CASE SERIES AND REPORTS

Two new cases of chronic tuberculous otomastoiditis in children

Due nuovi casi di otomastoidite cronica tubercolare in età pediatrica

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SUMMARY

This report focuses on tuberculous otomastoiditis treated at a third level Italian paediatric hospital. We reviewed the clinical charts of 4077 children who underwent middle ear surgery at the Audiology and Otology Unit of the Institution's ENT Department from January 1995 to December 2011. A tubercular aetiology was identified in 2 cases: a 4-year old boy who presented with primary ear involvement, i.e. with no other infected sites but the middle ear, and a 5-year old girl with secondary tuberculous otomastoidits, who was treated for pulmonary and mediastinal tuberculosis at the age of 7 months.

KEY WORDS: Tuberculous otomastoiditis • *Mycobacterium tuberculosis* • Middle ear • Children

RIASSUNTO

Il presente lavoro descrive l'esperienza di un ospedale pediatrico italiano di terzo livello sulle otomastoiditi tubercolari. Sono state revisionate le cartelle cliniche di 4077 bambini sottoposti dal gennaio 1995 al dicembre 2011 a chirurgia dell'orecchio medio presso la UO di Audiologia ed Otologia della divisione ORL dell'Ospedale. La diagnosi eziologica di tubercolosi è stata posta in 2 casi: in un bambino di 4 anni affetto da otomastoidite cronica tubercolare primaria, ossia senza segni di infezione in altri distretti corporei al di fuori dell'orecchio medio, e in una bambina di 5 anni affetta da otomastoidite cronica tubercolare secondaria, essendo stata trattata all'età di 7 mesi per tubercolosi polmonare e mediastinica.

PAROLE CHIAVE: *Otomastoidite tubercolare • Mycobacterium tuberculosis • Orecchio medio • Bambini*

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Introduction

Tuberculosis (TB) remains a major health concern in developed countries. In children, approximately 85% of reported cases are limited to the lung; the remaining 15% involve only extra-pulmonary or both pulmonary and extra-pulmonary sites [1 2]. Among the extra-pulmonary presentations, tuberculous otitis media (TOM) with otorrhoea is extremely rare, accounting for 0.05-0.9% of chronic infections of the middle ear [3].

The pathogenesis of TOM is controversial. The *Mycobacterium* can reach the middle ear via a haematogenous route, via mucus aspiration through the Eustachian tube or by direct implantation through the external auditory canal and tympanic membrane perforation [4].

Diagnosis of TOM may be difficult and delayed, mainly because of a low index of suspicion, its low prevalence and non-specific clinical signs mimicking chronic otomastoiditis (COM), such as painless otorrhoea refractory to standard antibiotics, tympanic membrane perforation and unilateral conductive hearing loss [1 5 6]. As in all COM cases, imaging is mandatory in order to study the extension of the disease and any possible complications, even if it is of little benefit in differential diagnosis, since radiological findings are not specific and signs of aggressiveness are common to other middle ear infections. Thus, identification of *Mycobacterium tuberculosis* remains the gold standard of diagnosis and therefore a necessary step in the presence of a high clinical suspicion. In fact, prompt diagnosis as well as early treatment are very important to avoid severe complications such as facial paralysis [1], sensorineural hearing loss [1] and abscess of the parotid [7] or brain [8].

The aim of this paper is to report on the experience of "Bambino Gesù" Paediatric Hospital with TOM in children. By reviewing the available clinical charts of 4077 cases of COM undergoing middle ear surgery at the Audiology and Otology Unit of the Institution's ENT Department from January 1995 to December 2011, the Authors retrieved three children. One patient had *Mycobacterium avium* isolated from the ear culture and, consequently,

was excluded from the study. This case was the object of a previously published case report [9]. The remaining two cases were caused by *Mycobacterium tuberculosis* and are described in the present report.

