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Limits of Endoscopic Surgery in Cholesteatoma: A Case Report

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Abstract **Case Report**

The introduction of endoscopy in otologic surgery has offered new perspectives in the management of middle ear pathologies, particularly cholesteatoma. However, certain limitations remain, still justifying the combined use of the microscope in many cases. We report here a case of severe complication following exclusive endoscopic surgery for a cholesteatoma, illustrating the current limitations of this approach.

Keywords: Endoscopy, Cholesteatoma, Surgery.

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INTRODUCTION

Over the past decades, ear surgery has been revolutionized by technological advances, particularly the introduction of endoscopy. Although endoscopy has expanded surgical possibilities, its limits in the management of cholesteatoma remain significant. This work aims to illustrate these limits through the presentation of a case report and a discussion of data from the literature.

CASE REPORT

A 37-year-old patient underwent surgery in May 2023 for a left ear cholesteatoma via exclusive endoscopic approach. The initial medical report noted:

- **Otoendoscopy:** Attic cholesteatoma on a stage III retraction pocket.
- **Audiogram:** Moderate conductive hearing loss on the left side.
- **Temporal bone CT scan:** Dense opacification of the attic and mastoid antrum with bony and ossicular erosions, discontinuity of the tegmen, sclerotic and poorly pneumatized mastoid, dehiscence of the superior semicircular canal, and fistula of the lateral semicircular canal.

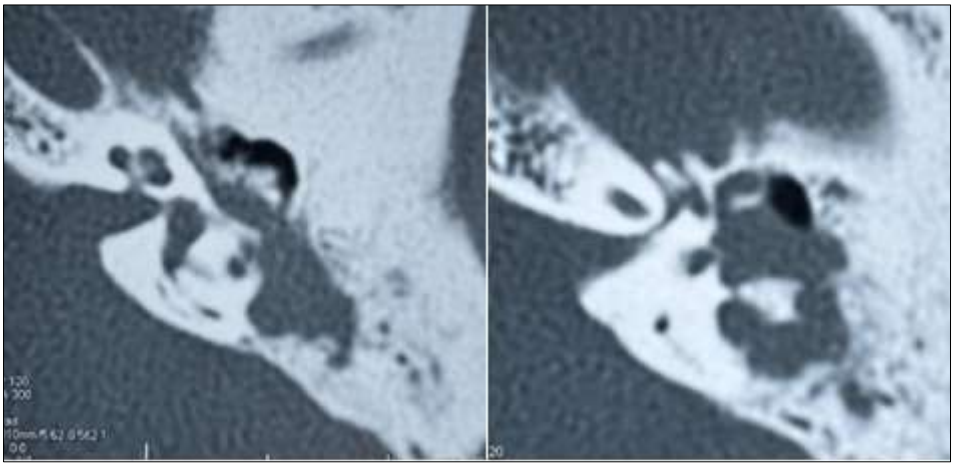

Figure 1: Axial cuts: Filling of the left middle ear extending towards the mastoid antrum with ossicular lysis, as well as a dehiscence of the superior semicircular canal

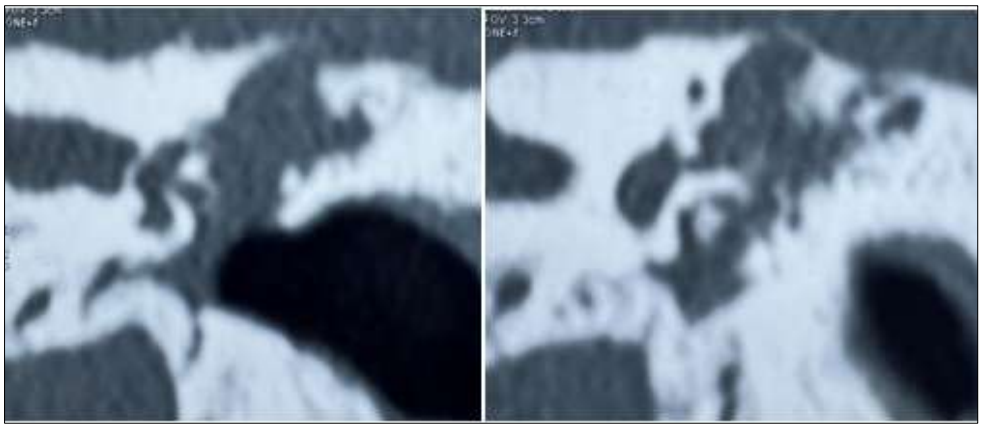

Figure 2: Coronal cuts: Complete filling of the left tympanic cavity with lysis of the tegmen, as well as a fistula of the lateral semicircular canal

Postoperative Complications

One month after the procedure, the patient developed otogenic meningoencephalitis caused by *Streptococcus pneumoniae* and septic thrombophlebitis, requiring intensive care unit admission.

