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## **Caso Clínico**

**Tuberculous otitis media: an unexpected  
manifestation of disseminated disease**

**Otitis media tuberculosa: una manifestación  
inesperada de enfermedad diseminada**

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## Abstract

Tuberculosis remains a major health concern both in developing and developed countries. Among possibly affected extrapulmonary sites, tuberculous otitis media (TOM) constitutes an extremely rare disease presentation, accounting for between 0.05% to 0.9% of chronic infections of the middle ear. The diagnosis of this specific type of chronic otitis media entails a number of obstacles, since non-specific manifestations are usual and typical signs and symptoms of presentation are lacking. Therefore delayed diagnosis is frequent, leading to delayed treatment onset and, thus, increased risk of complications and continued transmission of the disease.

The authors present a case of a 40-year-old male with an 11-month history of recurrent unilateral suppurative otitis media that was unresponsive to usual antibiotic therapy. He was ultimately diagnosed with TOM after positive smear of purulent ear discharge and subsequent molecular detection of *Mycobacterium tuberculosis* complex.

## Keywords

tuberculosis; diagnosis; middle ear

## Resumen

La tuberculosis sigue siendo un problema de salud importante tanto en los países desarrollados como en los subdesarrollados. Entre los sitios extrapulmonares posiblemente afectados, la otitis media tuberculosa (OMT) constituye una forma de presentación extremadamente rara, que representa entre el 0.05% y el 0.9% de las infecciones crónicas del oído medio. El diagnóstico de este tipo específico de otitis media crónica conlleva una serie de obstáculos, ya que las manifestaciones inespecíficas son habituales y faltan los signos y síntomas típicos de presentación. Por lo tanto, el diagnóstico tardío es frecuente, lo que lleva a un inicio tardío del tratamiento y, por lo tanto, a un mayor riesgo de complicaciones y transmisión continua de la enfermedad.

Los autores presentan un caso de un hombre de 40 años con una historia de 11 meses de otitis media supurativa unilateral recurrente que no respondía a la terapia antibiótica habitual. Finalmente fue diagnosticado con OMT después de un frotis positivo de secreción auditiva purulenta y la posterior detección molecular del complejo *Mycobacterium tuberculosis*.

### Palabras clave

tuberculosis; diagnóstico; oído medio

## Introduction

Tuberculosis (TB) is one of the most ancient infectious diseases and still poses considerable challenges for clinicians given its wide spectrum of clinical manifestations. Although there is significant geographical variation, TB is estimated to infect 1.7 billion people worldwide (a quarter of humanity)<sup>1</sup>, with an average lifetime risk of developing TB disease of 5-15%<sup>2</sup>. In 2016, there were 10.4 million estimated incident cases of TB and 1.3 million estimated deaths, placing TB as the second major cause of death due to infectious diseases, second only to HIV/AIDS.

Approximately 85% of reported TB cases were limited to the lungs, the remaining 15% involved only extrapulmonary or both pulmonary and extrapulmonary sites<sup>3</sup>. Among head and neck locations, cervical lymph nodes and larynx are the most frequent affected sites<sup>4</sup>. Middle ear involvement by *Mycobacterium tuberculosis* (MT) accounts for less than 1% of extrapulmonary TB cases<sup>5</sup>. Also, in patients with chronic middle ear infections MT is rarely implicated, with only four cases (0.06%) reported in a series of 6310 patients assessed at Massachusetts General Hospital during a 22-years period<sup>6</sup>.

