cavity, the reconstructed eardrum has a mosaic appearance (see Chapter 7).

Indications for Tympanoplasty with Broad Cartilage Palisades

Based on nine years of experience with broad palisades, Bernal-Sprekelsen and co-workers (2003) recommend the following indications for tympanoplasty with broad palisades:

- Total and subtotal perforations
- Perforations with tympanosclerotic plaques
- Perforation with atrophic membranes
- Revision surgery for failed myringoplasty or tympanoplasty type 1
- Anterior and inferior perforation with tubal discharge
- Retraction pockets
- Partially or completely atelectatic tympanic membranes
- Tympanic adherences
- Revision surgery for failed tympanoplasties of type 2 and type 3 as well as tympanomastoidectomies.

The Bernal-Sprekelsen Broad Palisade Techniques

Broad palisades are mainly used in total and subtotal perforation as underlay graft. They are supported by 2 mm × 3 mm pieces of cartilage placed vertically into the hypotympanum or into other regions such as the eminence of the tensor tympani muscle (**Fig. 6.1b**).

Total Perforation with Intact Ossicular Chain

The tympanoplasty may be performed in a transcanal, endaural, or retroauricular approach. The supports for the palisades are two or three 2 mm × 3 mm pieces of cartilage. Gelfoam can be used as well. The posterosuperior end of the palisade can rest on the chorda tympani and/or on the long process of the incus.

In an endaural approach, the edges of the perforation and around the malleus handle are cleaned. A medial circumferential incision with a radial incision is performed and two tympanomeatal flaps are elevated (**Fig. 6.2a, b**). The fibrous annulus is further elevated, exposing the bony annulus (**Fig. 6.2c**). Two sufficiently small pieces of cartilage are placed into the hypotympanum and along the eminence of the tensor tympani muscle to support the palisades (**Fig. 6.2 d**). An anterior semicircular palisade and a posterior palisade are placed onto the small pieces of cartilage (**Fig. 6.2e**). A small palisade is placed between the two large palisades close to the umbo and is supported with Gelfoam balls (**Fig. 6.2 f**). The tympanomeatal flaps with the eardrum remnant are replaced (**Fig. 6.2 g**).

Bernal-Sprekelsen and his group use several thin bluish silicone foils to cover the eardrum and the ear canal. After packing the ear canal with Gelfoam, the outer ends of the foils are turned inward (**Fig. 6.2h**), to stabilize the reconstructed eardrum and promote its epithelialization. When suturing the skin incisions laterally in the ear canal, the silicone foils are turned outward to cover the sutures and prevent formation of granulations.

Total Perforation with Missing Ossicles

Even if the entire malleus is missing, the reconstruction of the eardrum will be the same as when the malleus head is present.

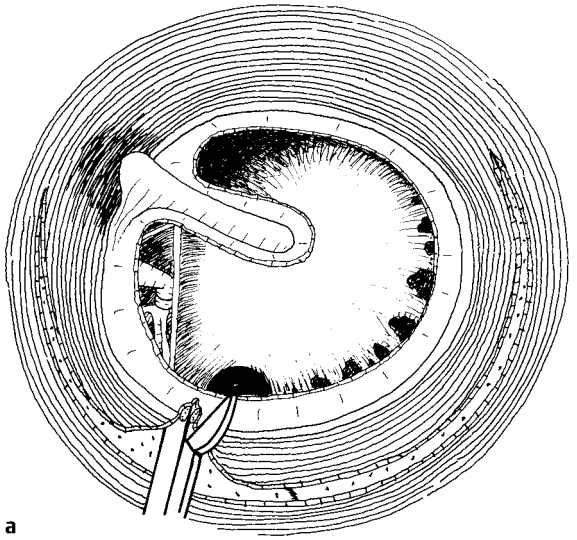
The support for the superior ends of the palisades will be a 1 mm × 3 mm piece of cartilage positioned partly onto the eminence of the facial nerve, partly onto the eminence of the tensor tympani muscle. In the hypotympanum a similar piece of cartilage is placed to support the broad anterior palisade (**Fig. 6.3a**). Onto the footplate an oval cartilage guide 0.3 mm thick is placed with a hole for the foot of the TORP prosthesis (see **Fig. 3.37**). The second palisade is placed at the site of the malleus and is supported in the same manner as the anterior palisade. The second palisade rests partly on the head of the TORP prosthesis. The posterior semilunar palisade is supported partly by the TORP and partly by the superior small piece of cartilage (**Fig. 6.3b**). The tympanomeatal flaps and eardrum remnants are replaced (**Fig. 6.3c, d**).

