SAS Journal of Medicine
Abbreviated Key Title: SAS J Med
ISSN 2454-5112
Journal homepage: https://saspublishers.com

OPEN ACCESS

Otorhinolaryngology

Middle Ear Tuberculosis: Clinical Features, Diagnostic Challenges, and Management – A Case Series

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DOI: https://doi.org/10.36347/sasjm.2026.v12i05.035 | **Received:** 07.04.2026 | **Accepted:** 21.05.2026 | **Published:** 30.05.2026

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Abstract **Case Series**

Middle ear tuberculosis is an uncommon but clinically significant condition that necessitates early and accurate diagnosis to prevent serious complications, including hearing loss and facial paralysis. In this case series, we present three patients diagnosed with middle ear tuberculosis and review its clinical presentation, diagnostic challenges, and management strategies. Although rare in immunocompetent individuals, the condition occurs more frequently in those with compromised immune systems. The exact mode of transmission remains unclear, but hematogenous spread or direct extension from a nearby tuberculosis focus are the most likely routes. Diagnosis is frequently delayed due to the rarity and non-specific symptoms of the disease; the most common presenting complaint is chronic otorrhea unresponsive to standard antibiotic therapy. High-resolution computed tomography (CT) is the preferred imaging modality to assess disease extent. Diagnosis typically requires a combination of clinical evaluation and paraclinical investigations. Medical treatment consists of a standard anti-tuberculosis regimen including isoniazid, rifampicin, pyrazinamide, and ethambutol for six to nine months. Surgical intervention may be necessary for diagnostic biopsy and to rule out other pathologies. Prompt and appropriate treatment can significantly reduce the risk of long-term sequelae. Increased clinical awareness is key to ensuring timely diagnosis and optimal patient outcomes.

Keywords: Tuberculosis, middle ear, otorrhea, facial nerve palsy, hearing loss, diagnosis, management.

INTRODUCTION

Tuberculosis of the middle ear is a rare but potentially serious condition that poses significant diagnostic challenges. Although it represents less than 0.1% of all chronic middle ear infections, its capacity to cause significant morbidity—including hearing loss and facial nerve paralysis—necessitates clinical vigilance [1]. In patients presenting with chronic otorrhea unresponsive to conventional therapy, facial palsy, or unexplained hearing loss, middle ear tuberculosis should be considered as a differential diagnosis, particularly in individuals with underlying immunodeficiency [1,2]. The exact route of infection remains uncertain, though hematogenous dissemination and direct extension from adjacent tuberculous foci are the most plausible mechanisms. Due to its rarity and nonspecific presentation, diagnosis is frequently delayed—often between 5 and 8 months after the onset of symptoms [3]. This underscores the importance of early recognition and accurate diagnosis to avoid serious complications. In this paper, we present a case series of three patients diagnosed with middle ear tuberculosis and provide a review of its clinical characteristics, diagnostic workup, and therapeutic management.

CASE REPORTS

Case 1

A 47-year-old patient with end-stage renal disease undergoing hemodialysis and receiving treatment for asthma presented with a six-month history of persistent, foul-smelling left-sided otorrhea, associated with tinnitus and progressive hearing loss. The patient had undergone several courses of antibiotics with no clinical improvement. Symptoms subsequently worsened, culminating in peripheral facial nerve paralysis and episodes of dizziness. There was no reported history of weight loss, asthenia, or anorexia.

Otoscopic examination revealed a single perforation of the tympanic membrane and grade IV facial nerve palsy according to the House-Brackmann scale. Rhinocavoscopy was unremarkable. Pure tone

audiometry showed profound mixed hearing loss on the left side with a Rinn value of 27 dB. A CT scan of the temporal bone demonstrated aggressive left otomastoiditis with lysis of the shell of the second portion of the facial nerve and the tegmens (figure 1).

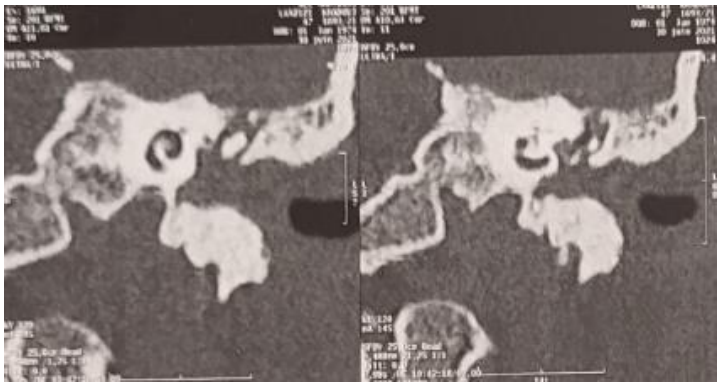

Figure 1: A CT scan of the temporal bone demonstrated aggressive left otomastoiditis with lysis of the shell of the second portion of the facial nerve and the tegmens