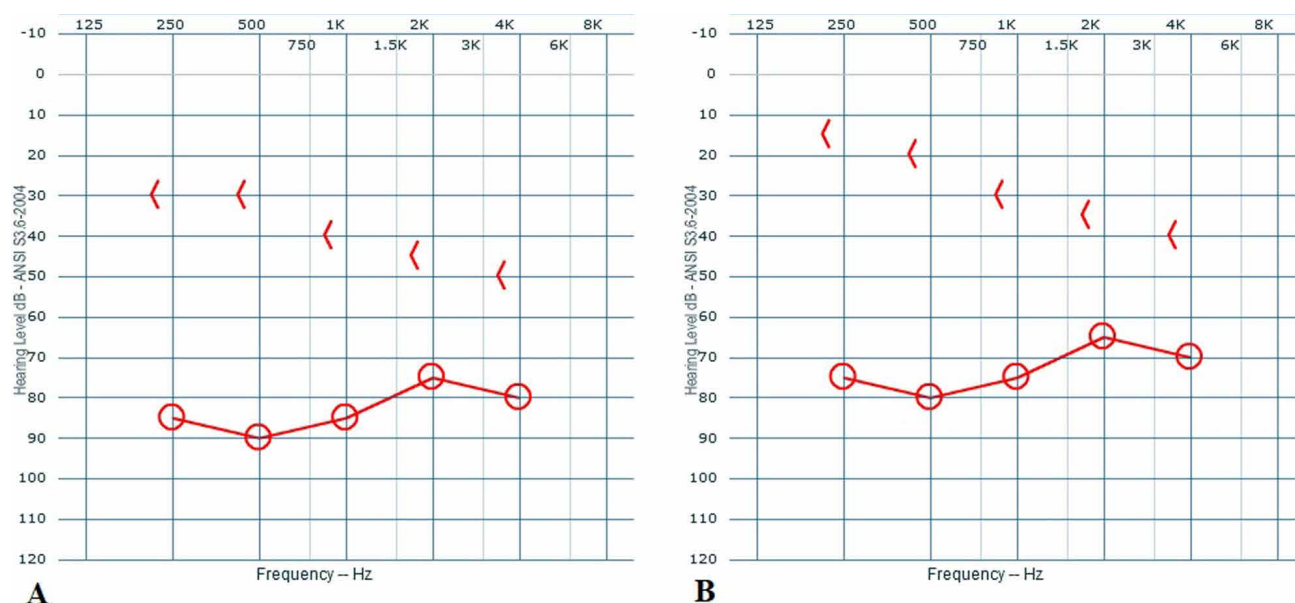
TOM diagnosis presents a significant diagnostic challenge due to its perceived rarity, especially in immunocompetent patients, and variable clinical signs reported in the literature. In addition, specific tests for TB are not routinely requested and confirmation of the diagnosis can be difficult because acid fast bacilli counts in ear discharge are typically low and secondary bacterial infection may interfere with the growth of *Mycobacterium tuberculosis*. As a result, TOM frequently goes unrecognized until extensive damage to the middle ear and surrounding structures occurs.

Early detection of this infectious disease relies on a high index of suspicion in patients who do not respond to standard antibiotic therapy for bacterial middle-ear infection and low threshold for adequate testing.

We present a case of TB affecting the middle ear and lung in a previously healthy man, to elucidate the clinical characteristics of tuberculous otitis media (TOM) and discuss the difficulties in diagnosis.

## Case Report

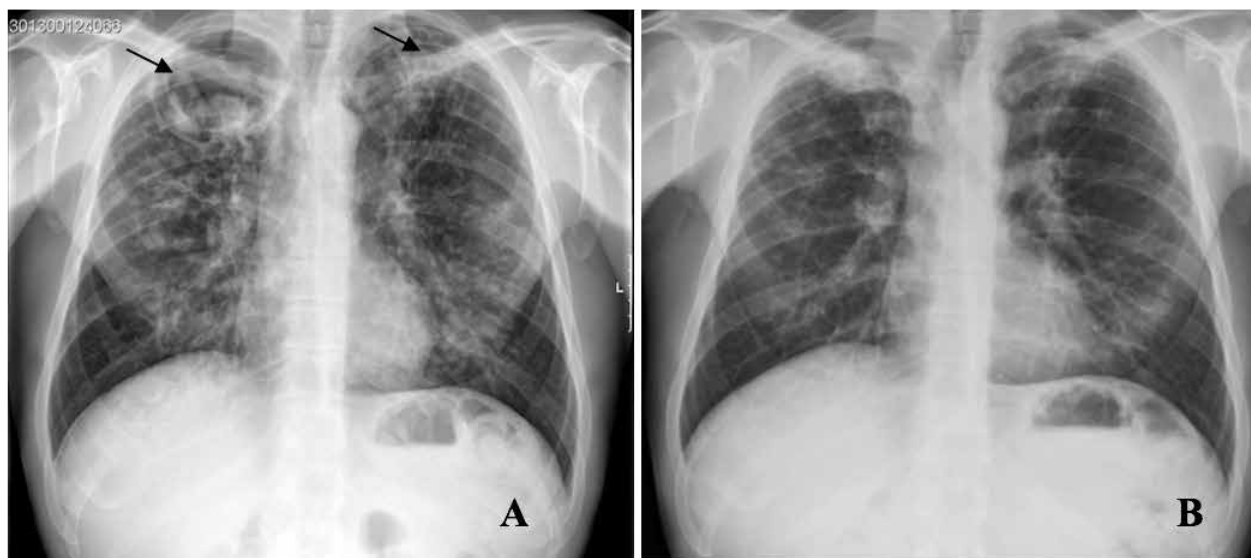
A 40-year-old male presented with an 11-month history of unilateral right-sided purulent ear discharge, mild otalgia, tinnitus and progressive ipsilateral hearing loss. These symptoms persisted despite multiple courses of oral and topical antibiotics for chronic otitis media. Otoloscopic examination revealed purulent whitish discharge in the right external auditory canal, with preserved integrity of the tympanic membrane, which was hyperemic and thickened. Pure-tone audiometry demonstrated only a right-sided severe conductive hearing loss (mean pure-tone threshold 85dB, mean air-bone gap 40dB) (Figure 1A). Speech audiometry indicated a 75dB speech recognition threshold and tympanometry showed a flat (type B) curve. The patient was otherwise healthy but reported a 30 pack-year history of smoking. There was no history of tuberculosis (TB) contact.