Total Perforation with Missing Long Process of Incus

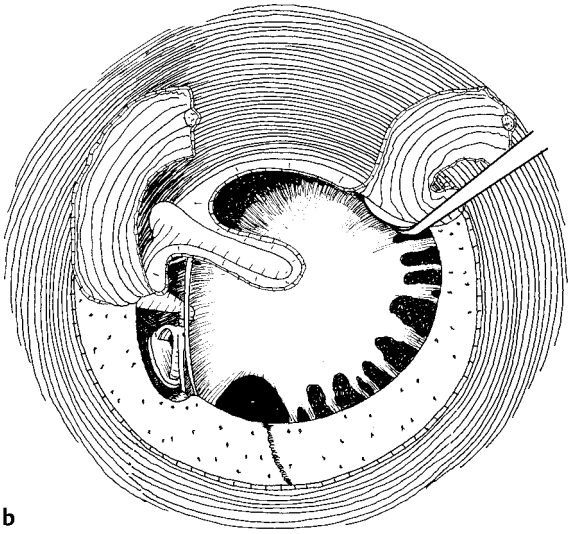
Tympanoplasty type 2 with interposition of a partial ossicular replacement prosthesis (PORP) of various materials and shapes is illustrated in numerous chapters of this book (see Chapters 4, 5, 7, 8, 9; see also MMES_1, pp. 245–329). Here only an example of the most common ossiculoplasty, the incus interposition, will be shown in connection with cartilage tympanoplasty with broad palisades, in particular to illustrate the need for reduction and careful shaping of the incus to accommodate the broad palisades.

In endaural approach the edges of the total perforation are cleaned. Using a swing-door technique, two tympanomeatal flaps are elevated, and the defective incus is extruded, reduced, and shaped to accommodate the undersurface of the broad palisade. First the anterior semilunar palisade is placed in the anterior tympanum, then the shaped incus is interposed between the head of the stapes and the malleus handle (**Fig. 6.4a**). Inferiorly, the palisade is supported by a piece of cartilage, placed into the hypotympanum, superiorly it is supported by an architrave. A palisade is adapted to the malleus handle and a semilunar broad posterior palisade is placed at the level of the bony

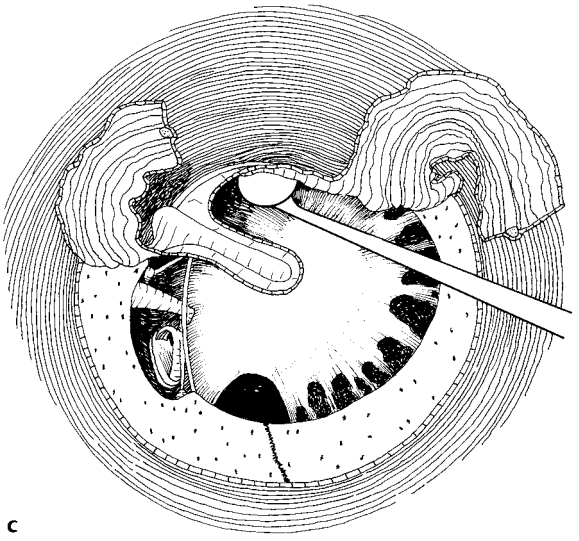
aus: Tos, Cartilage Tympanoplasty (ISBN 9783131450913) © 2009 Georg Thieme Verlag KG



