

Chapter 109 – External Canal Osteomas and Exostoses

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The contour of the cartilaginous and bony external auditory canal is S shaped. Direct inspection of the tympanic membrane may be obscured by a prominent anterior canal wall forming an acute angle with the tympanic membrane. Normal aural hygiene is facilitated by epithelial migration from the tympanic membrane to the external auditory meatus. Irregular bony overgrowth may impede this process and predispose the ear to epithelial entrapment and recurrent otitis externa.

Exostoses of the external auditory canal represent hyperplasia of the periosteum and underlying bone. When exostoses are present, they are typically seen in men, and a history of cold-water swimming can frequently be obtained. Examination of 307 surfers at a California surfing competition revealed a 73.5% prevalence of exostoses.^[1] In a recent study of 202 avid surfers on the east coast of the United States, the prevalence and degree of canal obstruction were assessed. Their surfing habits (location/water temperature) and duration of practicing the sport were recorded, along with the patency of their ear canals. Most of the surfers (84%) were categorized as warm-water surfers (>60° F). There was a 38% overall prevalence of external canal exostoses, with 69% graded as mild and 31% as moderate to severe. Those participating in the sport for a longer time and exposed to cold water had a much greater incidence of exostoses. In addition, surfers with moderate to severe obstruction were significantly more willing to surf in cold water than those who had mild exostoses.^[2]

Occasionally, patients will deny any water exposure yet will still manifest these bony overgrowths. Exostoses are usually multiple in number and have a smooth contour. They are broad-based, convex, epithelium-covered nodules located in the medial aspect of the external auditory canal (Fig. 109-1). These lesions are typically found bilaterally. Dense lamellae of bone are evident histologically.^[3]

Osteomas are benign bony lesions of unknown origin that have an outer cortex of bone with inner cancellous trabeculations. Osteomas are singular, pedunculated, unilateral lesions generally located at the tympanomastoid or tympanosquamous suture lines. Osteomas may vary in size from a few millimeters to larger than 2 cm (Fig. 109-2).^[4]

Exostoses are relatively common and are seen in 6.36 of every 1000 patients treated by ear, nose, and throat departments, in contrast to the rare incidence of osteomas. Osteomas are to be considered true bone tumors, and exostoses are believed to be reactions to irritation from cold-water immersion or chronic otitis externa. However, in a histopathologic review by Fenton and coworkers, many of the features of trabeculated bone, such as lamellar deposition of bone and fibrovascular channels, were seen in specimens clinically diagnosed as osteoma and exostoses.^[5]

Osteomas and exostoses are usually asymptomatic. They are often identified by an internist or family practitioner, who subsequently requests otologic consultation. Significant canal obstruction or chronic skin changes initiate recurrent ear symptoms. Osteomas or exostoses that significantly encroach on the canal lumen may impede migration of desquamated epithelium, thereby predisposing the patient to recurrent episodes of otitis externa. Both lesions, when extensive, may produce hearing loss by either occlusion of the canal or impacted epithelial debris inhibiting vibration of the tympanic membrane. Exostoses usually encroach on the external auditory canal in an anteroposterior direction. Superiorly based lesions located near the pars flaccida may grow inferiorly and restrict movement of the malleus. It is estimated that approximately 80% of the ear canal needs to be obstructed to cause symptoms of recurrent otitis externa and conductive hearing loss. Occlusion less than this degree rarely necessitates operative intervention.^[6]

Recurrent otitis externa occurs when epithelial debris is trapped between the tympanic membrane and osteoma and becomes macerated and colonized with bacteria. Débridement of the external auditory canal and the use of topical otic preparations are necessary for each acute infectious episode. These recurrent infections frequently result in chronic dermatitis and further canal obstruction.

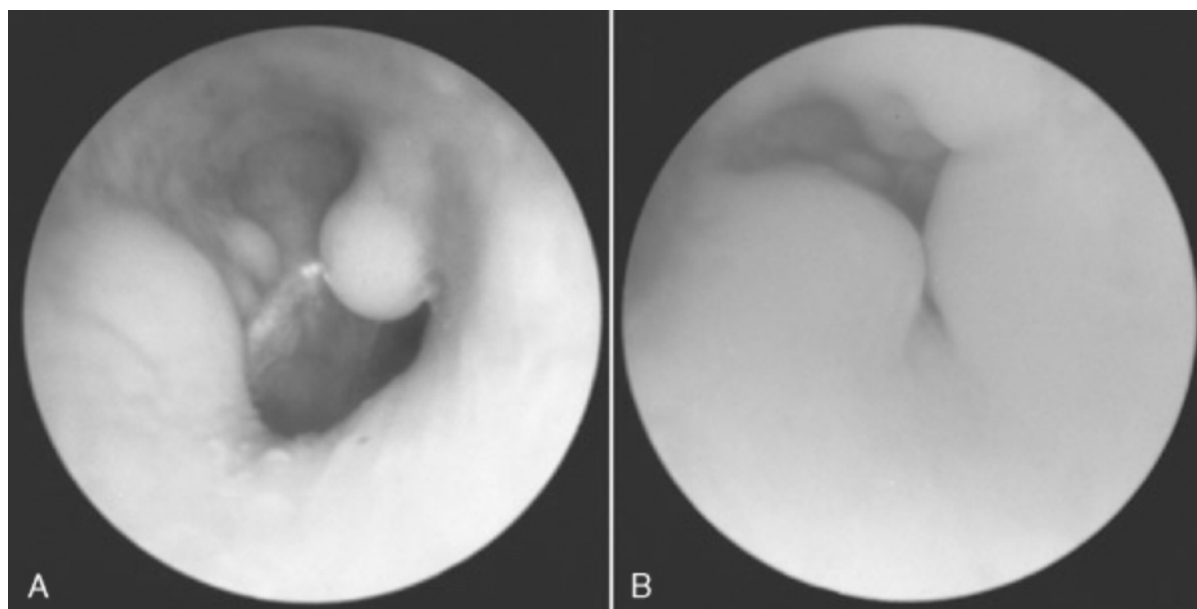


Figure 109-1 A, View of the right external auditory canal revealing multiple broad-based exostoses located medially near the tympanic membrane. B, Left external auditory canal with multiple obstructing exostoses obscuring the tympanic membrane.

