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Case Report

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Endoscopic Transcanal Approach to Remove Extensive Petrous Cholesteatoma

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Abstract

Petrous cholesteatoma is a rare clinical entity and surgical treatment is difficult because the anatomical location of the petrous bone. It poses potential surgical risk of injury to the facial nerve, labyrinth, carotid artery, dura and risk of cerebrospinal fluid leak. We report a case of a young patient with extensive petrous cholesteatoma with erosion of basal turn of the cochlea, posterior semicircular canals and dehiscence of tegmen, facial nerve, carotid canal and roof of the internal auditory canal. It was successfully treated via the endoscopic transcanal approach. This surgical approach provides an excellent anatomical advantage of reaching the tumor with minimal destruction to the vital structures. It minimises soft tissue dissection and left the normally aerated mastoid untouched. It gave excellent functional aesthetic outcome with complete disease clearance.

Keywords

Endoscopic ear surgery; TEES; Petrous cholesteatoma

Case

A 32 year-old gentleman had been under follow-up in our department for extensive petrous cholesteatoma since the age of 17. He initially presented with a history of left otalgia and hearing loss at the age of 17. He originally consulted general practice and medical for left sided headache and otalgia. His physical examination was normal. Later on he developed subacute deteriation of left hearing and occasional dizziness. His otoscopic examination was normal but his pure tone audiogram showed left mixed hearing loss. The Computed tomography (CT) of the temporal bone was performed and this showed a massive labyrinthine-apical petrous cholesteatoma abutting against the carotid canal with erosion of the cochlear and abutting against the internal carotid artery. Excision Removal of the lesion via a translabyrinthine-transcochlear approach was suggested but the patient refused the procedure due to operative risk. Throughout 15 years of follow-up, the patient declined surgery at each follow-up visit. He was thus closely monitored over the next 15 years during which he developed increasing symptoms of vertigo and progressive hearing loss. The follow-up CT (Figure 1) and a diffusion weighted MRI (Figure 2) scans showed a progressive disease with extensive bony erosion, including the Internal carotid artery, tegmen, facial nerve, fallopian canal, cochlear and anterior semicircular canal with labyrinthine fistula. The pure tone audiogram showed left severe hearing loss. His preoperative facial nerve was normal. A method involving an infracochlear approach and endoscopic transcanal excision of the petrous cholesteatoma via combined supragenieculate was adopted. (3-mm Karl Storz Hopkins II® ear endoscopes with (0°, 30° and, 45° endoscopes) lenses and Stylus high-speed drill system were used.) The Medtronic high speed drill system was used to drill off the scutum and overhangings. The ossicles were removed to improve exposure and gain access to the cholesteatoma. The cholesteatoma in the middle ear was traced and discovered to lead to the petrous bone via the supragenieculate and infracochlear routes with exposure of: anteriorly, the Eustachian tube opening; inferiorly, the jugular bulb; posteriorly, the horizontal portion of the facial nerve; and superiorly, the tegmen. The lateral semicircular canal was identified (Figure 3). Cholesteatoma above the tympanic portion of facial nerve was removed and traced to the petrous via the supragenieculate route. A small amount of cholesteatoma at the hypotympanum was removed and the main bulk was followed anterior to the cochlear. The opening was enlarged anterioinferiorly to the internal carotid artery. Complete removal of cholesteatoma was achieved and confirmed with 2.7mm 45 degree endoscope. At completion of surgery, the margins of dissection1 were the Eustachian tube opening and the internal carotid artery anteriorly, the jugular bulb inferiorly and the tegmen superiorly (Figure 3). The eroded cochlea, the horizontal portion of facial nerve and the lateral semicircular canal were all clearly visualized. Postoperatively, the patient recovered uneventfully. Postoperative facial nerve function was normal and the patient did not experience vertigo. The Pure tone audiogram showed profound hearing loss in the operated ear. The diffusion-weighted MRI is done in one year after the operation, which showed no recurrence or residual cholesteatoma.

A schematic diagram of the anatomy during dissection is shown in Figure 4.

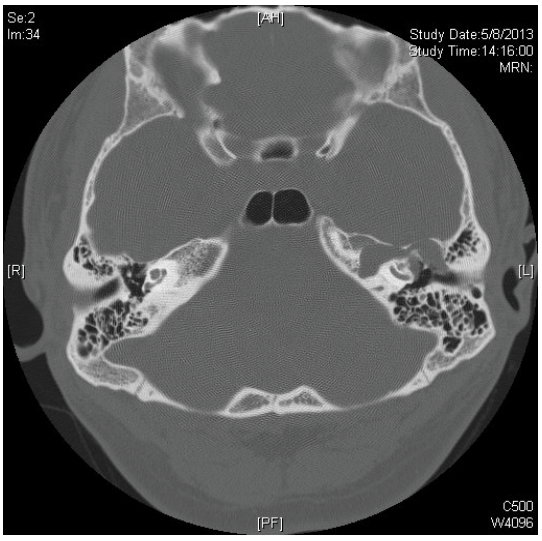

Figure 1: CT scan showing extensive bony erosion.