Description of clinical cases

Case 1. In September 2008, a 4-year old Moldovan boy was referred to our ENT Department for a 2-year history of recurrent, painless, purulent otorrhoea in his right ear, which was refractory to broad spectrum local and systemic antibiotics. Otoscopy showed a subtotal perforation of the tympanic membrane through which granulomatous and whitish epitympanic material could be seen. The boy's hearing was normal on the left side, and a moderate-to-severe conductive hearing loss (ACPTA = 61 dB HL, BCPTA = 10 dB HL) was found on the right side (Fig. 1). A CT scan of the temporal bones showed soft tissue-like material occupying the mastoid cells and the tympanic cavity, eroding the ossicles (Fig. 2). A cholesteatomatous otomastoiditis (CCOM) was suspected and in January 2009 a canal-wall up tympanomastoidectomy was performed with tympanic membrane reconstruction with temporalis fascia. Intraoperatively, the mastoid and the middle ear appeared entirely occupied by granulomatous material. Histological examination revealed granulomatous, non-necrotising tissue that was negative on Ziehl Nielsen staining.

After a healthy period, in October 2010 the patient was hospitalised for a recurrence of otomastoiditis with otorrhoea. On this occasion, the patient's mother reported a family history of TB (uncle). Therefore, an ear swab was performed, revealing acid fast bacilli. The purulent material, sent for culture, was positive for MT, and susceptible to routine anti-TB drugs. A tuberculin skin test and a QUANTIferon test were positive. The patient underwent a chest radiography, which was negative for pneumonia, suggesting a diagnosis of primary TOM. He was started on a three-drug antituberculous treatment (rifampin, isoniazid, pyrazinamide) and administered local therapy with boric acid and tobramycin/dexamethasone droplets. Over the following months, the otorrhoea subsided gradually, with no clinical recurrence after 3 years of follow-up. A CT scan of the temporal bones (Fig. 3) showed moderate opacification of the mastoid cavity and of the middle ear, with no signs of local recurrence. Finally, on the right side, the hearing threshold improved slightly (ACPTA = 45 dB HL; BCPTA = 15 dB HL).

Case 2. In January 2009, a 5-year old Romanian girl was referred to our hospital for a 2-year history of recurrent otorrhoea that was refractory to broad-spectrum antibiotic therapy. She had a history of bilateral pulmonary and mediastinal TB at 7 months of age that had been treated with anti-TB chemotherapy (isoniazid, rifampin and streptomycin).

Otoscopy revealed subtotal perforation of the tympanic membrane, through which whitish, simil-cholesteatomatous material could be seen occupying the tympanic cavity. Pure tone audiometry showed mild conductive hearing loss on the right side (ACPTA = 35 dB HL, BC PTA = 8 dB HL) and normal hearing on the left side. A CT scan of the temporal bones showed complete obliteration of the right mastoid cavity, with sclerotic remodelling of the mastoid and erosion of the mastoid cortical bone. The middle ear was also entirely filled with isodense material, without apparent erosion of the ossicular chain (Fig. 4).

The patient underwent canal-wall up tympanomastoidectomy in July 2009. Intraoperatively, abundant granulation tissue was found in the mastoid, in the antrum and in the tympanic cavity. The ossicular chain was intact. Histology did not confirm the suspected CCOM and bacterial culture of specimens was negative.

A few months later, otoscopy revealed successful eardrum reconstruction, but no effective ear ventilation. The neotympanic membrane was retracted, whitish and thick. Consequently, in December 2010 the patient underwent a myringocentesis with insertion of a ventilation tube in the right ear. Intraoperatively, after incision of the tympanic membrane, abundant whitish caseous material was found. Suspecting a local recurrent TB infection, the surgeon abstained from inserting a ventilation tube and sent the material for culture, which grew isoniazid and rifampin resistant MT. As MT was also cultured in a broncho-alveolar lavage, a secondary TOM diagnosis was made. CT of the temporal bones showed complete re-obliteration of the mastoid cavity by soft tissue-like material, which fully occupied the middle ear (Fig. 4). Due to growth of a drug-resistant TB strain upon culture, treatment with linezolid and moxifloxacin was prescribed for 12 months. In the following 18 months, the patient's ear appeared dry, the reconstructed tympanic membrane normal and the tympanic cavity well ventilated, with no signs of TOM recurrence. Audiometry showed unchanged conductive hearing loss on the right side (ACPTA = 35 dB HL, BC PTA = 8 dB HL) and normal hearing on the left side.

