

## Chapter 110 – Keratoses Obturans and Canal Cholesteatoma

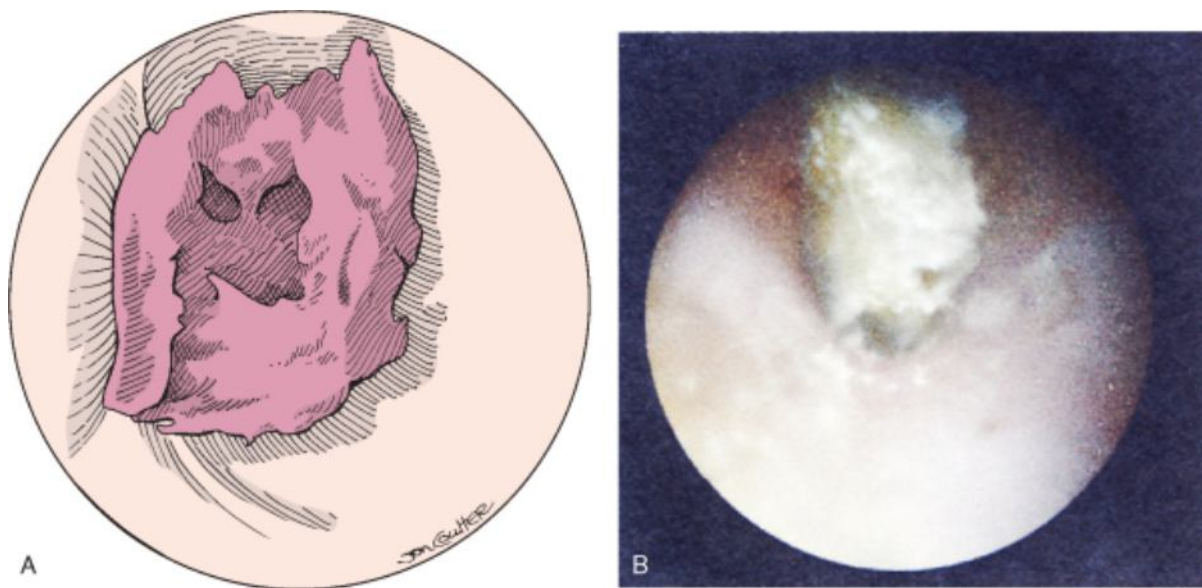
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Keratoses obturans and canal cholesteatoma were initially attributed to the same pathologic process, and the two terms were used interchangeably.[1] Both conditions are associated with disruption in the normal outward migration of external auditory canal epithelium, a process critical for extrusion of desquamated skin.[2] Piepergerdes and colleagues are credited with defining these two entities as unique processes requiring distinct management algorithms.[3] Nevertheless, partial overlap between these two conditions has led to continued debate in the recent literature over appropriate nomenclature.[4,5]