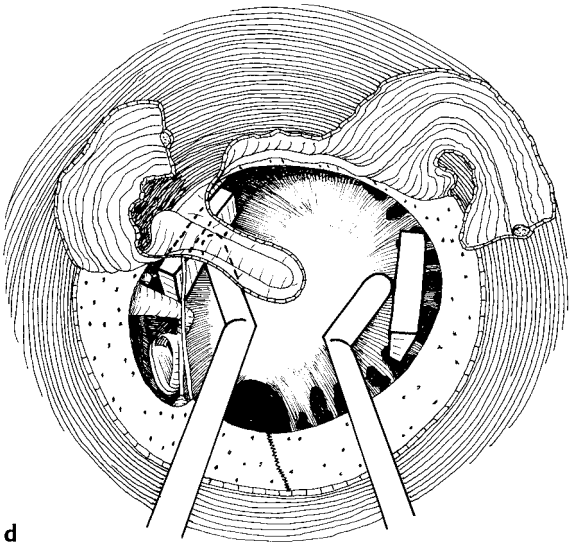
a



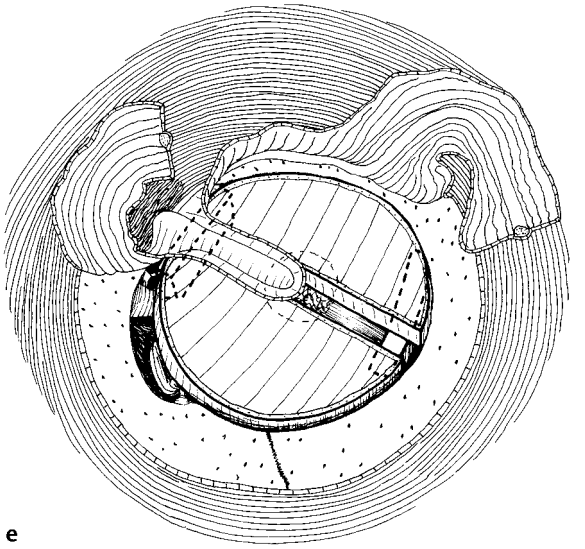
b



c



d



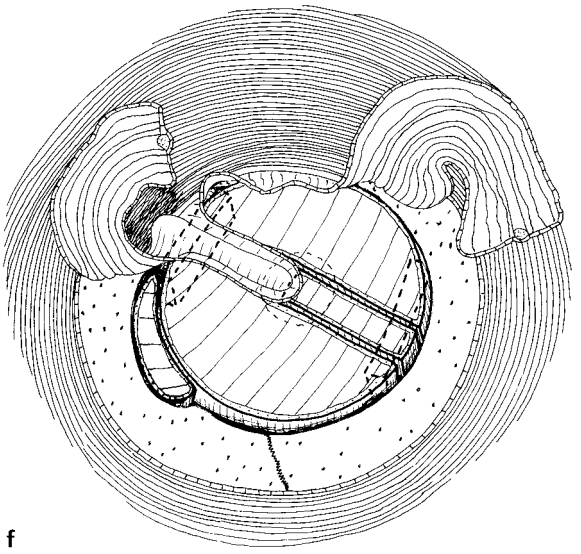
e

Fig. 6.2a–h Cartilage tympanoplasty with broad palisades harvested from the cymba in a case with total perforation and intact ossicular chain.

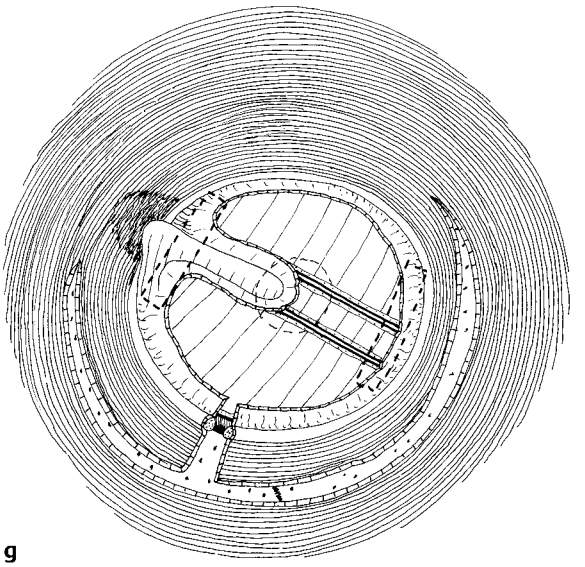
- **a** The edges of the perforation and around the malleus handle are cleaned and the epithelium is removed all the way around the entire edge. A medial circumferential incision is made. At the 9-o'clock position, a small radial incision separates the tympanomeatal flap into a superior and an inferior flap.
- **b** Both flaps are elevated together with the fibrous annulus, exposing the bony annulus.
- **c** Further elevation of the remnants of the eardrum and the inferior fibrous annulus.
- **d** Further elevation of the anterior fibrous annulus and the eardrum remnant. Placement of a small piece of cartilage in the hypotympanum and one along the eminence of tensor tympani muscle to support the palisades.
- **e** The first palisade is placed onto the piece of the cartilage previously placed into the hypotympanum and onto the cartilage placed along the eminence of the tensor tympani muscle. The palisade is placed at the level of the bony annulus and beside the malleus handle under the small eardrum remnant. The posterior broad palisade is placed onto the small inferior and superior cartilage supports. The palisades are positioned at the level of the bony annulus and along the malleus handle.