Management Upon Admission

Admitted to our ENT department at Rabat University Hospital one year later, otoendoscopic examination revealed an attic polyp. The audiogram showed severe conductive hearing loss on the left side. Imaging revealed a residual antro-attico-tympanic cholesteatoma.

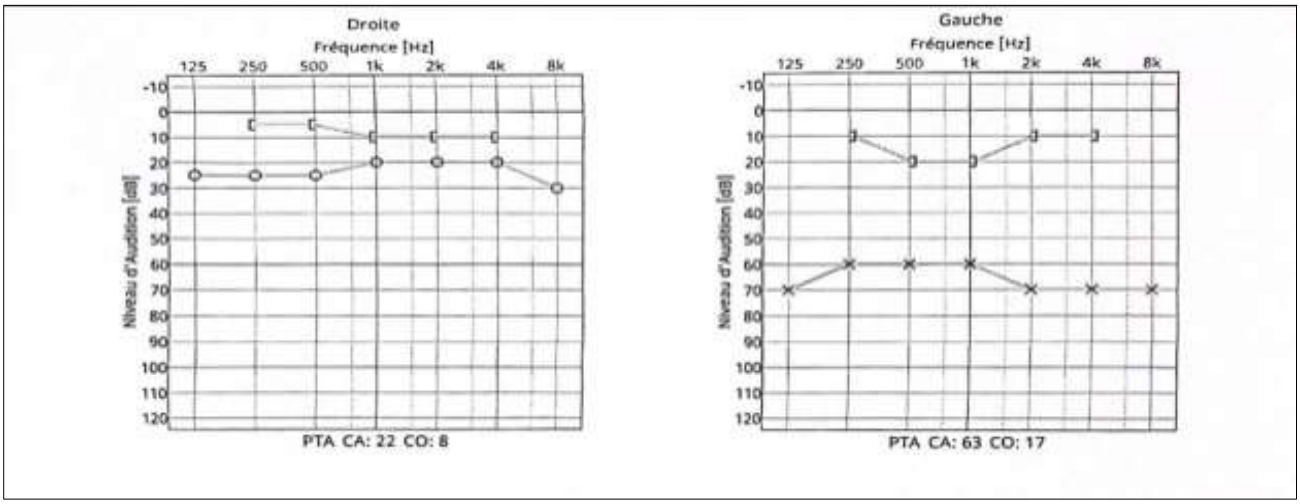

Figure 3: Tonal audiogram: showing severe conductive hearing loss in the left ear

Figure 4: Sagittal CT: Fistula of the left superior semicircular canal

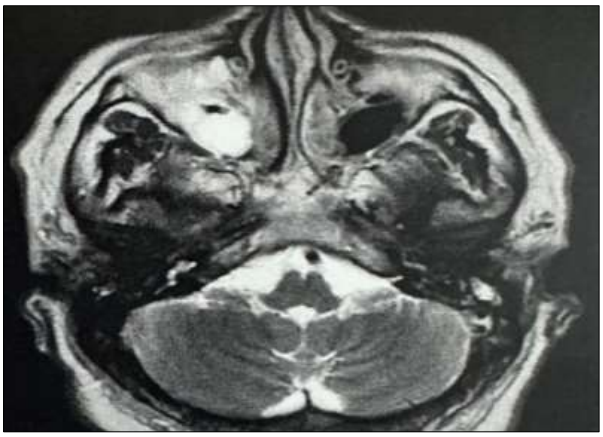

Figure 5 Diffusion MRI: Hyperintensity in the left ear compatible with a residual cholesteatoma

Surgical Treatment

The patient underwent a closed technique tympanoplasty with closure of the tegmen tympani defect and the lateral semicircular canal fistula.

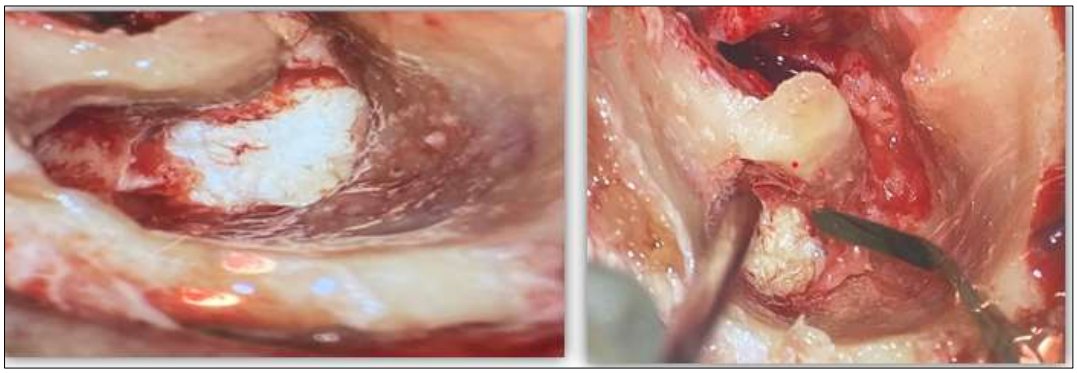

Figure 6 Per-operative images: showing the residual cholesteatoma in the mastoid up to the level of the digastric groove