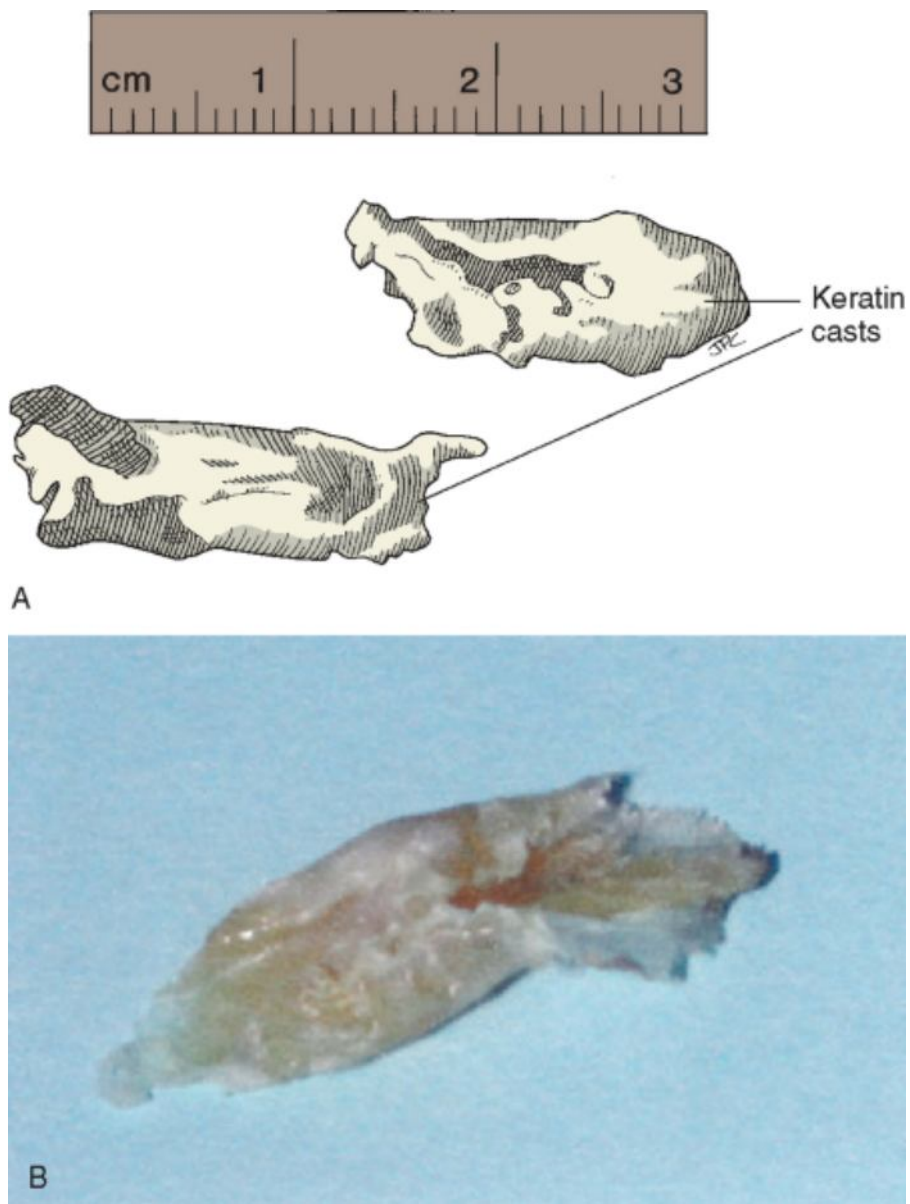
In keratoses obturans, the defect in lateral epithelial migration is circumferential and results in the formation of a laminar keratin plug that can frequently be removed intact as a cast of the external canal (Figs. 110-1 and 110-2). The keratin plug may extend medially to the tympanic membrane. Conductive hearing loss is common secondary to an occlusive effect. The condition is typically bilateral and may be accompanied by otalgia. Widening of the external auditory canal can occur as a result of circumferential bony resorption, presumably secondary to constant pressure induced by the keratin plug. The canal epithelium typically remains intact and can become thickened or inflamed. Early reports suggested an association with bronchiectasis and sinusitis, particularly in children.[6,7] Otorrhea is rare.

Canal cholesteatoma, in contrast, appears most commonly as a keratin “pearl,” usually situated on the floor of the external canal (Fig. 110-3). Canal cholesteatomas are generally unilateral and characterized by ulceration of the canal skin and focal bony erosion (Fig. 110-4). Hearing is not usually affected because the canal is not completely occluded and the middle ear is spared. After removal of the cholesteatomatous matrix, the bony canal is exposed and often eroded. Epithelium surrounding the bony defect will generally show sharply demarcated edges, although bleeding and granulation tissue are occasionally present. Whereas the appearance of keratoses obturans is difficult to confuse with other entities, the same cannot be said for canal cholesteatoma. Suspicion of carcinoma must be entertained and biopsy of the margins of the crater in the canal should be performed routinely. Bone exposure within the external auditory canal and the presence of granulation tissue may also be confused with acute necrotizing otitis (malignant external otitis). However, the latter condition is accompanied by significant pain and a greatly elevated erythrocyte sedimentation rate and is almost universally seen in diabetic patients. Furthermore, identification of *Pseudomonas* in culture would be expected in acute necrotizing disease, whereas normal canal flora is generally cultured from canal cholesteatoma.