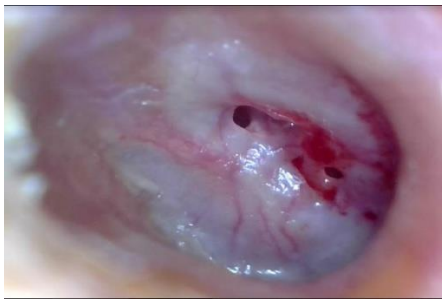

Figure 2: otoscopic examination showing a thickened tympanic membrane, and double posterior perforation

Based on these findings, a cholesteatoma was initially suspected, and the patient was scheduled for surgical exploration. Preoperative otoscopy revealed a thickened tympanic membrane with two posterior perforations on the left side (Figure 2).

Analysis of the otorrhea sample showed mixed flora, but cultures were sterile. Molecular testing using the Xpert MTB/RIF assay was positive for *Mycobacterium tuberculosis*. Further investigations, including chest radiography and sputum analysis for acid-fast bacilli and MTB gene, were negative. A diagnosis of tuberculous otomastoiditis was made. The patient was started on standard anti-tuberculous therapy according to the 2RHZE/4RH protocol. After one month of treatment, there was marked clinical improvement, with reduction of otorrhea, partial recovery of facial nerve function (from grade IV to grade II), and improved auditory thresholds in the left ear.

Case 2

A 65-year-old urban-dwelling patient with average socioeconomic status, undergoing treatment for sarcoidosis for the past three years, presented with a two-month history of left-sided otorrhea that was non-foul-smelling and unresponsive to standard medical therapy, including two courses of amoxicillin/clavulanic acid (1 g three times daily) and a short course of corticosteroids. The patient reported ipsilateral hearing loss but denied tinnitus, vertigo, or facial nerve palsy. General health status was preserved. Otoscopic examination revealed two anterior perforations in the left tympanic membrane, which appeared thickened and inflamed, along with an erythematous tympanic cavity (Figure 3)

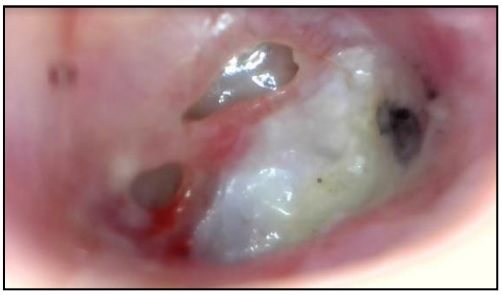

Figure 3: Otoscopy revealed two anterior perforations in the left ear, a thickened and inflamed membrane, and an inflamed fundus

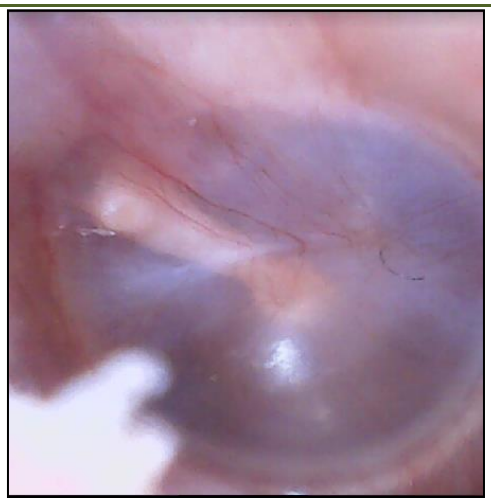

Figure 4: Otoscopic control after anti-tuberculosis treatment, showing a normal tympanic membrane

Rhinocavoscopy findings were normal. Pure tone audiometry demonstrated mild conductive hearing loss on the left side, with an average threshold of 15 dB. Due to the lack of response to conventional treatment, a cytobacteriological analysis of otorrhea fluid was performed, yielding no significant findings. However, the Xpert MTB/RIF test on the same specimen returned positive for *Mycobacterium tuberculosis*. The patient was initiated on anti-tuberculosis therapy according to the 2RHZE/4RH protocol. Significant clinical improvement was observed three months into treatment, including resolution of otorrhea, improved hearing, normalization of otoscopic findings (Figure 4), and full auditory recovery on follow-up audiometry.