Outcome

The postoperative course was favorable, with resolution of otologic symptoms and formation of a well-positioned neo-tympanum. Postoperative CT scan showed a clear tympanic sinus. In addition, MRI performed at 12 months showed no recurrence.

Figure 7: Otoscopic appearance of the left ear post-operatively with visible cartilage graft

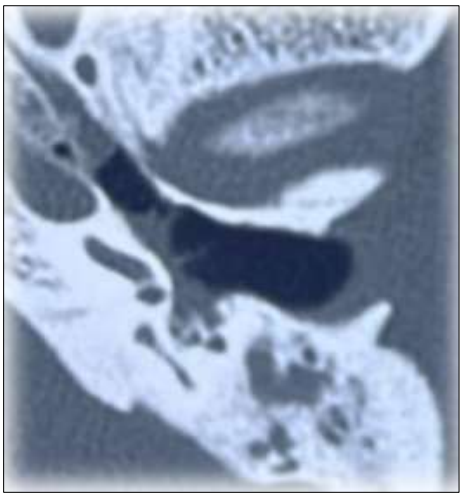

Figure 8: Preoperative CT image showing the filling of the tympanic sinus

Figure 9: Postoperative CT image showing the clearance of the tympanic sinus

Postoperative MRI:

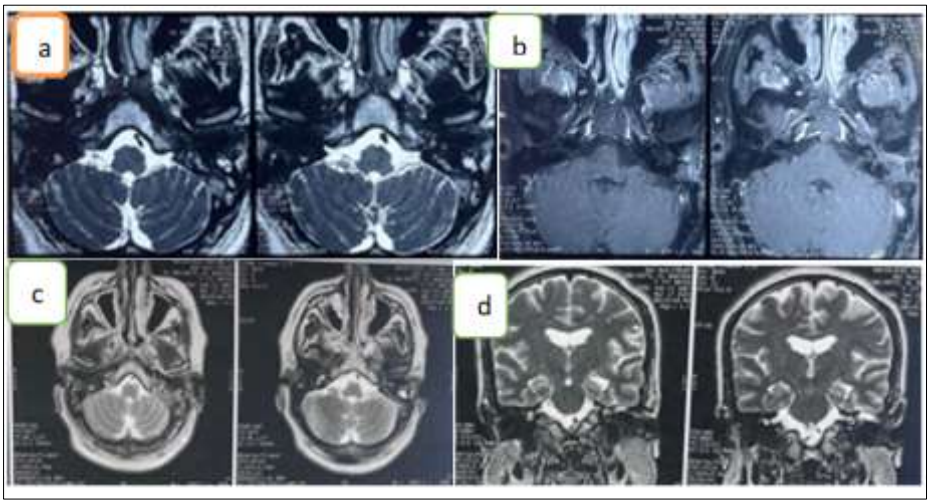

Figure 10: T2-weighted sequence: CISS in axial cut (a), axial T1 cut after gadolinium injection (b), and T2 sequence in axial and coronal cuts showing a postoperative evacuation cavity, well-aerated on the left, with T2 hyperintensity and no pathological contrast enhancement No signs of recurrence

DISCUSSION

Technical limitations of endoscopic surgery

Despite its advantages, exclusive endoscopic surgery presents several limitations:

1. **Topography of the Cholesteatoma and Its Posterior Extension:** This is the main limitation of endoscopic surgery. It loses its indication in cases of mastoid involvement beyond the aditus ad antrum. According to Fernandez *et al*., (2021), extension beyond the aditus ad antrum represents a major limitation for the purely endoscopic approach. Visualization of the posterior mastoid and management of deep involvement often require a retroauricular route and microscopic approach.