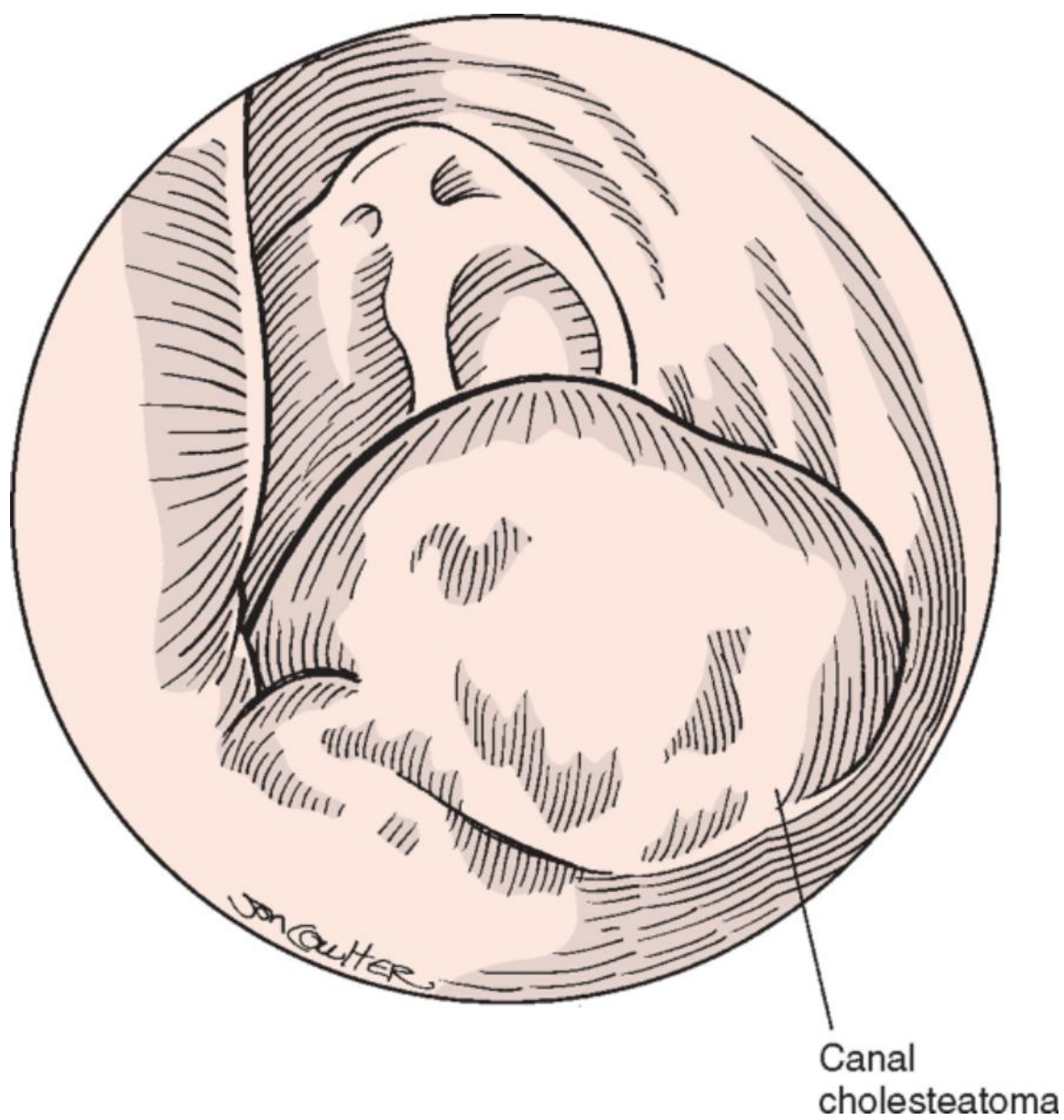
The chief distinction between keratoses obturans and canal cholesteatoma lies in circumferential widening of the bony canal in the former as opposed to focal bony erosion in the latter and visual determination of whether the canal epithelium remains intact or whether bone has become exposed. As yet, there is no clear understanding of the cause of the abnormalities in epithelial migration that characterize keratoses obturans and canal cholesteatoma. However, recent work on factors involved in the regulation of cell-cell adhesion and epithelial proliferation has begun to shed light on the molecular processes that may be involved.[8,9] Although this discussion is limited to idiopathic canal cholesteatomas, entrapment of squamous epithelium may occur in the setting of congenital or acquired canal atresia or after temporal bone trauma or surgery.



