The three most commonly used surgical approaches to the middle ear and mastoid are: transcanal, endaural, and postauricular. The most feasible approach to the mastoid is through a postauricular incision. Even though the endaural incision can be used to approach the mastoid, it does not provide as good exposure of the mastoid as the postauricular incision.

TRANSCANAL APPROACH

The transcanal (transmeatal, endomeatal) approach to the middle ear is not used as commonly in children as it is in adults owing to the relatively small ear canal in infants and young children. When the external canal is too small, the endaural or postauricular approach is used; however, in older children and adolescents, the canal is usually large enough to use a transcanal approach to the middle ear. The tympanomeatal flap that is developed provides excellent exposure of the mesotympanum. This approach was described by Rosen.1

Indications

• **Tympanoplasty**: Repair of tympanic membrane perforations when the canal is large enough for adequate exposure (an endaural or postauricular approach is indicated when the canal is too small) and when there is a need to examine the middle ear (see Chapter 3)

• **Cholesteatoma surgery**: When a congenital or acquired cholesteatoma is localized to the tympanic membrane, mesotympanum, and hypotympanum.

• Also, cholesteatoma that is localized to the attic can be removed using this approach if the superior portion of the tympanomeatal incision is elongated into the superior and anterosuperior portions of the canal wall (see Figure 2–2B).

• **“Second look” tympanotomy**: This procedure is usually performed approximately 6 months after surgery for cholesteatoma, in which the tympanic membrane is present and prevents adequate postoperative examination to determine if there is residual cholesteatoma. On occasion, a
“third look” is indicated 6 months after the second procedure if that operation uncovers a residual cholesteatoma; rarely, a “fourth look” is required (see Chapter 5).2

• **Ossiculoplasty:** Repair of congenital or acquired defects of the ossicular chain (see Chapter 4)

• **Otosclerosis surgery:** When stapedectomy or stapedotomy is to be performed and the external canal is large enough to provide adequate visualization of the operative site

• **Exploratory tympanotomy:** When an examination of the middle ear is indicated to determine the cause of diseases and disorders of the middle ear that are not evident by other diagnostic methods, such as when there is a conductive or mixed hearing loss of undetermined origin, or when a perilymphatic fistula is suspected (see Chapter 6)

• **Other procedures:** These include labyrinthectomy, obliteration or closure of the eustachian tube (see Chapter 6), and section of the tensor tympani or stapedius muscles, which are rarely indicated in children.

**Anesthetic Considerations**

• In children, the procedure is performed under general anesthesia.

• Local anesthetic (1% lidocaine with 1:100,000 epinephrine) is infiltrated into all four quadrants of the ear canal (6, 9, 12, and 3 o’clock) just lateral to the bony-cartilaginous junction and the graft site, for hemostasis and to enhance the anesthesia (Figure 2–1).

• When intraoperative monitoring of the facial nerve is indicated, such as when a middle-ear cholesteatoma is in close approximation to the nerve, only epinephrine is used to avoid temporarily blocking the facial nerve during the procedure.

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Figure 2–1 Injection sites (x) for transcanal approach.
Preparation
• If a temporalis graft is to be used, a small portion of hair is shaved just above the pinna.
• If a large speculum does not fit snugly into the external canal so that both of the surgeon’s hands are free to perform the procedure, a speculum holder attached to the operating table can be used. A speculum holder is frequently not needed, however, because the canal usually dilates when a smaller speculum is initially used, after which a larger speculum can be inserted.

Procedure
• This incision is used when the mesotympanum and hypotympanum are the surgical sites (Figure 2–2A). The flap includes skin over the medial two-thirds of the bony external auditory canal.
• An extended incision is made when greater exposure of the epitympanum is desired, such as when disease involves the attic (ie, superior tympanomeatal flap) (Figure 2–2B). The incision is made more lateral and anterior.
• The tympanomeatal flap is elevated to the annulus. Bleeding, if present, is controlled at this stage by application of cotton pledgets or by a Super Sorb Micro Eye Sponge (Storz Ophthalmics Inc, St. Louis, MO) soaked in epinephrine prior to entering the middle ear (Figure 2–3).

• The middle ear is entered by elevating the annulus with a curved pick just below the chorda tympani nerve (Figure 2–4).

Figure 2–3 The tympanomeatal flap is elevated to the annulus with a moon elevator.