At the end of the therapy, CT of the temporal bones showed a remarkable improvement of middle ear ventilation with only mild signs of effusion in the epitympanic space (Fig. 5).

Discussion

Tuberculosis remains the leading infectious cause of death worldwide. Although the incidence of TB in Italy has decreased over the last century, the recent increase in immigration of people from areas with a high incidence of TB has contributed to reversing this downward trend and to raising again the debate on TB as a matter of public health concern [10]. Among the extra-pulmonary presentations, TOM with otorrhoea is extremely rare, accounting for 0.05-0.9% of chronic infections of the middle ear [3]. Consistent with the literature [1 3 11], in our hospital the inci-

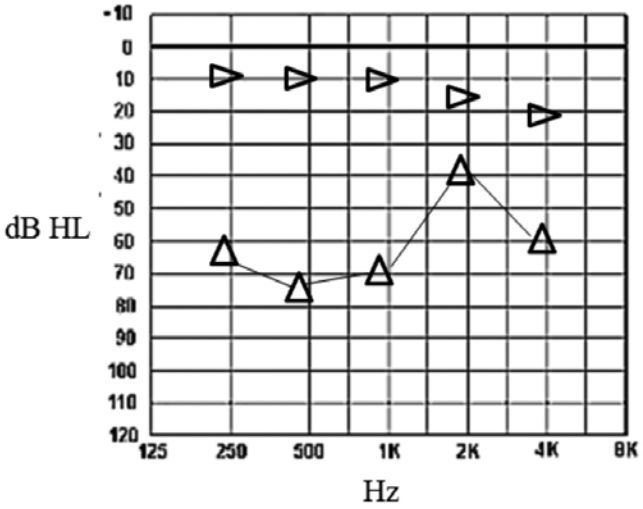

Fig. 1. Pre-operative pure tone audiometry of case 1.

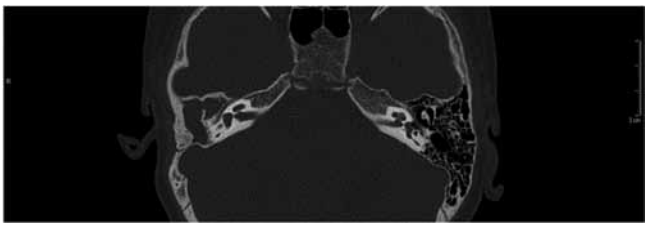

Fig. 2. Pre-operative temporal bone CT scan of case 1.

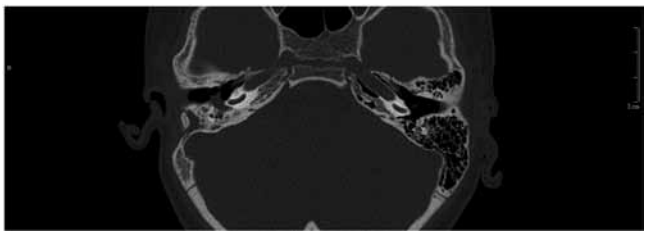

Fig. 3. Post-operative temporal bone CT scan of case 1.

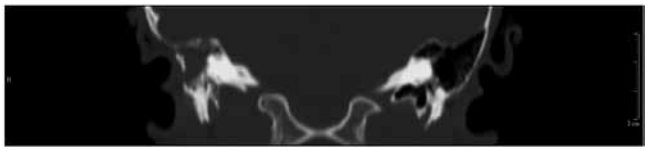

Fig. 4. Pre-anti-TB treatment temporal bone CT scan of case report 2.