Case 3

A 17-month-old infant, vaccinated in accordance with the national immunization schedule and with normal psychomotor development, presented with a painful, progressively enlarging left retroauricular swelling that had evolved over one month. There was no prior history of recurrent otitis media or known exposure to tuberculosis. Two months earlier, the child had experienced left ear pain accompanied by a dry cough, fever, asthenia, anorexia, and a 3 kg weight loss over the preceding three months. Clinical examination revealed a firm, mobile, and tender 4 cm inflammatory mass in the left retroauricular region, with no fistulization (Figure 5).

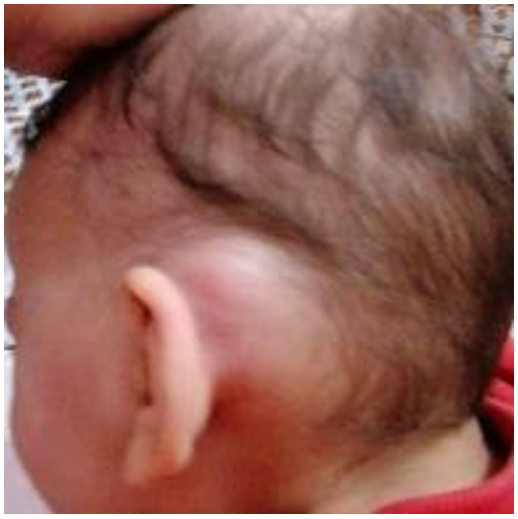

Figure 5: retro auricular inflammatory swelling in an 17-month-old child

Otoscopic examination showed normal tympanic membranes bilaterally, with no otorrhea. There were no signs of peripheral facial nerve palsy or cervical lymphadenopathy. Ultrasound of the lesion showed a well-defined 18x12 mm cystic formation with thin walls and finely echogenic contents, along with cortical bone discontinuity in the corresponding area.

A temporal bone CT scan revealed aggressive left-sided otomastoiditis with a contiguous abscess and associated ipsilateral sigmoid sinus thrombosis (Figure 6).

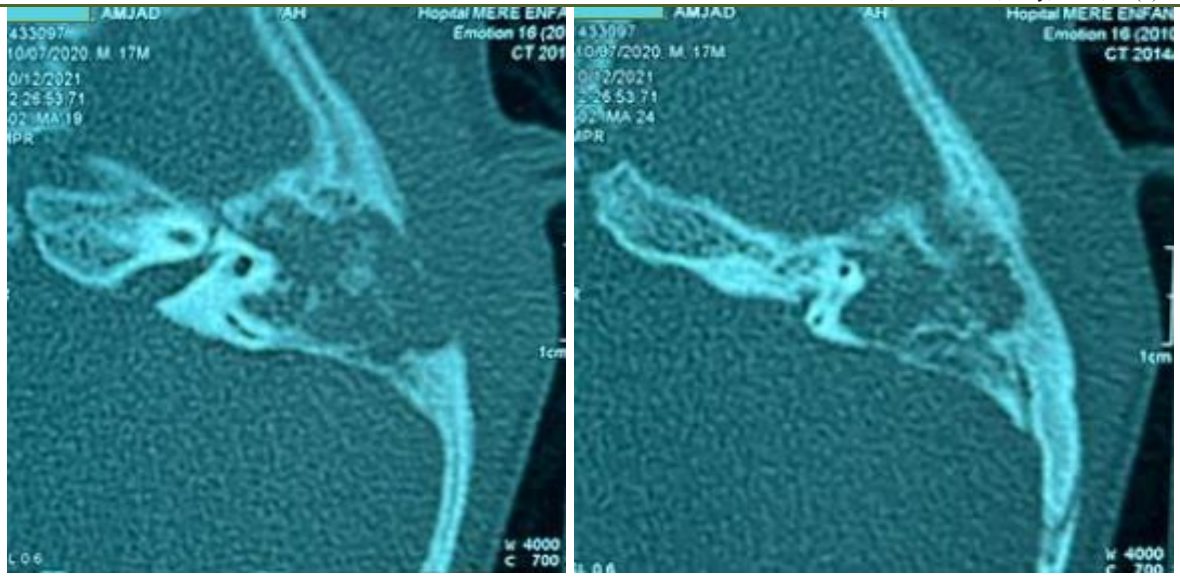

Figure 6: CT scan of the temporal bones showimg an aggressive left otomastoiditis complicated by a neighboring collection with homolateral sigmoid sinus thrombosis

Aspiration of the retroauricular mass yielded 5 cc of hemopurulent fluid. Cytobacteriological analysis was sterile, but the GeneXpert MTB/RIF assay was positive for *Mycobacterium tuberculosis*. Chest X-ray and sputum testing (including GeneXpert) were negative for pulmonary tuberculosis.