Figure 2–4 The middle ear is entered by elevating the annulus.
• The superior portion of the tympanomeatal flap is completed using microscissors (Figure 2–5).

• Curettage of the posterosuperior canal wall scutum to visualize the long process of the incus, stapes, and stapedius tendon may be necessary in many cases (Figure 2–6).
The tympanomeatal flap is completed when the posterior edge of the long process of the malleus, the long process of the incus, the stapes, the stapedius tendon, and the round window are visible, and the flap is reflected anteriorly without tension (Figure 2–7).

Postoperative Care

- Postoperative care depends on the final procedure performed. For example, if only a tympanoplasty was performed, the canal is filled with an antibiotic ointment, as described in Chapter 1 (see Removal of Tympanostomy Tube and Myringoplasty). In such cases, the child can be re-examined 4 to 6 weeks later.

ENDAURAL APPROACH

The endaural approach is commonly used in infants and young children because their ear canals are often too small to permit adequate exposure for the transcanal approach. Another advantage of the endaural approach is the accessibility of the epitympanum and anterosuperior portion of the mesotympanum; as well, a fascia graft can be easily obtained from the temporalis muscle, since this tissue is in the operative field.

Indications

- **Tympanoplasty**: Repair of perforation in the anterosuperior quadrant of the pars tensa (see Chapter 3)

- **Attic retraction pocket**: When the extent of the retraction pocket cannot be fully visualized using the otomicroscope, when there has been recurrent infection within it, when the pocket is progressively enlarging, or when placement of a tympanostomy tube fails to reverse an extensive pocket
• Distinction among these types of retraction pockets and acquired cholesteatoma is frequently difficult (see Chapter 3).

• *Congenital and acquired cholesteatoma.* When the disease is localized to the anterior epitympanum and the mesotympanum (see Chapter 5)

• *Closure or obliteration of the eustachian tube.* When adequate access is not possible employing the transcanal approach and anterior tympanomeatal flap (see Chapter 6)

**Anesthetic Considerations**

• General anesthesia is almost always required, and local infiltrative anesthesia is also used. Injection sites are the same as those described for a transcanal approach (see Figure 2–1), but additional injections are placed in the incisura of the pinna.

**Preparation**

• Because the incision is carried into the incisura of the pinna, a small area of scalp hair may have to be shaved anterosuperior to the pinna.

**Procedure**

The procedure described below is a modification of the one described originally by Lempert.3 Compared to the classical endural approach, my method differs in the canal incisions, the incision in the incisura of the pinna is shorter and only a small portion of the mastoid bone is exposed, since this approach is not feasible, as is the postauricular approach, when a mastoidectomy is planned.

• A Lempert speculum exposes the bony-cartilaginous junction (Figure 2–8). Injection sites are just lateral to the junction but directed toward the bony canal and into the incisura of the pinna.
• A posterior canal incision with a Rosen flap knife (a Bard-Parker blade is too large) is made slightly medial to the bony-cartilaginous junction, so that the medial (ie, tympanomeatal) flap is thin (Figure 2–9).

• The incision is continued into the incisura of the pinna but superficial to the temporalis muscle, using a No 15 Bard-Parker knife blade (Figure 2–10); the No 15C blade, which is smaller than the standard one, can be used in infants to make the incision in the incisura.

Figure 2–9 A posterior canal incision is made with the Rosen flap knife.

Figure 2–10 The incision is continued into the incisura of the pinna but superficial to the temporalis muscle.
• An anterior incision in the canal is connected to, and is a continuation of, the posterior canal incision (Figure 2–11).

• The lateral posterior and anterior flaps are elevated with a periosteal elevator to permit insertion of the self-retaining retractor (Figure 2–12).

• The tympanomeatal flap, tympanic membrane, and temporalis muscle are exposed (Figure 2–13).

Figure 2–11  An anterior relaxing incision in the canal.

Figure 2–12  The lateral posterior and anterior flaps are elevated.

Figure 2–13  The tympanomeatal flap, tympanic membrane, and temporalis muscle are exposed with the aid of a self-retaining retractor.
• The tympanomeatal flap is elevated (Figure 2–14). When indicated, the flap is dissected off the malleus (Figure 2–15).

Figure 2–14  The tympanomeatal flap is elevated.

Figure 2–15  Dissection of the flap off the malleus using a curved pick.
• The flap is elevated, exposing the middle ear (Figure 2–16).