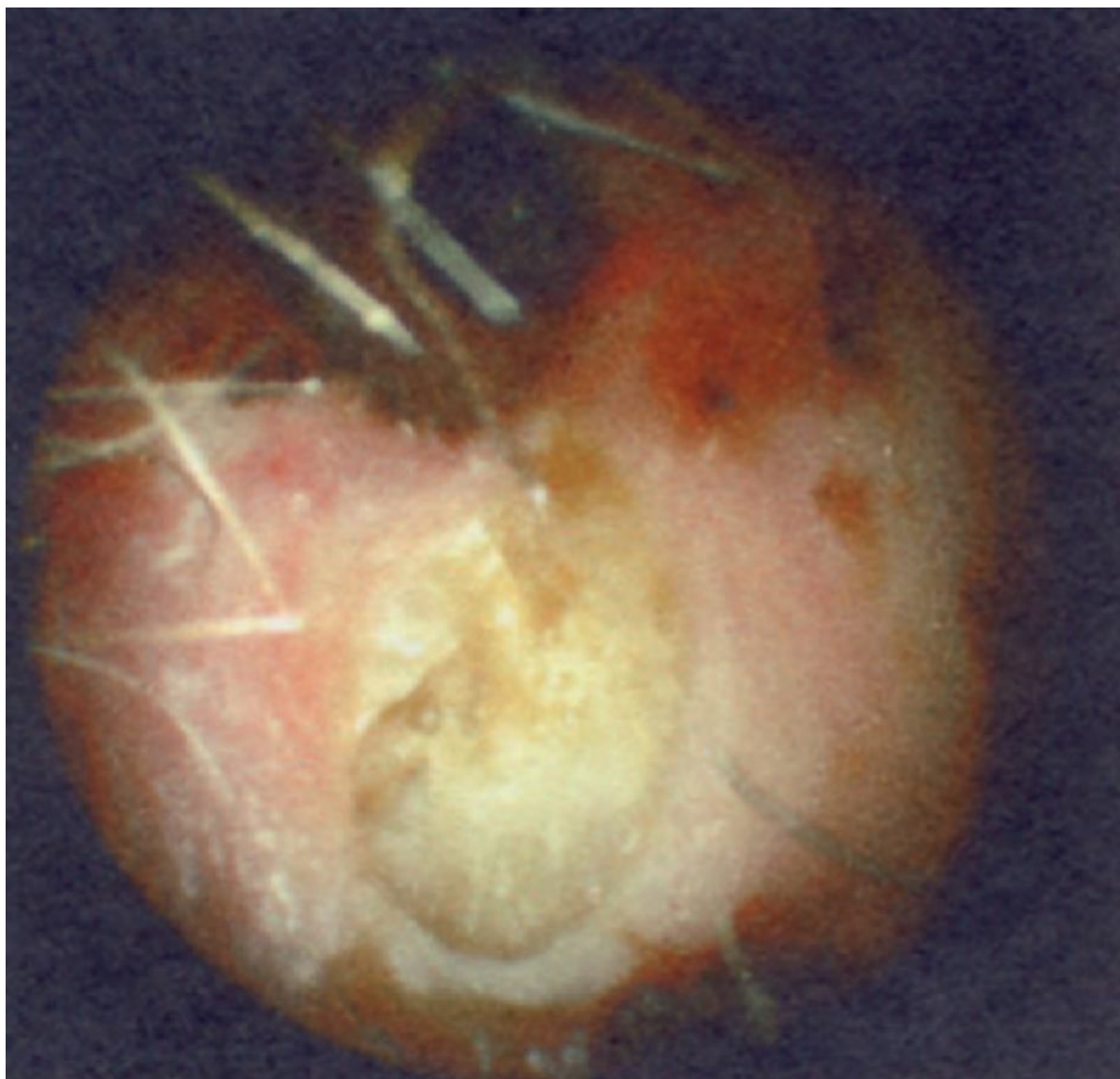
**Figure 110-1** A and B, Views of the external auditory meatus showing complete obstruction with a keratin plug.



**Figure 110-2** A and B, Keratin plugs after removal from the ear canals.



**Figure 110-3** Otoscopic view of a canal cholesteatoma forming in the inferior canal wall.



**Figure 110-4** Otoscopic view of exposed and eroded bone after removal of a cholesteatoma matrix.

## **PATIENT SELECTION**

Canalplasty has been described on rare occasions for intractable keratosis obturans<sup>[10]</sup>; however, conservative management suffices in most cases. Emollients and lubricants will aid in the removal of keratotic plugs, but no drugs have been found to successfully eliminate the problem. Steroid and exfoliative agents have been tried with limited success, but simple lubrication of the keratin plug before removal remains the most effective treatment. Over time, each patient will determine the correct interval necessary for serial canal cleaning to prevent hearing loss, obstruction, and secondary infection.

