Prevention and Management of Complications in Otosclerosis Surgery

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KEYWORDS

• Otosclerosis • Stapedectomy • Stapedotomy • Complication • Hearing loss • Dizziness

KEY POINTS

- Complications are uncommon with stapes surgery.
- Preoperative evaluation may allow for the prevention of some complications.
- Intraoperative complications may be avoided with proper surgical techniques.
- Most early postoperative complications usually can be managed medically.
- Revision surgery may be necessary to achieve optimal long-term outcomes.

PREOPERATIVE ISSUES

Complications may be avoided by performing a thorough preoperative evaluation. This effort is largely to identify conditions that may either mimic otosclerosis or may be present in conjunction with otosclerosis and are more likely to lead to suboptimal outcomes[1] or complications (**Box 1**). A history of lifelong hearing loss raises the potential for congenital dysplasia, most commonly an enlarged vestibular aqueduct,[2] and other congenital anomalies.[3] Autophony and sound- or pressure-induced vertigo suggests semicircular canal dehiscence.[4] The tympanic membrane should be carefully inspected for subtle evidence of atelectasis or cholesteatoma. The presence of myringosclerosis may suggest tympanosclerotic fixation of any of the ossicles. In addition to a comprehensive head and neck examination, which may reveal branchial arch anomalies, the skeletal system should be briefly surveyed for other markers of syndromic hearing loss (eg, digit anomalies with NOG mutations).[5] Audiometry may reveal patterns of hearing loss that are atypical for otosclerosis. Acoustic reflexes may be intact in the presence of an air-bone gap due to semicircular canal dehiscence.[6] The use of preoperative imaging, specifically, high-resolution computed

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Box 1
Clinically significant conditions that may mimic otosclerosis or may be found in conjunction with otosclerosis

- Ossicular pathology
  - Malleus fixation
  - Incus fixation
  - Incus necrosis
  - Congenital footplate fixation
- Tympanosclerosis
- Cholesteatoma
- Persistent stapedial artery
- Inner ear dysplasia
  - Large vestibular aqueduct/Mondini dysplasia
  - X-linked gusher
- Anomalous facial nerve
- Semicircular canal dehiscence, superior or posterior
- Paget's disease
- Osteogenesis imperfecta

tomography (CT), can identify such anomalies. Imaging is generally considered unnecessary for patients with a presentation typical of otosclerosis (eg, adult onset of progressive hearing loss with a large air-bone gap and otherwise normal history, examination, and audiometric testing).

INTRAOPERATIVE ISSUES

Bleeding

The surgical approach generally begins with injection of an anesthetic agent with the vasoconstrictor, epinephrine. The author favors xylocaine 1% with epinephrine 1:100,000, as this is widely available and it provides both sufficient anesthesia and vasoconstriction to carry out stapedotomy.[7] Many surgeons favor higher concentrations of epinephrine; but these require either compounding by the pharmacy or mixing by operating room staff, which increase the chance of errors, resulting in potentially life-threatening cardiac events.[8] If the injection is performed too quickly or patients are moving, the solution may pass between the skin and the periosteum, creating blebs that may compromise visualization and lead to more oozing of blood during the procedure. Bleeding from bone and mucosa is common, but usually limited, following the atticotomy. Otosclerotic bone and the overlying mucosa may be particularly hyperemic during active phases of bone turnover (otospongiosis).

Intraoperative bleeding can usually be controlled by topical application of epinephrine (eg, 1:20,000) on a gelatin sponge. Preparing such concentrated solutions only after canal injections have been completed reduces the risk of their injection. Hemostasis should be obtained before opening the oval window. Placing a delicate stapes prosthesis into a stapedotomy in the presence of significant bleeding can prove challenging. Concerns have been raised about the potential of blood in the inner ear to compromise outcomes.[9]

A persistent stapedial artery can present particularly brisk bleeding if not recognized and properly managed. The application of microbipolar electrocautery, laser energy (in a diffused mode), and bone wax can be used to manage small-caliber arteries and