Postoperative Care

• Following a procedure that uses the endaural approach, the ear canal is packed with two strips (one medial and one lateral) of Adaptic gauze (Johnson & Johnson Medical Inc, Arlington, TX) impregnated with an antibiotic ointment. Two strips are used to prevent accidental removal of all the packing by the child during the postoperative period.

• A Glasscock dressing (Glasscock Ear Dressing Kit, Oto-Med, Lake Havasu City, AZ) is used for the first postoperative day, and for a few days afterward if the child prefers.

• The Adaptic packing is removed after 1 week and cotton is inserted into the meatus. The cotton is changed at least once a day or whenever it becomes soiled, and may be left out once there is no further drainage. Application of an antibiotic ointment into the edge of the wound in the incisura prevents the cotton from adhering to it.

• The child is re-examined in about 1 month.
POSTAURICULAR APPROACH

The postauricular approach is frequently used in children. Since it facilitates exposure of the middle ear, a fascia graft can be readily obtained from the temporalis muscle, and it is the preferred approach when a mastoidectomy is to be performed.

Indications

• The postauricular incisions and approach are indicated when there is disease that involves the mastoid, but it is also used to provide access to the middle ear when neither the transcanal approach nor the endaural approach is feasible.

• This approach is also used when tympanoplasty is required for a large perforation; both medial and lateral graft techniques can use this approach (see Chapters 3 and 5).

Anesthetic Considerations

• The anesthesia is the same as that described for the transcanal approach, but additional injection sites are required in the postauricular area (Figure 2–17).
Preparation
• A small area of hair is shaved posterior and superior to the planned postauricular incision.

Procedure
• An incision is made a few millimeters posterior to the postauricular crease (Figure 2–18A). In children younger than 4 years of age, the incision is made away from the stylomastoid foramen and the facial nerve; injection sites are altered accordingly (Figure 2–18B).

Figure 2–18  A, An incision is made just a few millimeters posterior to the postauricular crease. B, An incision used for children younger than 4 years of age to avoid potential injury to the facial nerve.
- The postauricular soft tissue is exposed (Figure 2–19).
- A transcanal incision is made from the 6 to 12 o’clock position about one-third of the distance from the annulus to the meatus to create a Koerner flap (the transcanal incision usually precedes the postauricular incision) (Figure 2–20).

Figure 2–19 The postauricular soft tissue is exposed.

Figure 2–20 A transcanal incision is made with a Rosen flap knife to create a Koerner flap.
• Canal incisions are extended laterally (Figure 2–21).

• A Koerner flap is back-elevated a few millimeters laterally in the canal to facilitate identification of the incisions and elevation of the flap from the postauricular approach (Figure 2–22). A piece of Super Sorb Micro Eye Sponge large enough to fill the canal medial to the incisions also aids in identifying the canal incision, and prevents inadvertently and prematurely entering the middle ear.
- A “T” incision is made in postauricular soft tissue and the periosteum is elevated (Figure 2–23). The superior limb of the incision is placed just below the inferior edge of the temporalis muscle. If a mastoidectomy is not planned, the “T” incision may be replaced by a semicircular incision parallel to the lateral concavity of the external auditory canal.
- The Koerner flap is elevated through postauricular exposure (Figure 2–24).

Figure 2–23  A “T” incision is made in postauricular soft tissue and is elevated with a periosteal elevator.

Figure 2–24  The Koerner flap is elevated.
• The tympanic membrane, tympanomeatal flap, and mastoid are exposed (Figure 2–25).
• A Penrose drain is used to retract the Koerner flap anteriorly, which is fastened to the surgical drape in front of the ear. The Penrose drain also protects the Koerner flap when a self-retaining retractor is inserted (Figure 2–26).
• The tympanomeatal flap is elevated and reflected anteriorly to expose the mesotympanum, similar to that described for the transcanal approach (Figure 2–27).

Figure 2–27  The tympanomeatal flap is elevated and reflected anteriorly to expose the mesotympanum.

Postoperative Care
• The postauricular incision is closed with an absorbable suture; a drain is optional. Two strips of Adaptic gauze impregnated with antibiotic ointment are used to pack the ear canal.
• A Glasscock pressure dressing is applied for 1 day.
• The packs are removed in 1 week, and the child is re-examined in about 1 month.

REFERENCES