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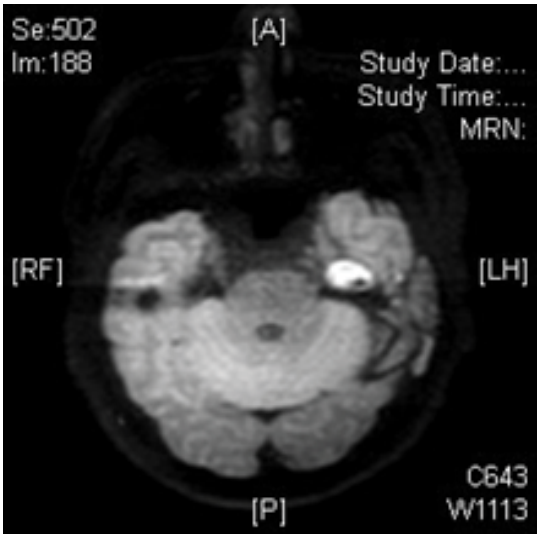

Figure 2: MRI scan showing extensive bony erosion.

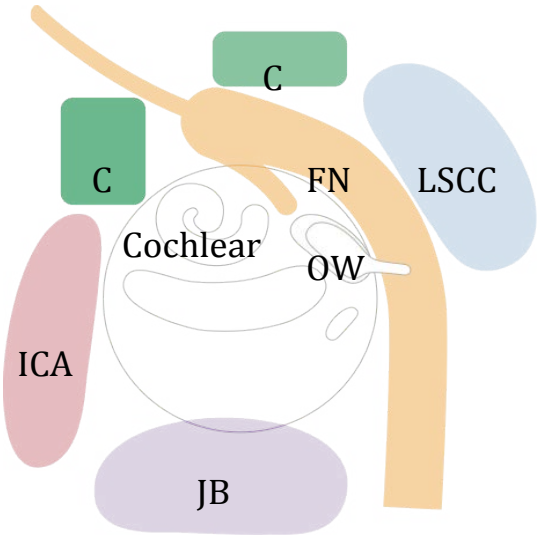

Figure 3: A schematic diagram of the anatomy during dissection.

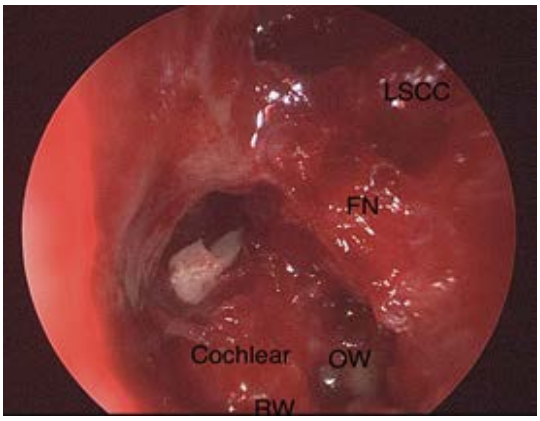

Figure 4: Remarks: C= Cholesteatoma, FN = Facial Nerve, OW = Oval window, RW = Round window, LSCC = lateral semicircular canal, ICA = Internal carotid artery, JB = Jugular bulb.

Discussion

Petrous bone cholesteatoma describes a non-migratory keratinized squamous epithelium affecting the petrous portion of the temporal bone. It is a rare pathological entity with a reported incidence of 4 to 9% of all lesions affecting the petrous pyramid [1,2]. Petrous bone cholesteatoma is detected in about 3% of all patients diagnosed and treated for cholesteatoma [3]. Unlike the acquired lesions, primary cholesteatomas can be found beyond the tympanomastoid space. Contrary to the more common middle ear cholesteatoma, petrous bone cholesteatoma grows medial to the otic capsule, invading the inner ear and the facial nerve early before it is diagnosed. Managing petrous bone cholesteatoma is a surgical challenge. The tendency for medial growth renders the surgical management of petrous bone cholesteatoma a difficult task owing to the central location of the otic capsule and the facial nerve as well as the proximity of vital intracranial structures, namely the internal carotid artery, the jugular bulb, the lower cranial nerves and the brain itself.

The surgical aim is total excision of the tumor with preservation of existing neuronal function and prevention of CSF leakage. The surgical approaches to be adopted vary according to the presenting symptoms and the extent of the disease.

Though a variety of approaches such as the suboccipital, transsphenoidal and transpalatal-transclival, are possible, the most suitable approaches for complete cholesteatoma removal are the translabyrintine-transcochlear and middle fossa approaches, or a combination of both approaches in extensive tumors [4,5,6].

The translabyrinthine-transcochlear approach may be more suitable in acquired cholesteatoma with hearing loss and facial nerve dysfunction [7-9]. This approach provides good access to the apex but impairs hearing and requires facial nerve mobilization. Facial nerve skeletenization carries a higher risk of postoperative facial nerve dysfunction.

The subtemporal middle fossa approach offers a high rate of hearing and facial nerve preservation. It is usually performed by neurosurgeons. Risks include brain traction injury, CSF leakage and meningitis.

With recent advances in minimally-invasive surgery and improvement of optics, incisionless transcanal endoscopic access to the petrous temporal bone for lesions such as cholesteatoma, cholesterol granuloma and petroapical lesion biopsies, are made possible. Potential advantages of endoscopic approaches include smaller wounds, avoidance of craniotomies, faster recovery, and shorter hospitalization. Pain associated with large wounds and wound complications are minimized. Furthermore, facial weakness and hearing-vestibular loss, which are more common complications of the transtemporal approaches, are less described in the endoscopic transcanal approach.

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