Fig. 6.2f–h ▷

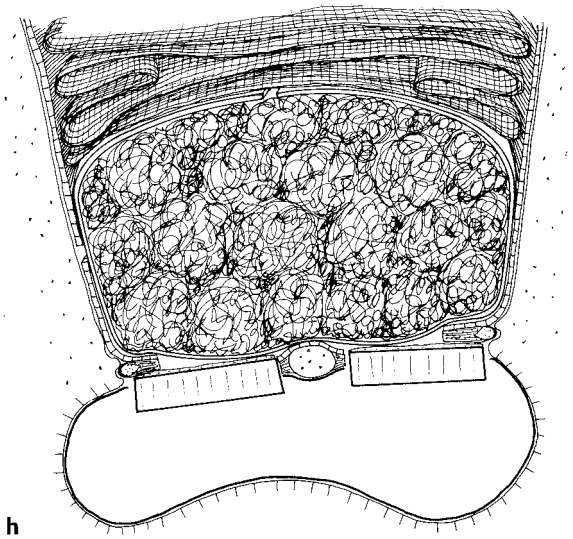
aus: Tos, Cartilage Tympanoplasty (ISBN 9783131450913) © 2009 Georg Thieme Verlag KG



f



g



h

Fig. 6.2f–h

f A small palisade is placed between the umbo and the inferior support cartilage. A superoposterior defect of the scutum is covered with a small palisade. A Gelfoam ball supports the upper end of the malleus palisade; support of the palisade with a Gelfoam ball is easy and effective.

g The tympanomeatal flaps are replaced, together with the fibrous annulus and remnants of the eardrum.

h Side view of underlay tympanoplasty type 1 with broad cartilage palisades at the level of the umbo, and packing of the ear canal. Two broad palisades are positioned at the level of the bony annulus. Several strips of blue silicone foil cover the eardrum and the ear canal skin. After placing several pieces of Gelfoam, the foils are turned inward. The lateral end of the ear canal is closed by gauze moistened with hydrocortisone–oxytetracycline ointment.

annulus and supported by the interposed incus (**Fig. 6.4b**). After replacement of the tympanomeatal flaps (**Fig. 6.4c**), the connection between the shaped and reduced interposed autogenous incus and the broad palisades is good (**Fig. 6.4 d**).

Similar solid interposition prostheses can be made and shaped from cortical bone, tragal cartilage, and homogenous incus.

Retracted and Adherent Malleus Handle in a Total Perforation with Defective Incus

The pathogenesis of such a condition is as follows: Chronic or recurrent secretory otitis media and long-lasting tubal dysfunction cause diffuse atrophy and retraction of the entire pars tensa, including resorption of the long process of the incus and adhesion of the umbo to the promontory. Because of severe purulent acute otitis media, the thin and atrophic pars tensa becomes necrotic and may disappear, resulting in a total perforation.

In the endaural approach, the edges of the perforation are cleaned and the two tympanomeatal flaps with the anterior fibrous annulus are elevated. The defective incus is removed. Using a curved incudostapedial knife, the adhesions between the umbo and the promontory are cut and the eardrum remnant is separated from the promontory. Under the inferior half of the bony annulus three small pieces of cartilage are placed to support the inferior semilunar palisade (**Fig. 6.5a**). The eardrum remnants connected to the umbo and to the retracted malleus handle are elevated as a malleus flap. Then the malleus handle is elevated to its normal position (**Fig. 6.5b**). The autogenous incus is shaped to become more flat and is placed onto the stapes head and under the malleus handle (Bernal-Sprekelsen, personal communication 2006). The large semi-

aus: Tos, Cartilage Tympanoplasty (ISBN 9783131450913) © 2009 Georg Thieme Verlag KG