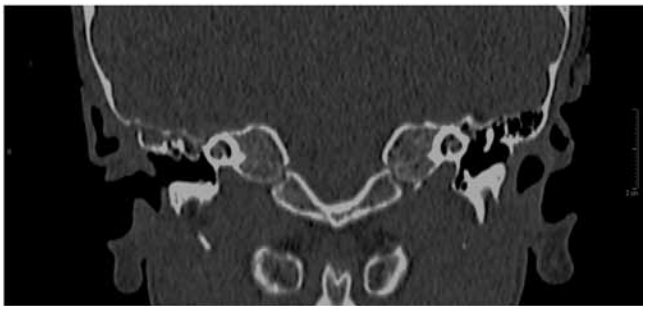

Fig. 5. Post-anti-TB treatment temporal bone CT scan of case 2.

dence of TOM in children undergoing middle ear surgery is 0.05% to date. It is by no means surprising that the 2 cases recorded at our institution are from 2008-2011 and were diagnosed in children originating from areas with a high incidence of TB. In the light of this, we expect the incidence of TOM to increase in the next years. In the literature, a considerable delay before the diagnosis is often reported because of its low prevalence and insidious clinical signs. Likewise, in our experience TOM presented with unspecific findings that did not allow early diagnosis. In fact, in both cases the clinical symptoms mimicked CCOM, and CT did not show any of the characteristic alterations such as those identified by Rho [12]. On the other hand, magnetic resonance imaging has no demonstrated role in the differential diagnosis of TOM and requires general anaesthesia in children. Therefore, clinicians did not think it would have provided useful information in the cases reported herein.

Because of the low specificity of imaging, the gold standard for TOM diagnosis remains microscopy, culture, drug sensitivity testing and histopathological examination of specimens obtained from the middle ear, as recommended by European guidelines [13]. It is with hindsight that the Authors acknowledge that an ear swab should have been obtained immediately and sent with a special request for culture and PCR analysis. However, this can be done if a high degree of clinical suspicion is present, which is rarely the case, since for most clinicians TOM is often far down in the list of possible differential diagnoses of chronic otorrhoea. At present, this conception of TOM as a rare disease entity should be revisited on account of the latest increase of migratory flows from Eastern Europe.

Nonetheless, MT identification through middle ear biopsy is not easy to obtain, in that it requires general anaesthesia in paediatric subjects.

The gold standard of TOM treatment is still a matter of debate: although the indication for chemotherapy is well defined, there is no consensus whether middle ear surgery should be attempted in these patients. The guidelines issued by the American Thoracic Society, CDC and Infectious Diseases Society of America in 2003 [14] recommend that extrapulmonary TB be treated with the same drug regimens as pulmonary disease, and do not mention surgery as a treatment option. The rationale of performing a tympanomastoidectomy in TOM is that anti-tuberculosis drugs alone do not completely penetrate the middle ear. Conversely, the effectiveness of surgery has not been yet demonstrated [6 15]. Some authors even recommend against it, unless complications are present [16]. Finally, recent studies have demonstrated that higher rates of dry ear are achieved when surgery precedes chemotherapy, as compared to chemotherapy alone [1 17]. In our experience, in both cases tympanomastoidectomy preceded anti-TB chemotherapy due to the delay of aetiological diagnosis. Nonetheless, surgery alone was effective only in the short term,

signs of local TB recurrence appearing 6-12 months after surgery, and specific anti-TB chemotherapy was essential in inducing a lasting remission of the disease. Therefore, when TOM diagnosis is not accidental, surgery should be considered optional as first-line treatment of TOM, whereas anti-TB chemotherapy with the drug regimen recommended by International Guidelines [14] should be the initial treatment. Surgery remains mandatory in two cases: for a diagnostic purpose when the clinical suspicion is high and bacteriological and PCR analysis of ear discharge fail to identify the MT, and to complete treatment when chemotherapy is not sufficient, in order to eradicate the infectious process from the mastoid and middle ear.

Once surgery is attempted, a "second look" should not be planned in the short term, since re-opening a potentially infected middle ear and mastoid cavities could facilitate disease dissemination. Finally, close follow-up is required to recognise early complications or recurrence of disease. In addition to otoscopic and audiometric examinations, radiological studies may be useful to monitor the disease and to modulate pharmacological therapy. In particular, CT of the temporal bones is the most appropriate exam for this purpose.

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