tumor vs. obstructive changes

PREOPERATIVE IMAGING

POSTOPERATIVE IMAGING

RESULTS

Final Pathological Evaluation
- Areas of squamous dysplasia and SCC in situ
- Interpretation: SCC in situ arising within a background of ISP versus papillary SCC
- Margins confirmed negative

Followup
- Followed for 2 years postoperatively with serial endoscopic examinations every 3-6 months
- No findings suggestive of recurrence
- Twice daily NeilMed nasal irrigations performed beginning early in the postoperative period
- Second-look procedure performed 3 months postoperatively, with negative biopsies
- Given persistently reassuring findings, adjuvant therapy was not deemed necessary
- Most recent MRI (3 years post-op) revealed no evidence of recurrent disease (Figure 3)

CONCLUSIONS

ISP presenting as a middle ear mass is exceedingly rare. This case illustrates successful complete resection via combined transtemporal and expanded endonasal surgical approaches. To our knowledge, this two-team approach for addressing ET disease is undocumented in the literature. While the effectiveness of this approach remains to be established broadly, its success is noteworthy and merits further consideration. Specifically, the morbidity profile of the described approach as compared an open approach of similar scope is clearly advantageous.

This case underscores the need for combined, multidisciplinary team approach to skull base lesions. A variety of seemingly unrelated management options can be combined to serve the patient’s best interests in such complex cases. Lesions of the petrous apex, clivus, and infratemporal fossa fall within the purview of both otologic/lateral and rhinologic/anterior skull base surgeons. Mutual cooperation through team integration is critical for successful patient care.

REFERENCES

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