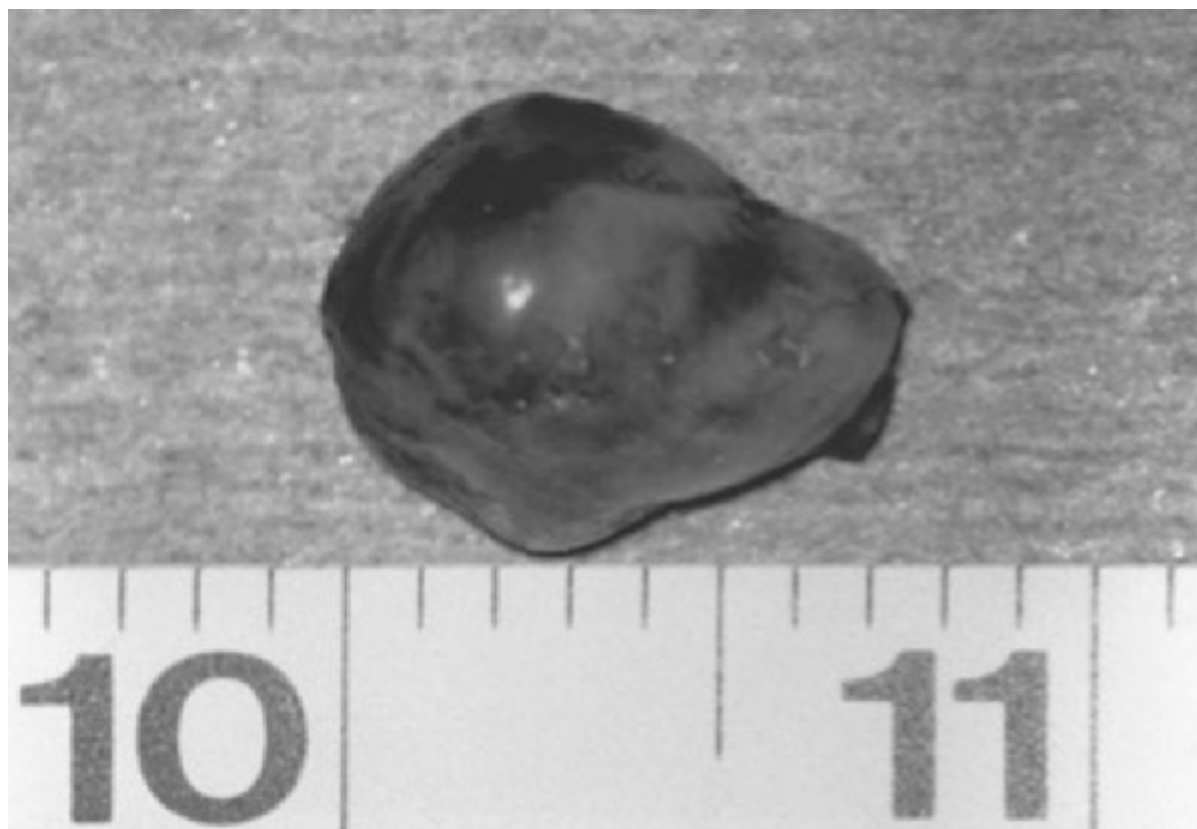


Figure 109-2 Excised osteoma of the external auditory canal with its narrow pedicle located on the right side of the bony tumor.

PATIENT SELECTION

Surgical intervention is not usually necessary when exostoses or osteomas are identified. Periodic cleaning of cerumen and epithelial debris medial to the lesions may be necessary. The prophylactic use of eardrops is recommended for patients who are continually exposed to water. Swimming without ear protection may have to be curtailed if it is the predisposing event for recurrent infections. Surgical intervention is indicated when patients experience chronic or recurrent otitis externa or when reaccumulation of epithelial debris and cerumen impaction cause conductive hearing loss.

Surgical treatment of external auditory canal exostoses may be associated with complications and the need for revision surgery. Initial symptoms include hearing loss, recurrent otitis externa, and cerumen impaction. In a series of 136 patients undergoing surgery for exostoses, it was found that 21% had no symptoms and were advised to have surgery based on their clinical examination. The author of this review emphasized that surgery should be reserved for patients with ear symptoms because, even in experienced hands, surgery is associated with a potential risk for complications.^[7]

Patients with a perforated tympanic membrane or conductive hearing loss from ossicular chain problems, in addition to exostoses, may have to undergo a staged procedure. The obstruction of the external auditory canal and recurrent infection may need to be addressed initially, and after subsequent healing, the second procedure may be performed.

PREOPERATIVE PLANNING

Patients undergoing surgery for recurrent otitis externa should have optimal preoperative medical care, including cleaning of the external auditory canal and minimizing inflammation with topical otic preparations. An audiogram is necessary to determine the presence and degree of conductive or sensorineural hearing loss. If symptoms are present bilaterally, surgical intervention is directed at the more involved ear. In the event of significant bilateral disease, the procedure should be staged to ensure unilateral healing and avoid the handicap of bilateral ear packing.

On occasion, lesions may totally obstruct the ear canal and thus prohibit examination of the tympanic membrane. In this situation, computed tomography is necessary to define the origin and extent of the bony lesions, particularly with osteomas located laterally in the canal (Fig. 109-3). Coronal and axial bone window images assist the surgeon in identifying the lesion and the appropriate approach (Fig. 109-4). The radiologic characteristics differentiating osteomas from exostoses have been described. An osteoma arises from the tympanosquamous or tympanomastoid suture line, and its density is slightly lower than that of normal bone, which suggests that it consists of mainly cancellous bone.^[8] An isolated osteoma, as demonstrated, may easily be removed with the patient under local anesthesia. Obstructive exostoses that require drilling are performed with the patient under general anesthesia. Removal of multiple large irregular exostoses may result in trauma to the canal epithelium. If the canal skin is not suitable for replacement or is inadequate at the time of surgery, it may be necessary to harvest a split-thickness skin graft (Thiersch graft). Along with informed consent for the canal procedure, patients should be told of the possible need for a skin graft.

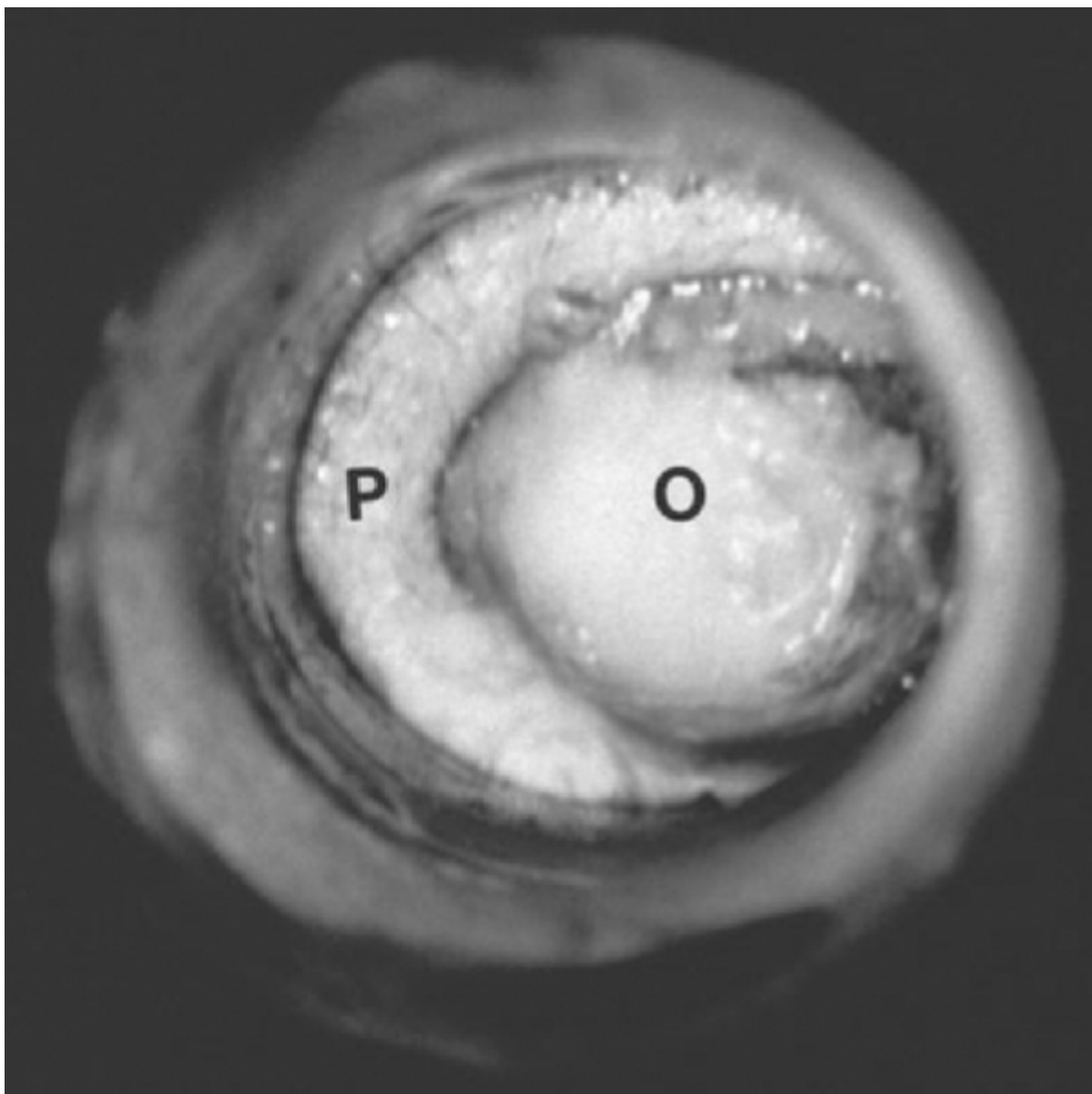


Figure 109-3 Right external auditory canal with a posteriorly based osteoma (O) obstructing complete examination of the medial canal and tympanic membrane. P, posterior.