**Figure 1:**

Right-ear pure tone audiograms. A – Preoperative audiogram with right-sided severe conductive hearing loss. B – Postoperative audiogram.

Nine months after the onset of otologic symptoms, he developed cough, purulent sputum, low-grade intermittent fever, anorexia, and experienced significant weight loss (15 kg in 6 months). He was initially diagnosed with community-acquired pneumonia and treated with amoxicillin/clavulanate plus azithromycin. Two months later, respiratory symptoms and hyperthermia persisted. Pulmonary auscultation revealed crackles over the right upper and middle lobes. Laboratory studies showed anemia (hemoglobin: 10.6g/dL), leukocytosis ( $15 \times 10^9$  cells/L), and elevated serum C-reactive protein (14.83mg/dL). An HIV serologic test was negative. The chest X-ray showed multiple bilateral ill-defined opacities with cavitation in the upper lobes (Figure 2A). Sputum smears demonstrated acid-fast bacilli and the Polymerase Chain Reaction (PCR) analysis was positive for *Mycobacterium tuberculosis* (MT)-complex DNA. A standard regimen for TB (isoniazid, rifampicin, pyrazinamide and ethambutol) was initiated and sputum cultures were positive for MT, susceptible to all first line drugs.



**Figure 2:**

Chest X-ray before treatment depicts bilateral ill-defined interstitial opacities and thin-walled cavities in both upper lobes (A, arrows). Chest X-ray after 10 months of treatment, showing significant improvement (B).

The extent of the patient's pulmonary TB and the prolonged duration of otorrhea raised concern for concurrent tuberculous otitis media (TOM). Smear microscopy of ear discharge sample was positive and PCR analysis confirmed the presence of MT-complex DNA. Computed tomography (CT) of the temporal bone showed soft tissue density in the entire right mastoid cavity and middle ear and thickening of the tympanic membrane (Figure 3).

After two months of medical treatment, the patient presented with significant improvement of symptoms, along with negative sputum smear and culture conversion. However, the complaints of purulent ear discharge and otalgia persisted, for which the treatment was prolonged until ten months. Repeated culture of ear discharge was negative for MT. At the end of treatment, he reported complete recovery from respiratory symptoms. A chest X-ray showed significant reduction in the size and number of pulmonary cavities (Figure 2B). However, no improvement of hearing occurred and the patient maintained persistent otorrhea. A canal-wall-down mastoidectomy was performed for complete control and scouring of the abundant hyperplastic material found within the middle ear and mastoid cavity. Removal of the malleus and incus was also necessary, since they were involved with granulation tissue. No post-operative complications occurred. Tissue samples were sent for MT culture, which were negative. After confirmation of infection resolution, a second-stage functional surgery for hearing rehabilitation was proposed to the patient, which he deferred. During two-year follow-up, the hearing has not significantly improved (Figure 1B), yet the patient reported resolution of otorrhea.