The child was started on anti-tuberculosis therapy following the 2RHZE/10RH protocol, along with anticoagulant treatment using low-molecular-weight heparin followed by vitamin K antagonists. Clinical improvement was noted within the first month, with increased appetite, general health improvement, and reduction in swelling.

DISCUSSION

Tuberculosis of the middle ear is a rare but potentially severe condition that requires early recognition and accurate diagnosis to prevent complications such as permanent hearing loss and facial nerve palsy. Although it represents less than 0.1% of all chronic middle ear infections, its clinical relevance is significant due to the diagnostic challenge it presents and the potential morbidity it causes [1,2].

This condition more frequently affects immunocompromised individuals—those with HIV, malnutrition, diabetes, or chronic renal failure—but cases in immunocompetent patients have also been reported, as illustrated in our case series [1,3].

The route of infection remains uncertain, though hematogenous dissemination and direct extension from adjacent tuberculous foci are considered the primary mechanisms. Involvement of the inner ear is rare but can lead to vestibular dysfunction and balance disorders [4].

The classic triad of tuberculous otitis media—painless otorrhea, multiple tympanic membrane perforations, and facial nerve palsy—is rarely encountered in modern clinical practice. The historically described “watering can” appearance of the tympanic membrane, characterized by multiple perforations, is also infrequently observed [3,5].

Due to its rarity and nonspecific presentation, diagnosis is often delayed, with an average interval of 5 to 8 months from symptom onset [6]. Chronic otorrhea unresponsive to standard antibiotic therapy is typically the presenting symptom. While middle ear tuberculosis is usually unilateral, bilateral cases have been documented. The presence of facial nerve palsy or cervical lymphadenopathy may lead to misdiagnosis as cholesteatoma or neoplastic disease [3,7].

High-resolution computed tomography (CT) of the temporal bone remains the imaging modality of choice for assessing disease extent. It allows evaluation of the ossicular chain, facial nerve canal integrity, and labyrinth. Facial nerve paralysis warrants additional investigation to exclude alternative etiologies [8].

Diagnosis relies on a combination of clinical findings and paraclinical tests. Conventional bacteriological cultures and histopathology often yield inconclusive results. Rapid molecular diagnostic tools such as the GeneXpert MTB/RIF assay have improved detection rates for *Mycobacterium tuberculosis*, even in extrapulmonary samples [6–8]. However, due to the limited sensitivity of all individual tests, a high degree of clinical suspicion remains essential [9].

Management is primarily medical, with standard anti-tuberculosis therapy consisting of isoniazid, rifampicin, pyrazinamide, and ethambutol

(2RHZE/4RH or 2RHZE/10RH), administered for 6 to 9 months [10]. Surgery is generally reserved for diagnostic biopsies or for complications such as abscess formation or ossicular erosion. Early and effective treatment substantially reduces the risk of long-term sequelae such as persistent deafness or facial paralysis [2,5].

CONCLUSION

Tuberculosis of the middle ear, though rare, should be systematically considered in patients presenting with persistent otorrhea, hearing loss, or facial nerve palsy that do not respond to conventional treatments—especially in individuals with known risk factors for tuberculosis. Due to its nonspecific clinical presentation and often delayed diagnosis, maintaining a high index of suspicion is crucial.

Early recognition, appropriate imaging, and confirmation using modern molecular diagnostic tools such as GeneXpert can lead to timely initiation of treatment and significantly reduce the risk of severe complications, including permanent hearing loss and facial paralysis.

A multidisciplinary approach—engaging ENT specialists, infectious disease experts, radiologists, and microbiologists—is essential for optimizing diagnosis and management. Increasing awareness among clinicians of this uncommon but serious condition remains the cornerstone of improving patient outcomes.

Compliance with Ethical Standards

Conflict of Interest

The authors declare that they have no conflict of interest.

Research Involving Human Participants and/or Animals

All procedures performed in this case series were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

No experiments on animals were performed in this study. Given the descriptive nature of this case series, formal ethical approval was not required.

Informed Consent

Written informed consent was obtained from all individual participants included in this study for the publication of their clinical data and any accompanying images.

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