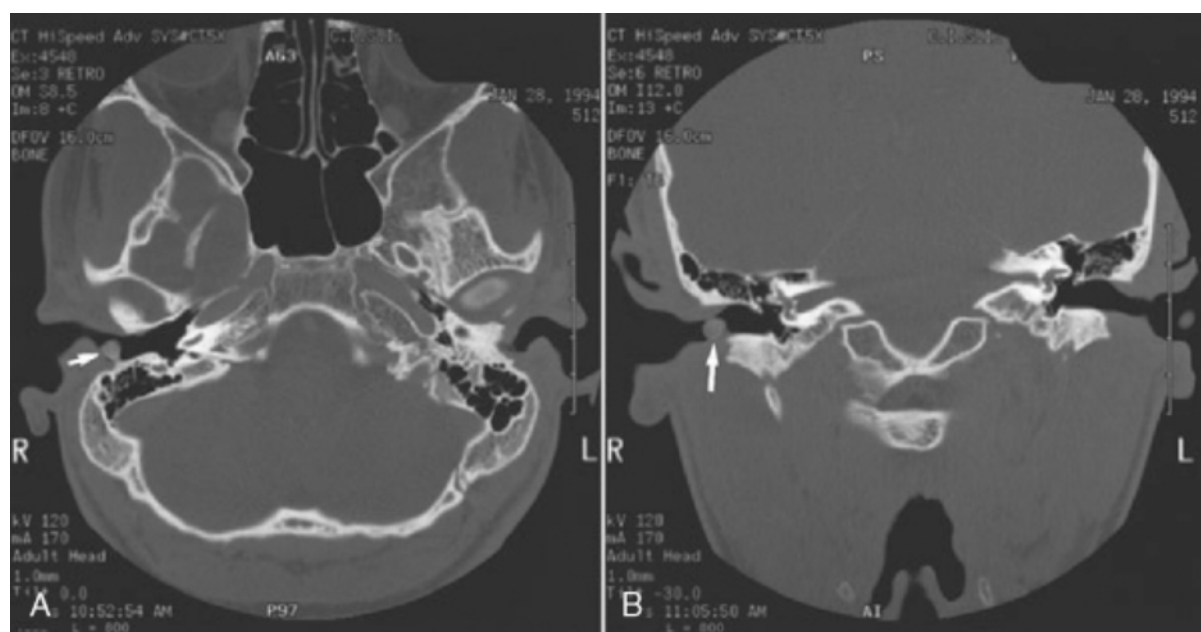


Figure 109-4 Axial (A) and coronal (B) bone-windowed computed tomography images demonstrating a pedunculated attachment to the lateral posterior canal wall (arrows). The remaining external auditory canal and middle and inner ear are normal.

SURGICAL TECHNIQUE

The pedunculated attachment of osteomas to suture lines in the external auditory canal can be removed through a transmeatal approach. A four-quadrant block consisting of an anesthetic solution of 2% lidocaine (Xylocaine) with 1:100,000 epinephrine is injected into the external auditory meatus. After adequate local anesthesia has been achieved, a middle ear curette or right-angled hook is passed beyond the osteoma. If exposure is inadequate for visualization or instrumentation, the soft tissue at the incisura at the 12-o' clock position may be compressed or incised to permit passage of an instrument beyond the osteoma (Fig. 109-5). An overlying skin flap can be incised and preserved if the osteoma is attached by a broad base (Fig. 109-6A and B). If the osteoma is on a narrow pedicle, the osteoma can usually be fractured with a curette and removed. Occasionally, it may be necessary to use a small osteotome or drill to weaken the base. Once the osteoma is removed, the bony base is further drilled to the level of the bony external canal. A small strip of silk or a piece of Gelfoam impregnated with antibiotic ointment is used as a topical dressing (see Fig. 109-6C).