Small canal cholesteatomas can also be managed conservatively, provided that the patient is free of otalgia and the entire extent of the affected area can be visualized and accessed for cleaning. Even extensive canal erosion with bone exposure can be managed conservatively in elderly patients for long periods without resorting to surgical intervention. Significant otalgia is rare and permits consideration of surgery in patients with the following criteria: (1) those living at a great distance or who have difficulty traveling regularly for cleaning of the ear; (2) individuals with repeated bleeding from ulcerated skin margins and those in whom repeated secondary canal infections develop; (3) patients who electively wish a more permanent alternative to repeated cleaning of the ear canal; and (4) large lesions with involvement of the middle ear, facial canal, or mastoid air cells. Reassurance, as well as biopsy in cases of canal erosion, will suffice in the great majority of cases to satisfy patients that ongoing conservative treatment is the method of choice.

## **PREOPERATIVE EVALUATION**

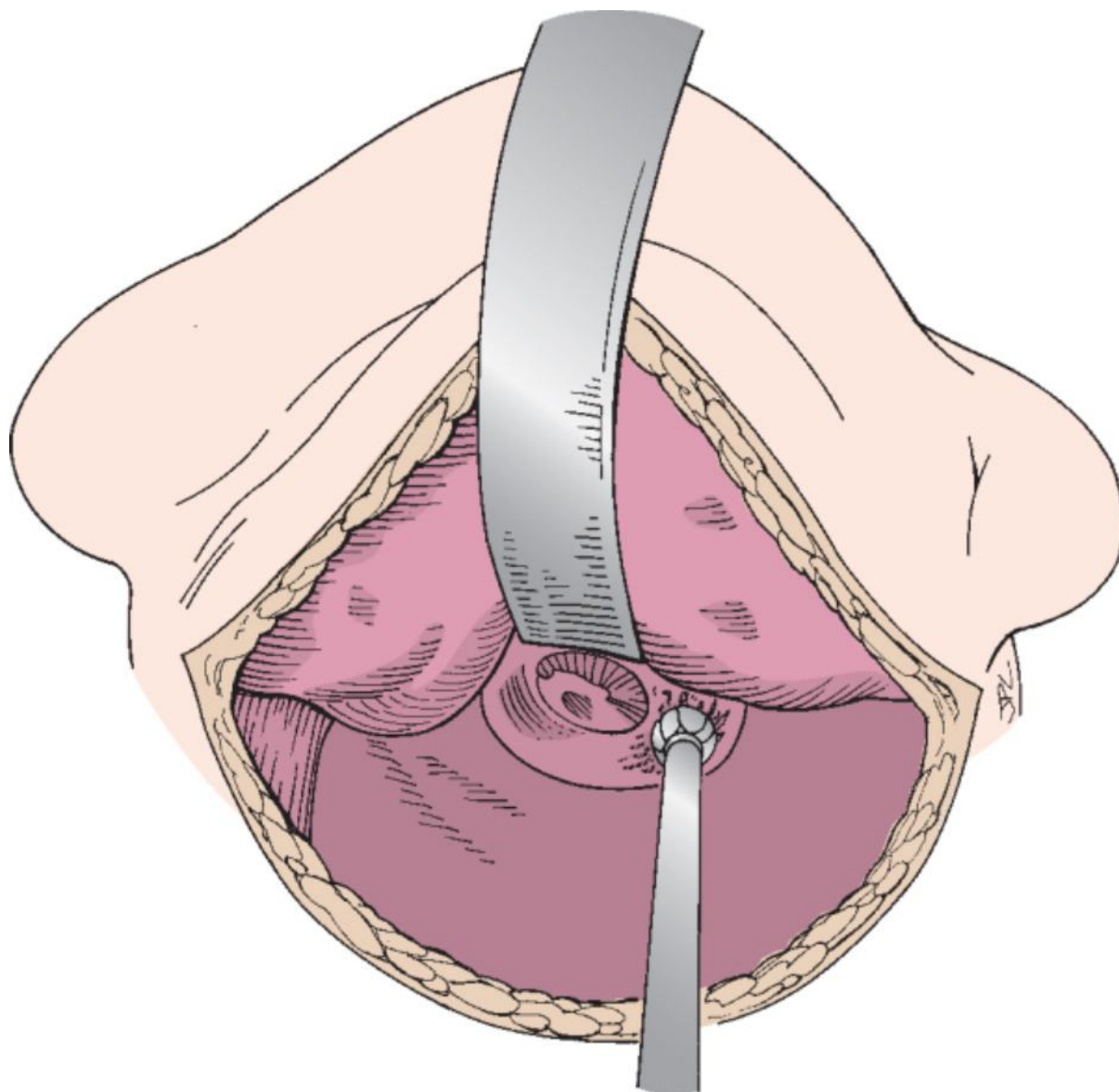
In large canal cholesteatomas, preoperative imaging with temporal bone computed tomography can be helpful in