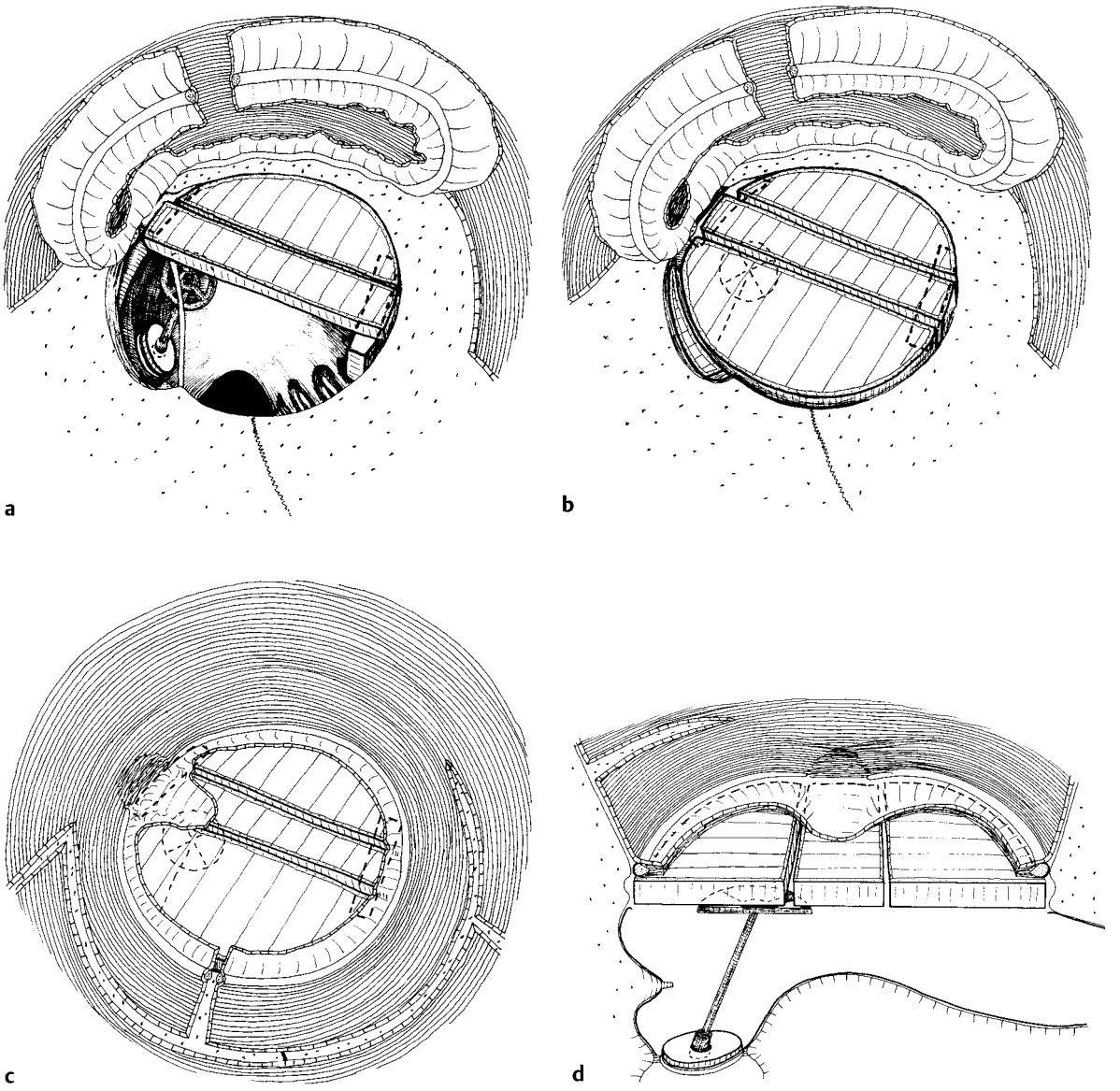


Fig. 6.3a–d Reconstruction of a total perforation without ossicles using broad cartilage palisades and titanium TORP prosthesis.

a The edges of the perforation are cleaned of epithelium. In endaural approach and swing-door technique, an inferior and a superior tympanomeatal flap are elevated together with the fibrous annulus, exposing the bony annulus. The epithelium around the attic region is elevated. The footplate is cleaned and a Hüttenbrink cartilage guide is placed onto the footplate (Hüttenbrink et al. 2004). A Kurz titanium TORP prosthesis is placed through the hole of the guide onto the footplate. Onto the eminence of the tensor tympani muscle a small cartilage palisade is placed, similar to the architrave. In the hypotympanum a 3 mm × 2 mm piece of cartilage is placed to support the inferior ends of the palisades. The anterior semilunar palisade is placed onto the architrave and onto the cartilage in the hypotympanum. The second palisade replaces the malleus, it is supported by the cartilage and the head of the TORP prosthesis.

b The third palisade covers the posterior half of the tympanic cavity. It is placed and adapted to the head of the TORP prosthesis and the chorda tympani as well as the palisade on the tensor tympani and partly on the facial nerve. The bony defect after drilling of the posterosuperior scutum is covered with a small palisade.

c The tympanomeatal flaps with the eardrum remnant are replaced.

d Side view with some perspective at the level of the footplate of an underlay cartilage tympanoplasty type 3 with broad palisades. The Kurz titanium TORP prosthesis has contact with two palisades, which are placed at the level of the bony annulus.

aus: Tos, Cartilage Tympanoplasty (ISBN 9783131450913) © 2009 Georg Thieme Verlag KG