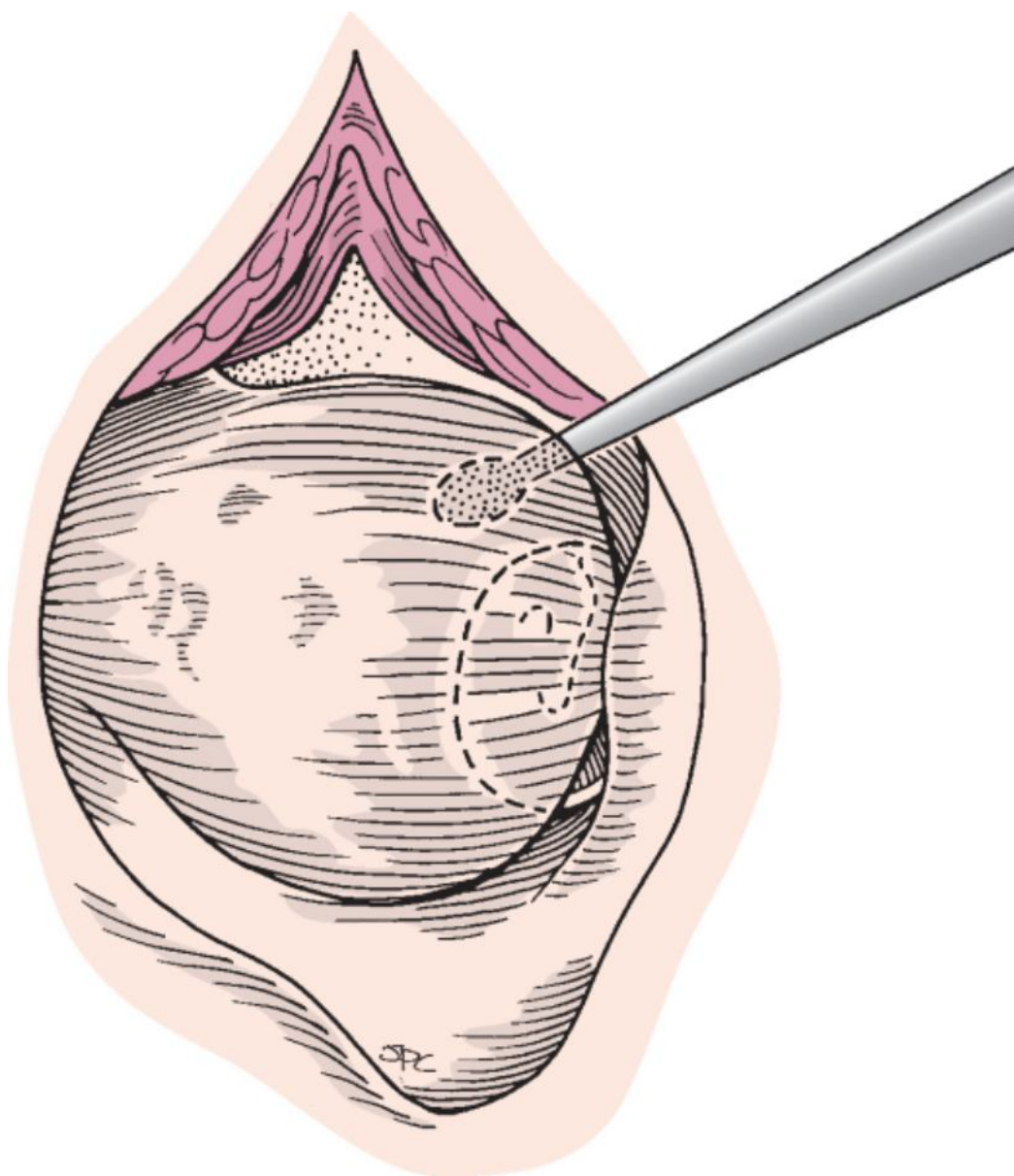


Figure 109-5 An incision made in the incisura widens the aperture to the external auditory meatus. A curette is positioned medial to the osteoma in preparation for removal. The tympanic membrane is ghosted in.

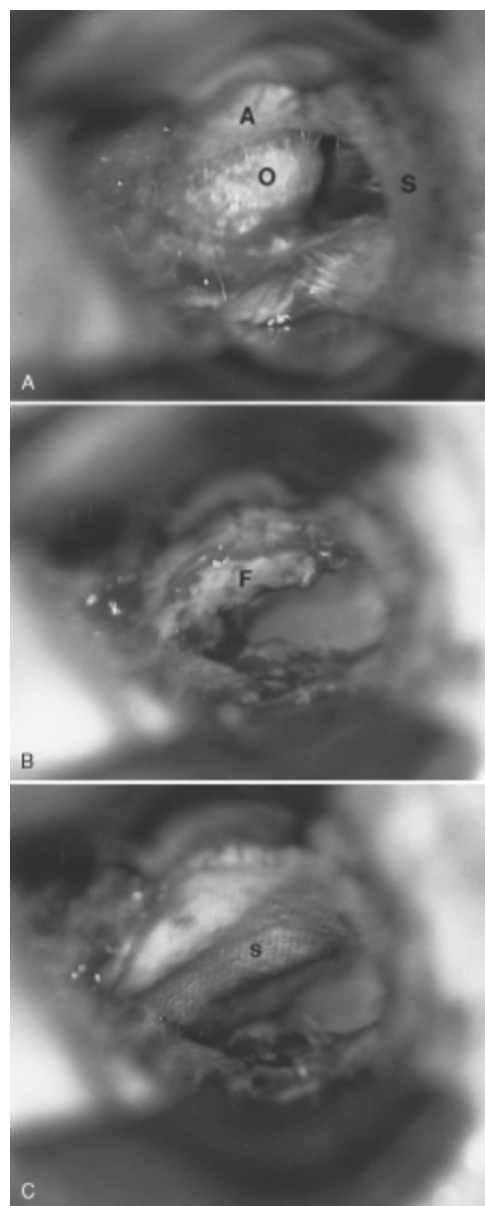


Figure 109-6 **A**, Broad-based osteoma (O) of the left ear located on the anterior external auditory canal wall. A, anterior; S, superior. **B**, A skin flap (F) based medially was created and returned to cover the exposed bone. **C**, A strip of silk (S) is positioned on the anterior canal wall to secure the skin flap.

Exostoses are generally multiple and broad based. Greater surgical exposure routinely requires a postauricular approach, usually performed with the patient under general anesthesia. The postauricular hair is shaved and the ear is prepared and draped in the usual sterile fashion. A solution of 2% lidocaine with 1:100,000 epinephrine is injected in a four-quadrant block into the external auditory meatus and the postauricular crease. The exposure and approach are similar to those used for postauricular tympanoplasty techniques (see Chapter 113). Endaural incisions in the 12- and 6-o' clock positions are made in the lateral meatus and connected vertically to create a conchal flap. The medial extent of the skin flap extends approximately 3 to 4 mm beyond the hair-bearing canal (Fig. 109-7). A postauricular incision is made, the conchal flap is elevated from the lateral posterior canal wall, and the two incisions are connected. A tracheostomy tape is used to reflect the conchal flap with the external auditory meatus anteriorly (Fig. 109-8). A self-retaining retractor holds the auricle and posterior conchal skin flap anteriorly to provide direct exposure to the more medial canal.

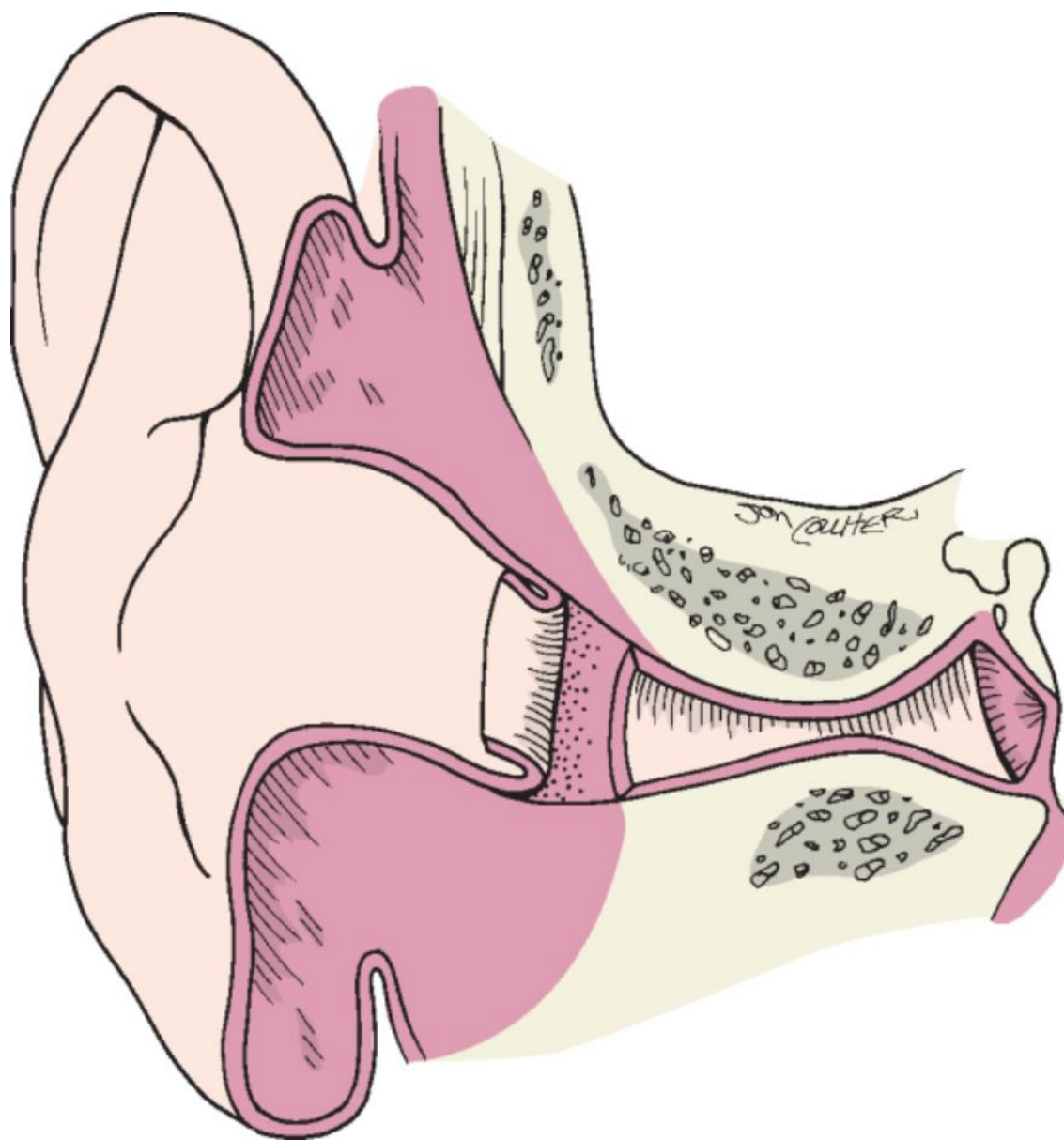


Figure 109-7 Through the external auditory meatus, a conchal flap is incised and back-elevated. Note the narrowed bony canal medially.