determining the extent of involvement of mastoid air cells or the facial nerve canal and assist in deciding whether facial nerve monitoring will be necessary.

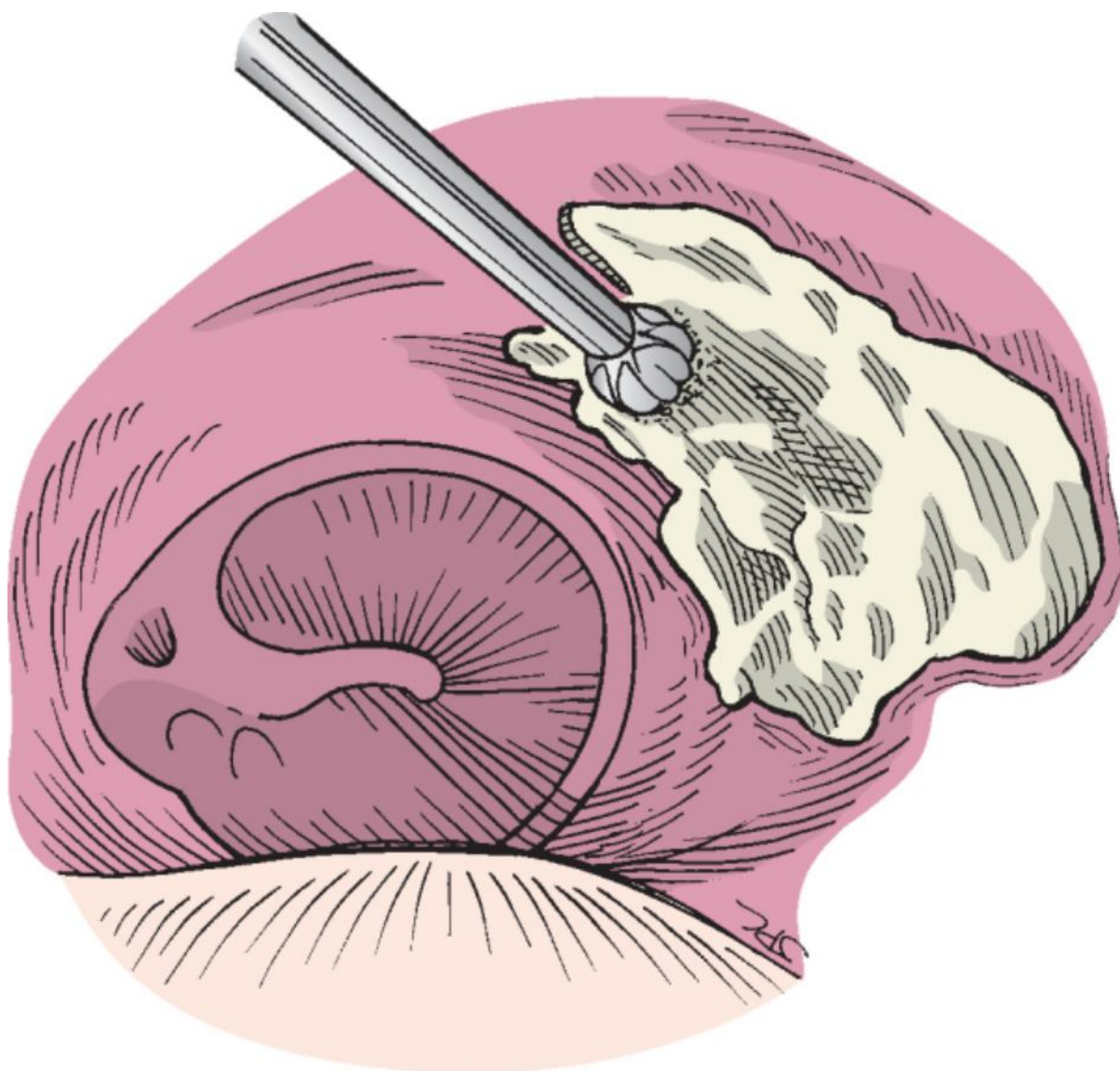
## **SURGICAL APPROACHES**

Local anesthesia is the method of choice in patients who elect to undergo surgery. The purpose of surgery is to remove infected or unhealthy skin, eliminate devitalized bone, smooth the contours of the bony canal, and finally, reline the denuded area of the canal.

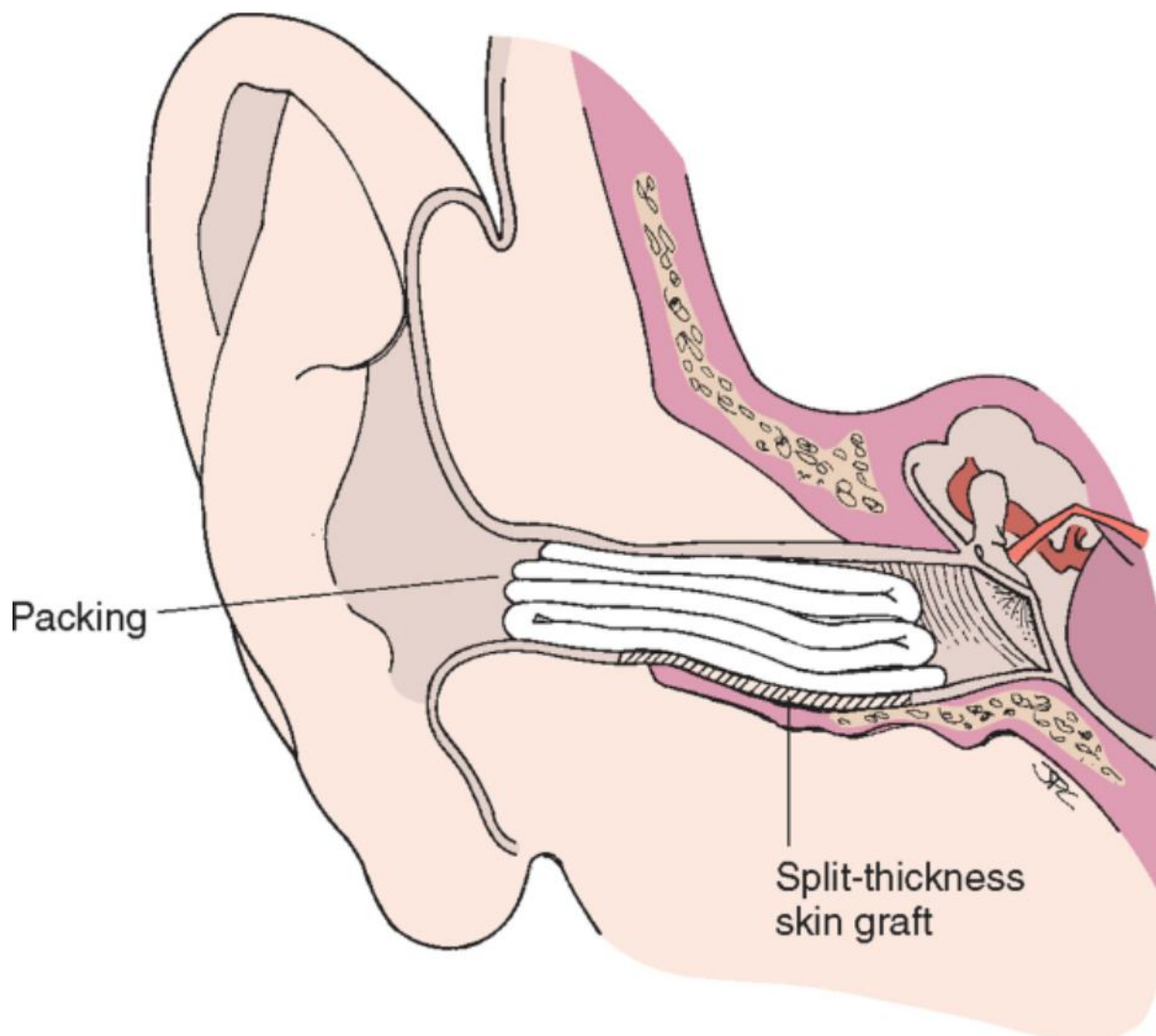
A postauricular approach provides the best exposure of the affected canal. The postauricular incision is combined with a short conchal flap extending to the level of the defect in the canal. The auricle is then reflected anteriorly in the standard tympanoplasty-mastoidectomy fashion (Fig. 110-5). After exposing the area of canal erosion, unhealthy tissue is débrided from the epithelial border, and the skin adjacent to the defect is reflected medially for optimal exposure. Appropriately sized cutting and diamond burrs are then used to removed devitalized bone and smooth the contours of the canal defect. Bone is removed until healthy bleeding osseous tissue is encountered (Fig. 110-6). Lesions of the posteroinferior canal may extend into the mastoid air cells. When the cells are of sufficient size, they should be obliterated with fat or fascia before applying the skin graft. At this point, the area of denuded bone is determined. If minimal coverage is required, the bony canal can be lined with temporalis fascia. Extensive areas of bone exposure can be resurfaced with a split-thickness skin graft approximately 0.012-inch thick. The authors prefer the upper inner aspect of the arm as a donor site, but other convenient areas may be used as well. It is seldom necessary to take more than about 1 square inch of skin for repair of canal defects of this type. Previously elevated skin flaps in the canal are replaced, and the conchal flap is returned to its original position. After the skin graft is placed over the defect, a strip of silk or rayon mesh is laid over the graft to protect and prevent movement of it. Finally, continuous packing soaked in antibiotic ointment is gently layered into the canal (Fig. 110-7). The postauricular incision is then closed and dressed in the usual manner.