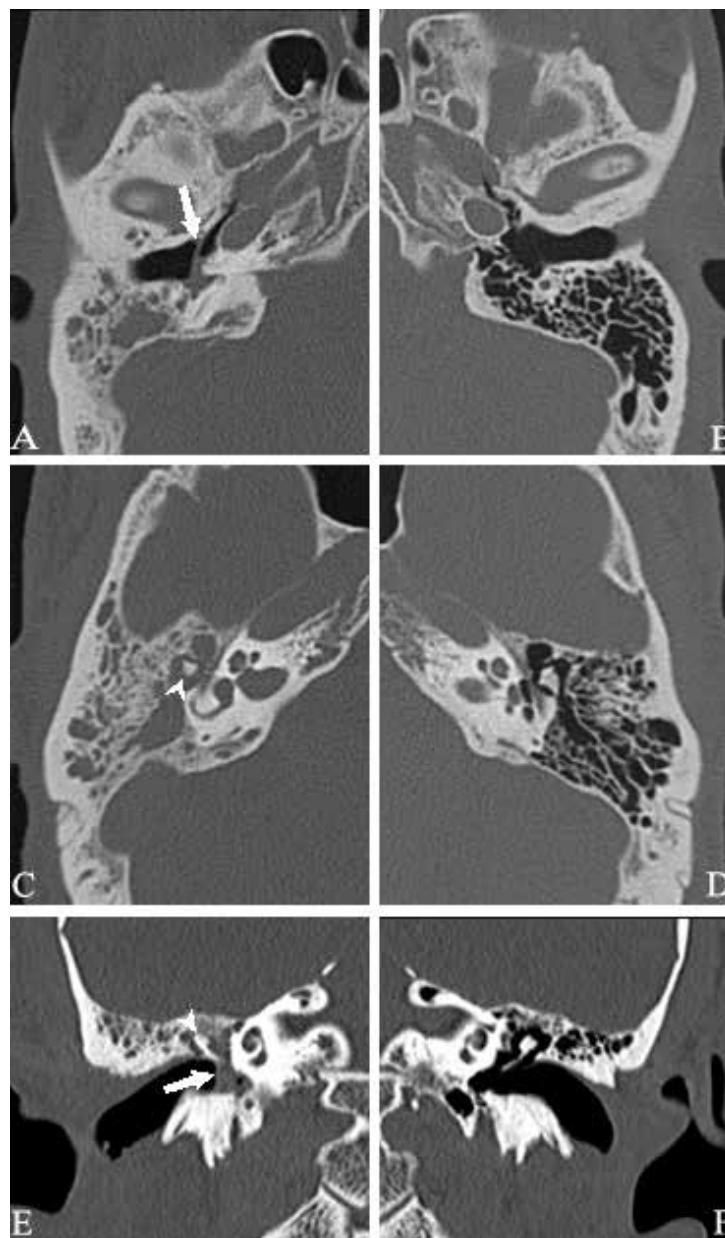
## Discussion

Middle ear is rarely affected by MT infection and most clinicians are unfamiliar with the diagnosis.

The pathogenesis of TOM is explained by three different mechanisms: direct passage of infected mucus through the Eustachian tube during coughing or sneezing, hematogenous dissemination or direct implantation of bacilli through the external auditory canal in the presence of perforated tympanic membrane<sup>7</sup>. In the present case, the dissemination was most likely by the hematogenous route, because the patient had no cough or respiratory secretions at the onset of symptoms.

The classical clinical features of TOM include painless otorrhea, multiple tympanic membrane perforations and ipsilateral facial nerve paralysis, which are nowadays rarely seen<sup>8</sup>. Recent retrospective case series reported that persistent otorrhea, severe hearing loss, and single perforations are the most common findings<sup>9-11</sup>. An otoscopic examination showing necrotic components, abundant granulation tissue, or whitish exudates in the middle ear should raise the suspicion of TOM. Pure-tone audiometry commonly reveals conductive hearing loss, although sensorineural or mixed hearing loss can occur in later stages of disease.

A diagnostic workup of TOM should start with smears and cultures of ear discharge, although these are frequently negative<sup>7,12</sup>, due to the concurrent presence of other bacterial species and masking from previous antibiotic treatment. Repeated cultures of purulent discharge, DNA amplification techniques and screening for the involvement of other organs may be helpful<sup>13</sup>. Ultimately, surgery may be needed to obtain multiple tissue specimens, with higher diagnostic yields<sup>14</sup>. Radiological studies, mainly with CT, are useful in assessing the extent of TOM lesions, although there are no literature reports of specific radiologic signs.



**Figure 3:**

CT images showing the retracted and thickened right tympanic membrane (A and E, arrows) and the characteristic soft tissue in the middle ear and mastoid cavity, with no signs of bone erosion and normal appearance of the middle ear ossicles (C and E, arrowheads). CT images of the normal left mastoid cavity and middle ear are shown for comparison (B, D and F).



The prevalence of active or inactive pulmonary TB in patients with TOM can be as high as 50%<sup>15</sup>. Thus, evaluation of TOM should include screening for respiratory symptoms, sputum smear and culture, and a chest X-ray.

TOM should be primarily managed with the standard anti-TB medical treatment. If initiated early during the infection, this regimen alone can provide a favorable prognosis. Complications associated with TOM include hearing loss, fistulae, facial nerve paralysis, labyrinthitis, osteomyelitis of the petrous pyramid, acute mastoiditis and spread of the infection to the central nervous system. Surgical intervention may be needed if there are complications, for functional reconstruction or removal of bony sequester.

This case provides two valuable learning points. First, this case documents the similarity of TOM to the more common chronic nontuberculous otitis media, which should raise the awareness for possible long-term misdiagnosis. Thus, a thorough history and keeping a high index of suspicion is paramount. The clinical features that increase the suspicion for TOM include chronic suppurative otitis media unresponsive to usual antibiotic therapy, pale granulation tissue in the middle ear, hearing loss disproportionate to otoscopic appearance, and personal history suggesting TB infection. These features should prompt adequate microscopic examination and culture of purulent discharge.

Second, this case also highlights the importance of excluding pulmonary involvement in all patients with TOM. Clinicians should routinely perform chest X-rays and collect sputum samples for smear and culture as these may reveal advanced pulmonary disease, even in the absence of respiratory symptoms.

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## **Disclosure of interest**

The authors declare that they have no competing interest.

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