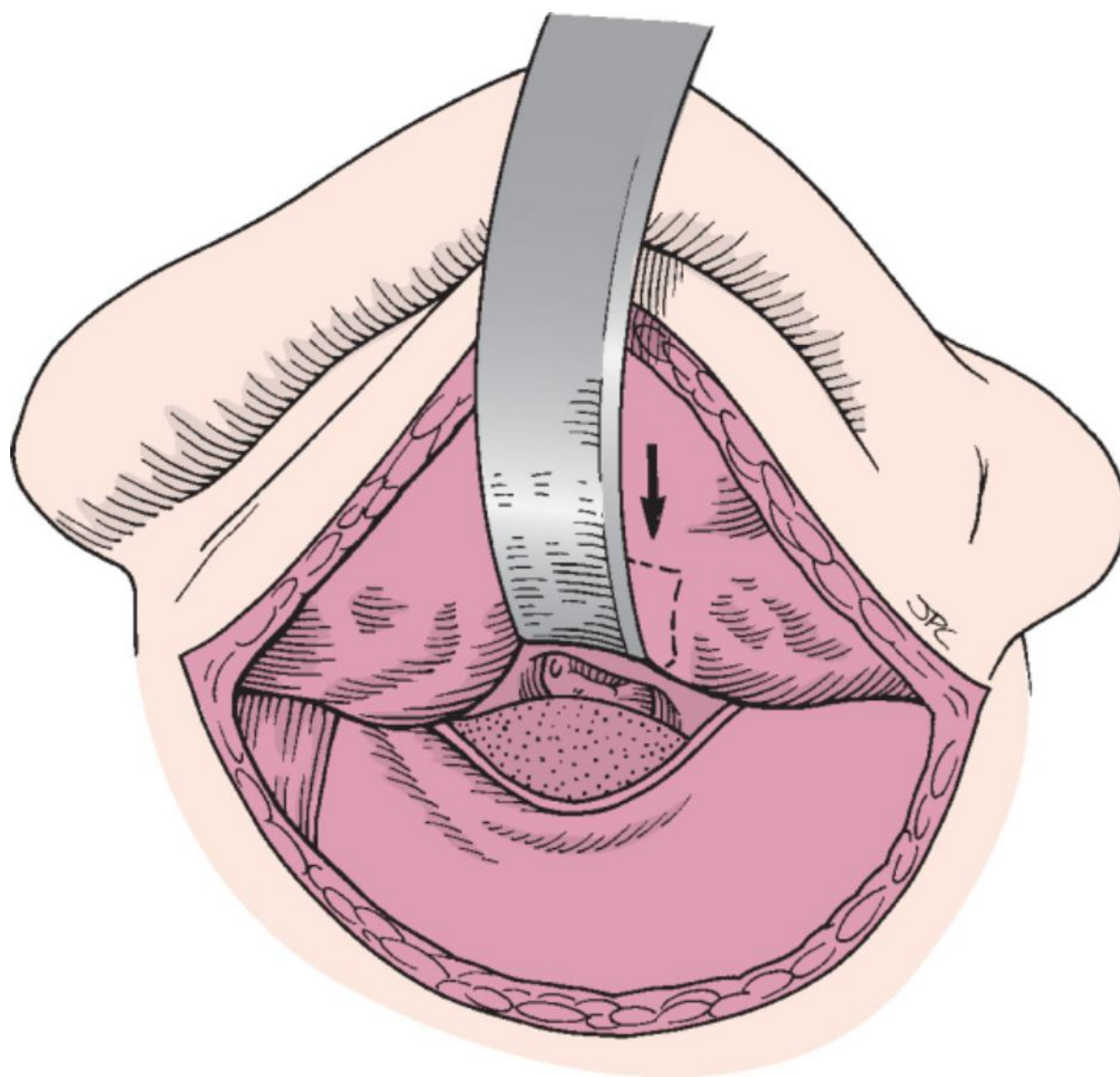


Figure 109-8 A postauricular incision has been made and a tracheostomy tape is placed to evert the conchal flap within the canal (arrow). A self-retaining retractor (not shown) provides the necessary exposure.

Skin flaps based medially are carefully dissected from the anterior and posterior canal walls. A medium-sized cutting burr is used to remove the bony exostoses while leaving a thin shell of bone attached to the canal skin. Dissection is performed in a lateral-to-medial direction toward the tympanic membrane. The suction tip is used to protect the canal skin flap from the shaft and burr of the drill. If space permits, thin Silastic sheeting or a section of foil from a suture pack is positioned to provide additional protection to the canal wall skin (Fig. 109-9). As the bony overgrowth is removed, direct examination of the tympanic membrane becomes feasible. Once exposure is gained, the flap is returned to its newly contoured canal and the opposite wall is treated in a similar fashion. A thick, crescent-shaped section of bone often remains at the medial aspect of the dissection. Care is taken to further elevate the medially based skin flap distal to this shelf of bone as it approaches the tympanic membrane. The remainder of the bone is removed to create a smoothly contoured canal. More aggressive bone removal can be undertaken anteriorly. Because such bone removal encroaches on the posterior aspect of the temporomandibular joint, care must be taken to avoid trauma to the periosteum surrounding the joint capsule. Medium and small diamond burrs are used to further smooth the walls of the bony canal. Care is taken to avoid drilling into the tympanic membrane, the bony lateral process of the malleus, and the tympanic annulus. Aggressive drilling of the posterior canal wall can lead to injury to the mastoid air cells and should be avoided.