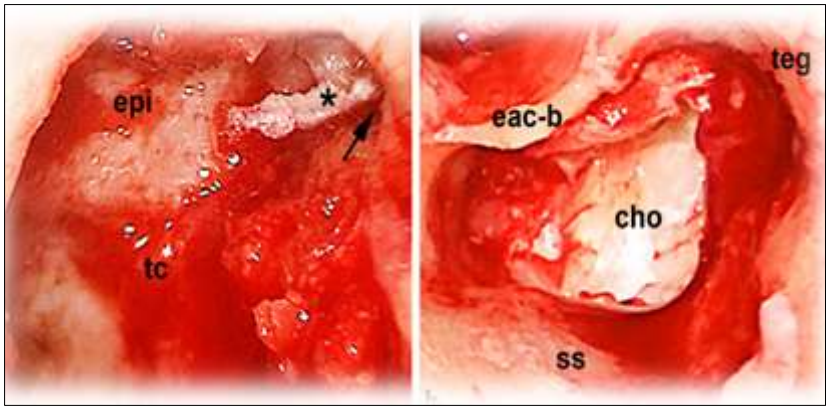

Figure 11 Left ear:

a: Endoscopic view - Cholesteatoma infiltration towards the antral region (black arrow)

b: Microscopic view - Large cholesteatomatous matrix in the mastoid removed through a retroauricular approach

epi: *Epitympanum,* ***tc:*** *Tympanic cavity,* ***eac-b:*** *External auditory canal bone,* ***cho****: Cholesteatoma,* ***ss:*** *Sigmoid sinus,* ***teg:*** *Tegmen antri*

2. **Recurrences:**

The management of recurrences also presents a challenge. Tarabichi *et al*., recommend the use of the microscope in revision surgeries to ensure optimal control of high-risk areas and better removal of cholesteatomatous tissue [2].

3. **Deep Tympanic Sinus:**

The tympanic sinus, an anatomical space located between the facial nerve and the round window, is difficult to access with exclusive endoscopy—especially in the case of a type C sinus (significant posterior depth) [3]. In such cases, a retrofacial approach becomes essential for complete excision.

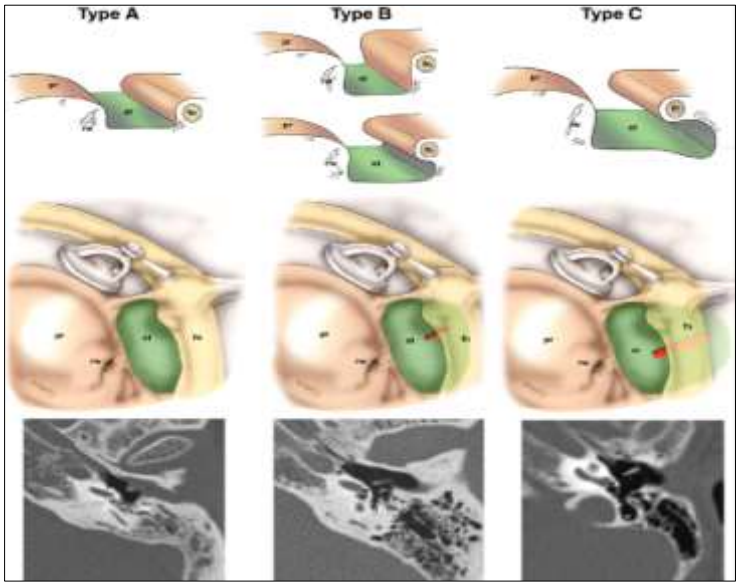

Figure 11: Classification of tympanic sinus depth based on axial CT scan:

- **Type A:** Limited tympanic sinus.
- **Type B:** Deep tympanic sinus with medial extension relative to the facial nerve.
- **Type C:** Deep tympanic sinus with posterior extension relative to the facial nerve.

Abbreviations:
fn: facial nerve, **pr:** promontory, **rw:** round window, **st:** tympanic sinus

4. **Relative contraindications:**
    - **Labyrinthine fistulas:** Manipulating around defective semicircular canals poses a high risk of cerebrospinal fluid leakage and postoperative hearing loss [1].
    - **Tegmen defects:** Dural breaches associated with serious infectious risks (e.g., meningitis) require conventional surgery, which is better suited for hemostatic control and tegmen reconstruction.
    - **Narrow external auditory canal:** This makes it difficult to insert the endoscope and instruments.
    - **Coagulopathies:** As bleeding control in endoscopy is limited by the use of one hand, coagulopathies represent a major contraindication [4].

Advantages and Technical Limits of Endoscopy

Despite these limitations, endoscopy allows for excellent exploration of deep and hidden regions (facial recess, superficial tympanic sinus, hypotympanum) in cholesteatomas confined to the middle ear. However, the lack of stereoscopic vision, the necessity of operating with one hand, and the difficulty in managing bleeding remain major constraints [1- 5].

CONCLUSION

Exclusive endoscopic surgery is reserved for cholesteatomas limited to the middle ear and attic. The endoscope, used with one hand and providing a two-dimensional view, remains limited in complex cases. The microscope, with its three-dimensional characteristics and maneuverability, remains essential for optimal management of extensive or complicated cholesteatomas.

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