Ossiculoplasty positioned via posterior tympanotomy

C. Martin*, J.-M. Prades, C. Richard

Service ORL, Pavillon B, hôpital Nord, 42055 Saint-Étienne cedex 2, France

Summary  Tympanoplasty now frequently uses cartilage to repair bone lysis in the external auditory canal (EAC) and to reinforce the tympanic membrane. Once in place, however, the cartilage may complicate ossiculoplasty by obstructing visualization of the stapedial region. Posterior tympanotomy, when included in the tympanoplasty procedure, may provide an interesting means of positioning the ossiculoplasty.

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Introduction

Closed cholesteatoma surgery usually includes posterior tympanotomy. Towards the end of the procedure, large cartilage fragments may be used to reinforce the tympanic membrane and repair bone lysis in the external auditory canal (EAC); these, however, can obstruct visualization of the stapedial region, making the ossiculoplasty difficult to position. Ossiculoplasty positioning via the posterior tympanotomy offers a solution to this problem.

Surgical technique

We shall take the example of a right-ear cholesteatoma extending throughout the middle ear cavities, with resection sacrificing the remaining stapes and malleus. Under general anesthesia, a retro-auricular approach is performed by incising in the retro-auricular sulcus, creating a subcutaneous plane and then a periosteal flap with anterior pedicle. The auricle is inclined forward, and the skin of the posterior EAC wall is sectioned then retracted and held forward with the auricle by means of an autostatic retractor. This allows good visualization of the tympanum and an approach to the tympanic cavity by raising the tympanomeatal flap; the fibrocartilaginous ring is conserved and raised as little as possible. Mastoidectomy (Fig. 1a) is then performed. The cholesteatoma is exposed and progressively resected using the combined EAC, masto-antro-atticotomy and posterior tympanotomy approaches (Fig. 1b).

The tympanic membrane is reconstructed using one or several large thinned cartilage fragments (0.5—1 mm thick), beveled at the extremities, and positioned on the superior and posterior part of the bony canal (Fig. 1c). The inferior part of the fragment or fragments lies on the anterior and inferior part “of tympanic cavity” or on cartilage fragments specially positioned to raise it up. The cartilage is generally covered by an aponeurosis graft extending well onto the posterior wall of the EAC but only slightly onto the anterior wall, to avoid any lateralization of the reconstructed tympanum; the residual tympanum is folded back over the aponeurosis graft, repositioning the ring precisely in the sulcus.

With the tympanic grafts in place, the ossicle implant is introduced through the posterior tympanotomy.

When stapes superstructure is absent, ossiculoplasty generally uses a TORP implant; our center has been using titanium Spiggle and Theis® TORP implants for 5 years. It is introduced through the posterior tympanotomy by microforceps, which also allow it to be positioned between the
footplate and cartilage. Implant length should be adapted to the distance between the cartilage and the stapes footplate without hypercorrection. It is usually introduced through the posterior tympanotomy then positioned between the footplate and the cartilaginous neotympanum simultaneously using a micro-instrument, such as a curved bistoury or micro-hook, in the right hand (for a right-handed surgeon) and a micro-aspirator in the other. The micro-aspirator lifts up the implant plate while the micro-instrument slides the tip of the implant on the stapes footplate (Fig. 2a,b). Once in position, functioning is checked by looking for movement in the round window when the stapes is mobilized by light pressure on the neotympanum with a micro-instrument. The same maneuver is employed to check functional efficacy in other ossiculoplasty procedures.

If the stapes structure is present and the distance between the cartilage and the stapes head exceeds 2 mm, assembly generally uses a PORP implant: our center has been using Xomed® partial hydroxyapatite 90°, round-head, offset PORP implants for more than 20 years. The implant is introduced through the posterior tympanotomy by microforceps and positioned on the head of the stapes. The positioning technique is very similar to that used with a TORP implant. Implant length should be adapted to the distance between the cartilage and the stapes head without hypercorrection.

If the distance between the cartilage and the stapes head is short, as it usually is, one or several cartilage fragments are introduced via the posterior tympanotomy and positioned between the cartilaginous neotympanum and the stapes head.

After adjusting the ossiculoplasty, the auricle is inclined and the wound closed in its three planes, without drainage, using resorbable suture for the cutaneous plane. Gelatin is introduced to ensure good application of the residual
was first described by Heerman [3,4]; EAC reconstruction and tympanic membrane reinforcement using large thinned cartilage fragments was described by Glasscock and Miller [5], followed in France by Roulleau and Martin [6] and Martin et al. [7].

Such large cartilage fragments reaching up the superior and posterior EAC walls effectively repair EAC bone lys and reinforce the tympanic membrane but, once in place, may obstruct visualization of the stapedial region, hampering ossiculoplasty positioning. Performing ossiculoplasty via the posterior tympanotomy may in that case prove useful and functionally efficacious. We therefore conducted a study comparing results in closed surgery for extensive cholesteatoma between two techniques: the first allowed malleus conservation, with limited cartilage reinforcement of the tympanic membrane and ossiculoplasty by an ossicle introduced via the canal; the second involved ablating the malleus, reinforcement of the entire tympanic membrane by thinned cartilage extending up the EAC wall, and ossiculoplasty directly between the stapes and the cartilaginous neotympanum, usually introduced and adjusted via the posterior tympanotomy. Functional results were found to be more or less equivalent for both, with significantly lower recurrence of cholesteatoma associated with the second technique [8].

Ossiculoplasty positioned via posterior tympanotomy is a simple and effective solution, applicable during primary closed tympanoplasty involving large cartilage fragment tympanic membrane reconstruction. In revision surgery, if the cartilaginous neotympanum is well-positioned and ossicular assembly promises to be beneficial, the ossiculoplasty can be introduced and positioned via the posterior tympanotomy without the neotympanum having to be released.

**Disclosure of interest**

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

**References**