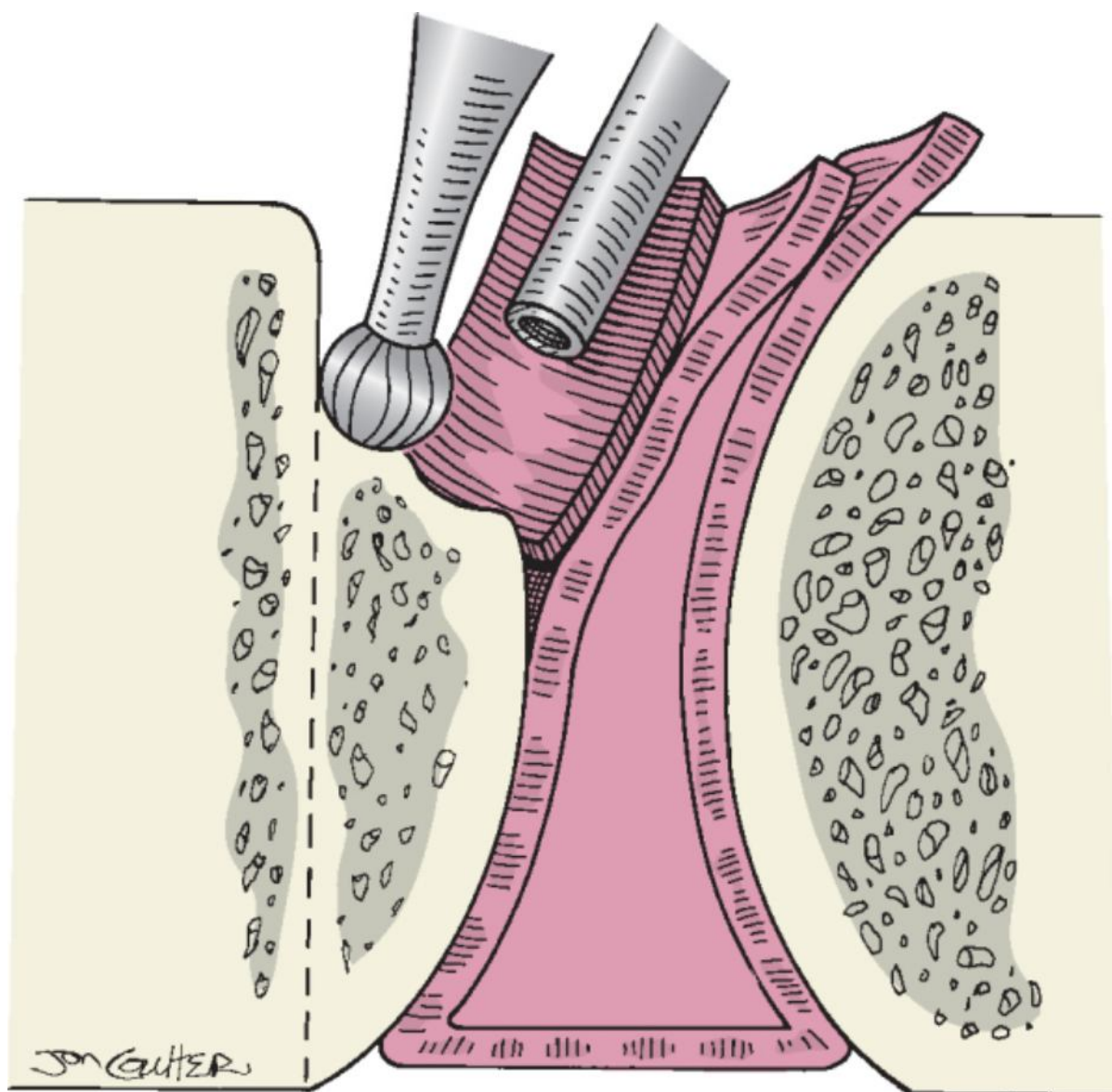


Figure 109-9 Beginning laterally, the posterior canal wall skin is elevated and protected with a sheet of suture pack foil or Silastic. The suction tip is used to retract the skin and maintain a clean surgical field. The bony exostosis is drilled to contour the canal.

It may be difficult to leave the anterior or posterior skin pedicled medially. Should additional bone work be necessary in an area obstructed by the skin flap, rather than tearing it with the drill burr or shaft, the skin can be removed in a large rectangular section to provide the exposure needed. The skin can subsequently be replaced when the bony canalplasty is completed.

Once drilling is completed, the skin is repositioned, although it is not necessary to completely cover all areas of denuded bone. If the skin flaps have been preserved, they are adequate for epithelial coverage. However, large areas of exposed bone should be grafted to facilitate more rapid and uncomplicated healing. Freehand split-thickness skin sections (Thiersch grafts) measuring approximately 1.0 by 1.5 cm are harvested with a no. 10 blade from the postauricular skin overlying the mastoid (Fig. 109-10). The feathered edges of the skin graft are trimmed sharply. The grafts are placed over areas of raw bone while avoiding overlapping the edges of the surrounding skin. It is necessary to secure the skin flaps (and grafts) by packing the medial and lateral canal. If the original canal skin was pedicled and preserved, the canal can be packed with a single Merocel stent (Fig. 109-11). When the original skin or graft is replaced in sections, firm reapproximation and immobilization are achieved with rosebud packing, which consists of multiple strips of silk placed in the ear canal. Cotton or Merocel balls impregnated with antibiotic ointment are placed in the depth of the packing and brought out to the level of the midcanal. The ear is returned to its anatomic position, the conchal flap is repositioned, and a second rosebud packing is placed (Fig. 109-12) (see Chapter 113). The postauricular wound is closed with 5-0 fast-absorbing suture and Steri-Strips. A cotton ball is placed in the external meatus, and a Glasscock or sterile mastoid dressing is applied.

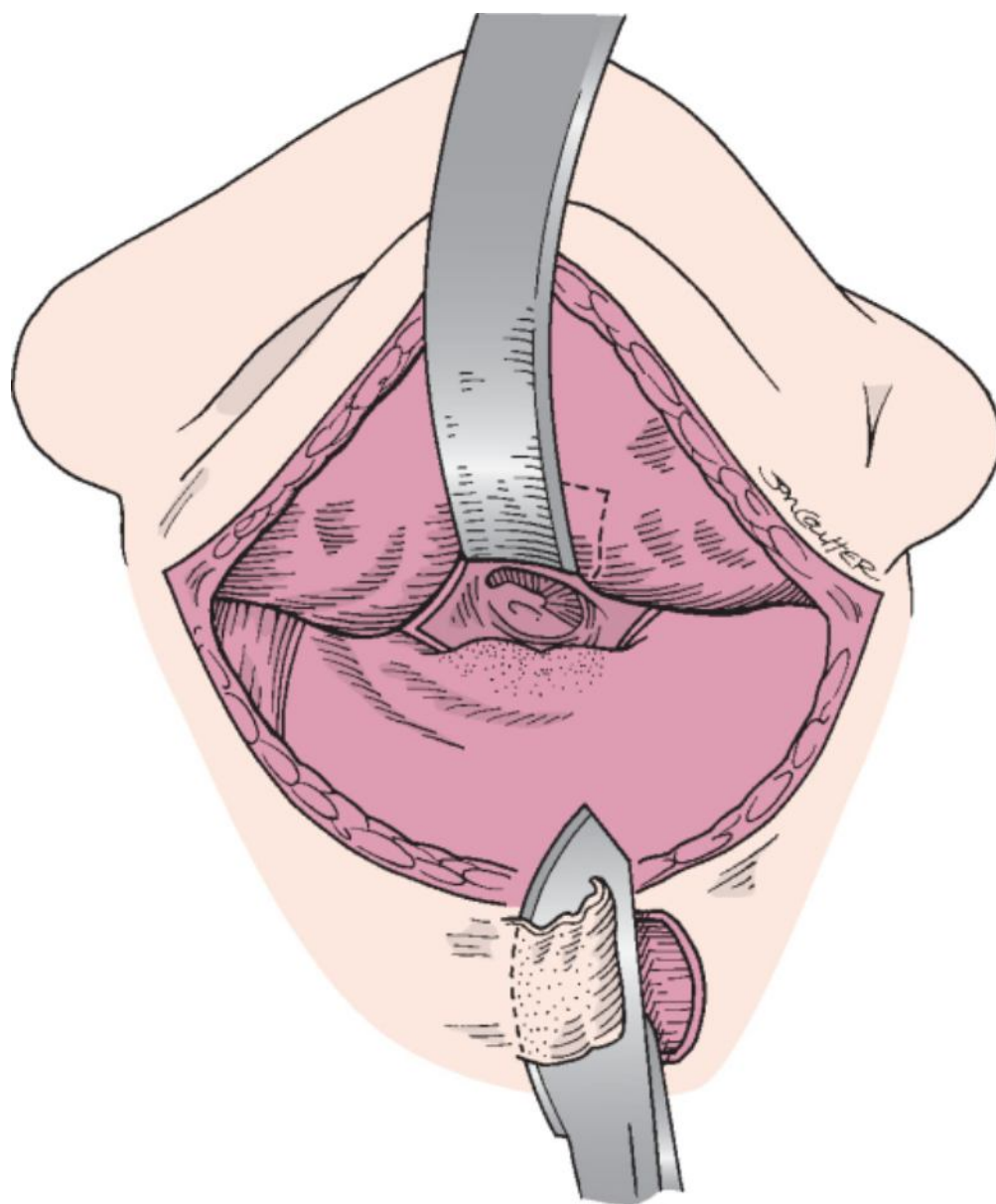


Figure 109-10 Excessive loss of canal skin should be replaced. A freehand split-thickness Thiersch graft is harvested from the postauricular skin overlying the mastoid.

