CASE REPORT

Cholesterol granuloma of the middle ear invading the cochlea

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KEYWORDS
Cholesterol granuloma;
Middle ear;
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Summary
Objectives: To report a second case of cholesterol granuloma of the middle ear invading the cochlea.
Material and methods: A 54-year-old woman, who had undergone right-side tympanoplasty with stapedectomy, complained of intermittent right-side otorrhea associated with cophosis. Otomicroscopy found anterior eardrum perforation with mucopurulent effusion. Computed tomography (CT) showed a lesion filling the tympanic cavity, exposing the tympanic facial nerve, with destruction of the ossicles; the vestibule and cochlea were ossified except for the basal turn. The petrous apex was normal. Magnetic resonance imaging (MRI) showed invasion of the cavity and basal turn of the cochlea by a mass in heterogeneous hypersignal on T-1 weighted images, non-enhanced by gadolinium injection, and hyperintensity on T-2-weighted images. Cholesterol granuloma of the middle ear was suspected, with surgery indicated due to the facial nerve exposure and cochlear invasion.
Results: A brownish-yellow compressive mass invading the basal turn of the cochlea, suggestive of cholesterol granuloma, was removed. Histologic examination confirmed diagnosis.
Conclusion: Direct invasion of the otic capsule by cholesterol granuloma is extremely unusual. Surgery is indicated in such cases, to avoid onset of neurologic complications.

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Introduction
Cholesterol granuloma is a chronic inflammatory reaction probably resulting from direct contact between bone marrow and the mucosa of the pneumatic system around the otic capsule [1]. Forms invading the petrous apex are rare, but associated with neural or intracranial involvement [2]. Cholesterol granuloma of the middle ear, on the other hand, is classically pain-free and non-aggressive [3]. To the best of our knowledge, only one case of cholesterol granuloma of the middle ear invading the cochlea has been previously reported [4]. We here report a second case.

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Case report

Ms L.M., 54 years of age, consulted for intermittent purulent otorrhea associated with right unilateral deafness without otalgia, vertigo or tinnitus. Surgical history included stapedectomy with tympanoplasty and fitting of a Teflon piston for chronic otitis media in 1976.

Clinical examination found anterior microperforation of the eardrum with purulent effusion and retraction of the pars tensa. The left ear was healthy.

Pure-tone threshold audiometry was normal in the left ear and showed cophosis in the right.

High-resolution computed tomography (CT) of the pars petrosa found a tissular process completely filling the tympanic cavity, with mastoid cell eburnation and ossicle erosion. The tympanic facial nerve was exposed, and the cochlea and vestibule were ossified except for the basal turn. The petrous apex was normal (Fig. 1A, B). Magnetic resonance imaging (MRI) found a tissular lesion invading the tympanic cavity and basal turn of the cochlea in heterogeneous hypersignal on T-1 weighted images non enhanced by gadolinium injection (Fig. 2A) and marked hyperintensity on T2- and diffusion-weighted sequences (Fig. 2B, C).

A diagnosis of middle-ear cholesterol granuloma was strongly suspected. The exposure of the tympanic facial nerve and invasion of the cochlea indicated surgery.

Antroatticotomy with facial nerve monitoring found a brownish-yellow compressive mass completely filling the middle ear, with an aspect of cholesterol granuloma, inside of which a Teflon piston was discovered. There was direct invasion of the basal turn of the cochlea, with exposure of the tympanic facial nerve. Partial rasping of the basal turn removed the invading granulation tissue, and the fistula was closed using temporal fascia fat. Broad posterior tympanotomy was performed after removing the incus. Post-operative course was free of complications, without facial palsy, vertigo or otorrhea. At 2 years’ follow-up, there was no recurrence.

Anatomopathology found a foreign-body granuloma containing cholesterol crystals surrounded by giant cells and hemosiderin-laden macrophages (Fig. 3).

Discussion

Cholesterol granuloma has been known since Manasse’s study of 1894 [5]. Etiopathology remains controversial. Bone marrow exposure by bone rarefaction or resorption has been implicated, direct bone marrow contact with the mucosa of the pneumatic system around the otic capsule inducing an inflammatory reaction, sustained by abundant formed blood elements [1]. The incidence of cholesterol granuloma of the middle ear is unknown; it is rarely primitive, and classically associated with chronic otitis media [6], of which the present patient had a long history. Clinically, forms involving the petrous apex induce intracranial complications. House and Brackmann reported a case of cholesterol granuloma with destruction of the petrous apex [2].

Cholesterol granuloma of the middle ear is said to be pain-free, but may lead to transmission deafness. Cochlear invasion is rare: Murugasu et al. reported the first case of cholesterol granuloma of the middle ear invading the basal turn [4]. The mechanism leading to aggressiveness remains unknown: the cophosis was thought to be due to passage of inflammatory substances into the endolymphatic fluid, with bone destruction due to necrosis by compression [4]. The present patient presented with right-ear cophosis.

CT could have suggested residual cholesteroloma, inflammatory pseudotumor or simple granulation tissue. MRI specified diagnosis, finding a lesion in hypersignal on T1-weighted sequences without gadolinium enhancement and on T2-weighted sequences. Cholesteroloma and granulation tissue, in contrast, are in hypo- or iso-signal on T1-weighted sequences without contrast medium and enhanced with gadolinium injection, and in hypersignal on T2 [3,7–9]. In the present case, T1 hypersignal was observed in the basal turn of the cochlea, indicating direct extension of the cholesterol granuloma in the inner ear. This strong signal
Figure 2  A. Right pars petrosa MRI, axial slice. T1-weighted gadolinium-enhanced sequence, showing lesion with heterogeneous signal in basal turn of the cochlea (arrow). B. Pars petrosa MRI, axial slice. T2-weighted sequence, showing clearly hyperintense lesion, confirming diagnosis of cholesterol granuloma (thin arrow). C. Pars petrosa MRI, axial slice. Diffusion-weighted sequence showing hypersignal (arrow).

Figure 3  Hematoxylin eosin (HE); original magnification × 20. Foreign-body granuloma containing cholesterol crystals (cc) surrounded by giant cells and hemosiderin-laden macrophages (arrow).

density results from the paramagnetic effect of hemoglobin. The cochlear fistula was not visible on CT, due to its small size.

Cholesterol granuloma is not specific to the temporal bone; other locations have been reported: central nervous system, frontal bone diploe, orbital cavity, paranasal sinus, infratemporal fossa, thyroid gland, mediastinum, ovary and peritoneum [7,8]. Histologically, it is a chronic foreign-body granuloma containing cholesterol crystals surrounded by giant cells and hemosiderin-laden macrophages.

Treatment comprises simple surveillance in purely mastoid locations. In the present case, the risk of facial nerve damage was an indication for surgery.

Conclusion

Cholesterol granuloma of the middle ear is a slow-growing granulomatous inflammatory lesion, with clinical expression limited to transmission hearing-loss. Invasion of the otic capsule or facial nerve is exceptional; in such a case, surgery is mandatory to avoid complications.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References