**Figure 110-5** Postauricular approach for resculpting and grafting of a canal wall defect.



**Figure 110-6** Use of cutting and diamond burs to remove sequestrum and expose fresh, viable bone.



**Figure 110-7** Packing is placed in the canal to stabilize the split-thickness skin graft.

Larger canal cholesteatomas involving significant exposure of the mastoid air cells may require reconstruction of the canal wall (i.e., with hydroxyapatite) or a modified radical mastoidectomy. Facial nerve monitoring should be considered for these lesions because the cholesteatoma can erode into the facial canal.

### **POSTOPERATIVE MANAGEMENT**

The packing is removed in 10 to 14 days, and simple débridement of the skin edges is carried out until healing is complete. It is rare for canal cholesteatomas to recur, but desquamation from the skin graft site may continue for a period of several months. During this time, the application of mineral oil in small amounts will prevent desquamated epithelium from accumulating. Healing is usually complete within 6 to 10 weeks.

### **COMPLICATIONS**

Complications include facial nerve injury, recurrence of cholesteatoma, injury to the tympanic membrane or malleus, and persistent exposed bone. The facial nerve is particularly at risk when drilling in the medial, postero-inferior aspect of the canal and caution is required in this region. If the mastoid air cell system is entered, skin may grow through the defect resulting in a fistula or recurrent cholesteatoma. This can be prevented by using fat, fascia or cartilage to obliterate the exposed cells. If the pathology is located medially, the tympanic membrane or malleus may be injured during drilling of the bony canal. The surgeon must be mindful of the deep aspect of the rotating burr and downsize appropriately to avoid iatrogenic hearing loss or a perforation. Assuring the removal of all devitalized bone, as well as careful positioning of an adequately sized graft, can help prevent incomplete epithelialization.

### **PEARLS**

- It is important to remove all devitalized bone because failure to do so will lead to loss of the overlying skin graft. Bleeding must be seen from all newly freshened bone surfaces to ensure an adequate nutritional bed for the graft.
- Histologic examination of skin edges must be performed to rule out malignancy.
- Desquamation from the skin graft may continue for several months postoperatively and requires frequent débridement until healing is complete.

#### **PITFALLS**

- Extensive drilling of the posteroinferior canal wall may expose the vertical portion of the facial nerve, and thus caution must be exercised in this region.
- Otorrhea or recurrence of canal cholesteatoma may result if the mastoid air cells are not obliterated with fat or fascia before skin grafting.
- Preoperative consent for harvesting of a split-thickness skin graft should be obtained lest the operating room staff be caught unprepared in the event that an extensive area of bony exposure is encountered.

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