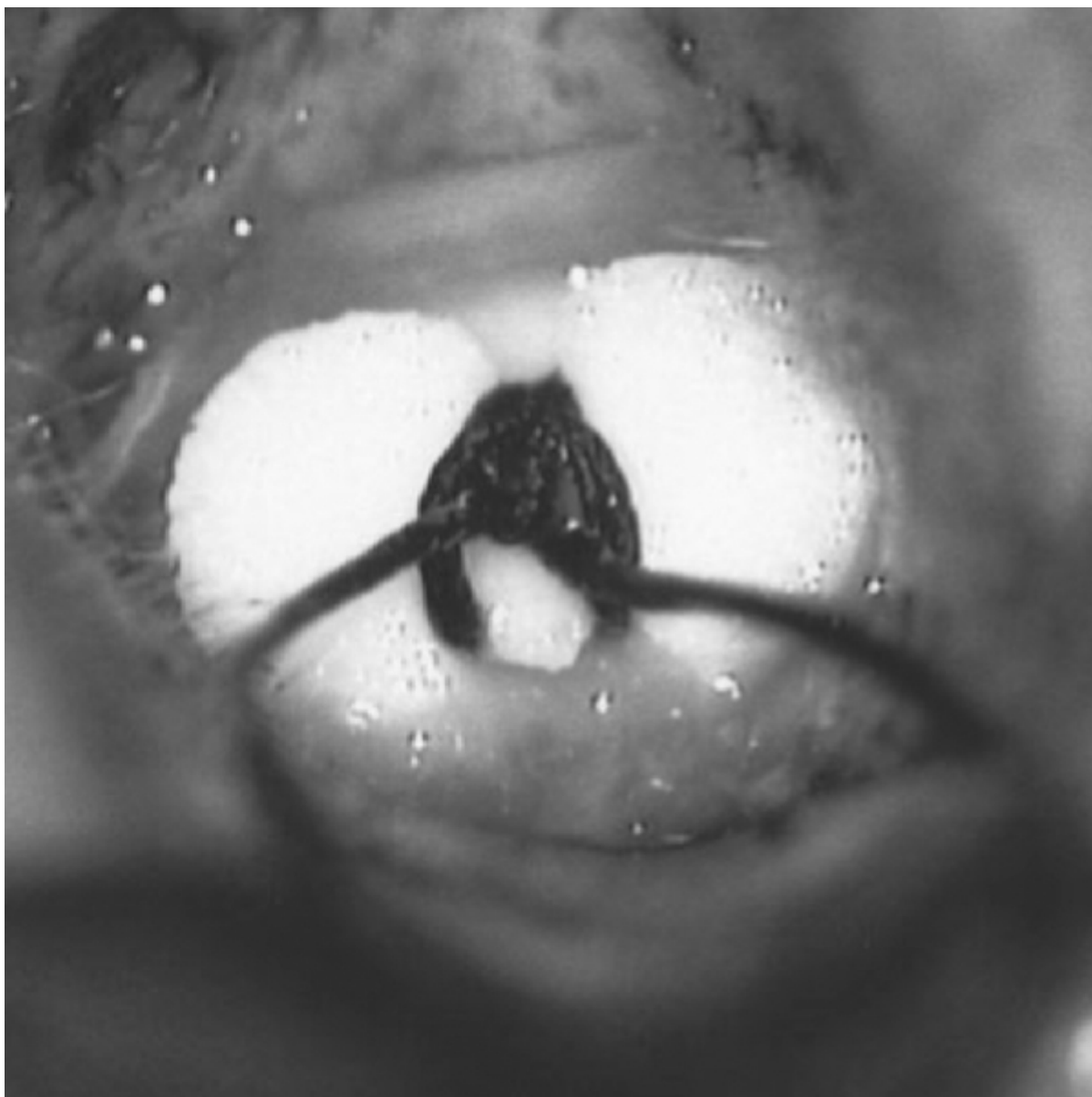


Figure 109-11 A Merocel ear pack secures the canal wall skin flaps.

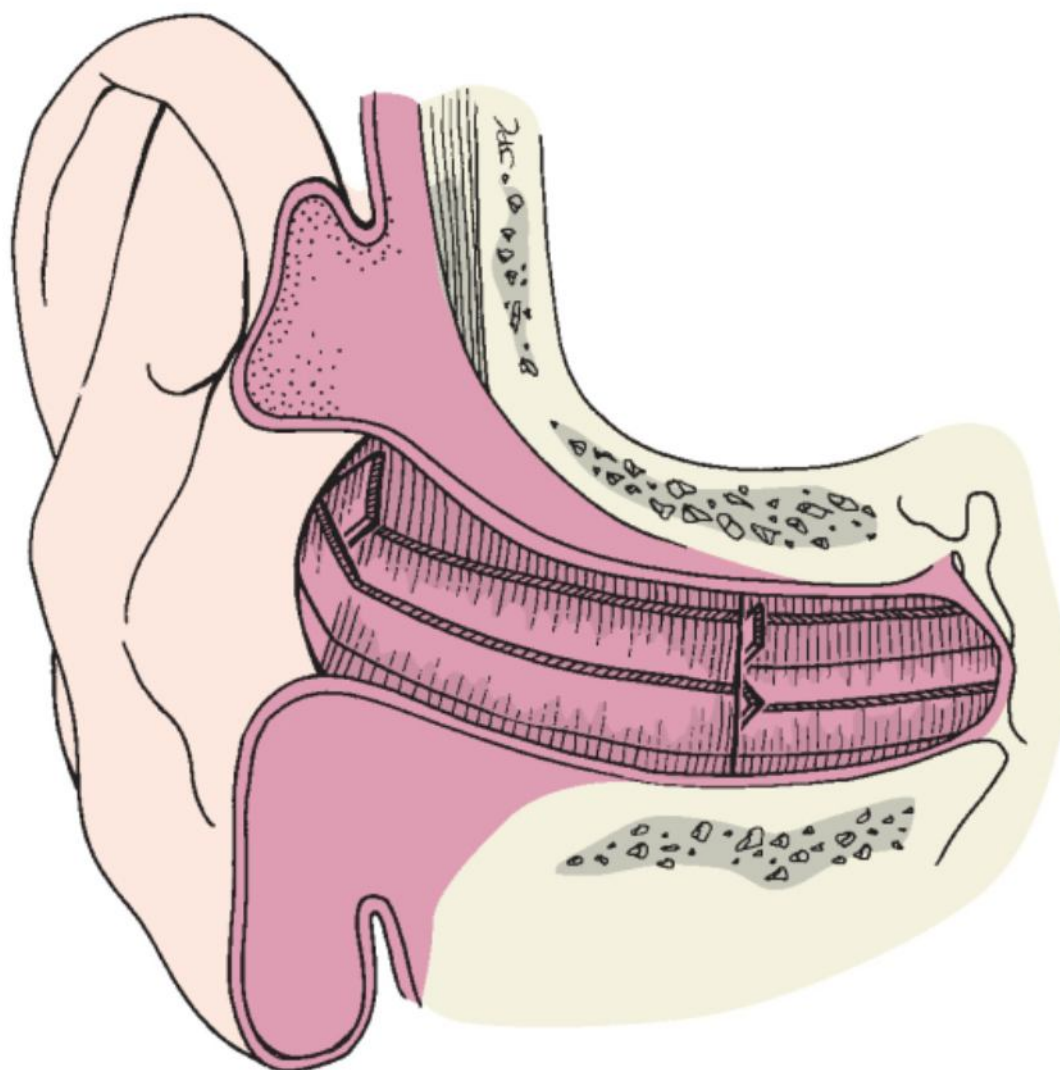


Figure 109-12 Double-rosebud packing is used to secure skin that was replaced in sections.

The routine method for removing these bony lesions is to use a high-speed otologic drill. Some surgeons advocate the use of a mallet and a thin 1- to 3-mm chisel or osteotome. It has been proposed that the bony mass can be serially shaved with these instruments. This technique may also minimize noise and vibration trauma from the drill.^[6,9]

Rather than completely removing all the exostoses from both the anterior and posterior canal walls, an alternative strategy is to address only exostoses of the anterior wall of the external auditory canal. This still places the temporomandibular joint at risk but minimizes complications related to disruption of the ossicular chain and injury to the chorda tympani and facial nerve.^[10]

POSTOPERATIVE MANAGEMENT

Systemic antibiotics are not administered unless there is concern for ongoing low-grade chronic infection and cellulitis. Patients undergoing a postauricular approach have the mastoid dressing removed the following morning. Oral narcotic analgesics are prescribed when necessary. The cotton ball in the conchal meatus may need to be changed frequently in the first few postoperative days, depending on the amount of serosanguineous drainage. Antibiotic-steroid eardrops are administered twice daily. After 7 to 10 days, patients are seen for follow-up. Sutures and the lateral rosebud packing are removed from those who have undergone postauricular canalplasty. Antibiotic-steroid eardrops are continued twice a day, and the patient is seen the following week, at which time the medial rosebud packing is removed.

The donor site for the split-thickness skin graft is treated with topical antibiotic ointment twice a day. Patients are asked to wash their hair in a sink to avoid potential water contamination or maceration.

Patients who have isolated lesions (osteomas) removed by the endomeatal approach are seen 10 days

postoperatively, at which time the silk sleeve or Gelfoam packing is removed. Flat de-epithelialized areas are allowed to heal further by secondary intention. Topical eardrops are continued for a few weeks until complete healing has occurred.

Despite attempts to meticulously approximate epithelial flaps within the external auditory canal, there may be areas of exposed bone medially and de-epithelialized subcutaneous tissue laterally. Careful cleaning and débridement of the ear are performed when the second packing is removed. Areas of hypertrophied granulation tissue are cauterized with silver nitrate, and antibiotic-steroid drops are continued. Frequent, diligent, and meticulous care should be given to canal hygiene to avoid postoperative stenosis. Should encroachment of the canal lumen develop, a stent consisting of multiple Pope otowicks or strips of Meroceol microporous sponge is placed in the canal and remains for an additional week. The canal is reevaluated and appropriate local care is given. Patients demonstrating irregular epithelialization and midcanal stenosis or medial canal soft tissue blunting may need to be returned to the operating room. In this situation, hypertrophied soft tissue is débrided and a single firm stent consisting of long rosebud silk packing is inserted. Topical eardrops are administered, and the stent is removed in 10 days. Silver nitrate is usually effective for control of excessive granulation tissue. 5-Fluorouracil cream may also be applied if silver nitrate alone is unsuccessful.

The first few postoperative weeks are critical to the healing process. It may be necessary to see patients weekly to monitor and control wound healing. Despite the appearance of appropriate epithelialization, patients are restricted from water exposure for at least 2 months. A cotton ball with Vaseline is used while showering. Swimming is prohibited until complete healing has taken place.

COMPLICATIONS

Patients undergoing removal of exostoses usually have a history of chronic otitis externa. They are prone to wound-healing problems and thus require close observation. Exuberant granulation tissue may heal with a midcanal stenosis or medial blunting at the level of the tympanic membrane.

The structures surrounding the external auditory canal are subject to potential injury during the operative procedure. Aggressive drilling of bony lesions on the posterior wall may result in injury to the mastoid air cell system. Migration of epithelium into these cells would potentially lead to fistulization or cholesteatoma formation. Similarly, drilling the anterior canal wall may lead to entry into the capsule of the temporomandibular joint. Small areas of bony dehiscence are tolerated if the periosteum is not violated. However, large areas of bone removal lead to prolapse of the soft tissues of the temporomandibular joint into the external auditory canal. This not only retards wound healing in the immediate postoperative period but may also produce subsequent aural hygiene problems. Clicking or other auditory sounds may occur with mandibular movement.

Structures potentially at risk when drilling the canal medially are the chorda tympani nerve, the tympanic membrane, and the malleus. The chorda tympani may be drilled in the area just medial to the posterior annulus. The tympanic membrane may be torn by the drill or other instruments used during dissection of the canal skin. The lateral process of the malleus may also be hit by the drill and result in conductive or sensorineural hearing loss.

Inadequate bone removal may give rise to persistent symptoms. This typically occurs at the interface of the tympanic membrane and the anteromedial canal wall. An acutely angled anterior sulcus may continue to trap epithelial debris and promote the persistence of symptoms.

When the skin of both the anterior and posterior canals is violated, postoperative canal stenosis can occur. Caution is needed during the procedure, and heightened awareness is necessary during the immediate postoperative period to avoid and recognize this problem. Débridement of exuberant granulation tissue and repacking of the canal should be undertaken once this process is recognized.

Patients experiencing persistent inflammation or chronic otitis externa should be suspected of having allergic dermatitis secondary to topical otic drops. Preparations containing aminoglycosides should be discontinued in favor of other topical agents. Steroid cream preparations may be necessary if an allergic reaction develops.

Facial nerve injury is a devastating complication after surgery for exostoses. The facial nerve is relatively close to the posteroinferior annulus. A facial nerve with an aberrant course that is lateral and more anterior to its normal position may potentially be damaged and result in inadvertent facial paresis. The surgeon should anticipate this problem while drilling the bony posteroinferior canal. Facial nerve monitoring during the procedure should help minimize the likelihood of this untoward event.

PEARLS

- Surgical intervention is not usually necessary when exostoses and osteomas are asymptomatic.

- Computed tomography scans of the temporal bone should be obtained when the ear canal and tympanic membrane cannot be examined.
- A single osteoma located laterally in the ear canal and attached by a narrow pedicle can be removed with a curette under local anesthesia.
- Caution is needed when drilling the posterior and inferior bony canal walls because of the proximity of the facial nerve.
- Facial nerve monitoring is advisable during surgical removal of exostoses.

PITFALLS

- Surgical intervention in patients with limited symptoms may result in greater problems postoperatively than before surgery.
- Aggressive drilling of the posterior inferior external auditory canal may result in injury to the facial nerve.
- Contact between the surgical drill and the ossicular chain may cause sensorineural hearing loss.
- External canal stenosis can occur when excessive skin is sacrificed or traumatized.
- Failure to recognize and intervene when significant narrowing of the canal is seen in the early postoperative period will result in inflammatory stenosis and conductive hearing loss.

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