Endoscopic Techniques in Tympanoplasty

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KEYWORDS

• Endoscopic ear surgery • Endoscopic tympanoplasty • Endoscopic myringoplasty • Underlay • Overlay • Inlay • Interlay

KEY POINTS

- The endoscope allows improved view and reconstruction of tympanic membrane perforations.
- Endoscopic myringoplasty is feasible by a transcanal approach regardless of perforation size or anatomy of the ear canal.
- The endoscopic approach for tympanoplasty has not surpassed microscopic anatomic or functional outcomes, but it is undeniably less invasive and better tolerated by patients.
- Assessing the ventilation routes and preserving mastoid tissues may enhance functional outcomes for minimally invasive reconstruction of the middle ear.

Video content accompanies this article at http://www.oto.theclinics.com.

INTRODUCTION

Tympanic membrane (TM) perforations are a common problem, most often as consequence of middle ear infection, traumatic rupture, or postoperative complication. Despite the autoregenerative capacity of the eardrum, chronic perforations may be subject to surgical repair.[1] The main goal of tympanoplasty (TP) is to restore anatomy and function and to eliminate disease; therefore, an uninterrupted TM, an air-containing mucosal-lined middle ear and a secure connection between the TM and the inner ear fluids are essential.[2,3]

The introduction of endoscopy to otologic surgery was underpinned by the ability to provide better access and view to otherwise hidden areas of the middle ear, such as the retrotympanum, anterior epitympanum, or middle ear folds, resulting in better appreciation of their relationships.[4–8] This improved visualization results from

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closeness of the light source to the surgical field and wide angle optics, thereby transforming the external auditory canal into an excellent surgical portal.[9]

The endoscopic revolution has also lead to advances in anatomic and pathophysiologic concepts, which elucidate the role that middle ear folds play in blocking middle ear ventilation routes in patients with chronic otitis media. A more conservative approach preserving the mastoid tissues decreases morbidity and may improve postoperative middle ear ventilation, owing to their role in middle ear gas exchange. Systematic intraoperative visualization, analysis, and in some cases removal of these folds should be regarded as essential to restore middle ear physiology.[10–13] Endoscopes better illustrate these findings and aid in engaging this new philosophical perspective.

Endoscopic procedures, nevertheless, have several disadvantages. Given the diameter of the endoscope in relation to the ear canal, dissection may only be feasible with 1 hand and, thus, inefficient and challenging, chiefly when there is blood in the surgical field. Refinement of endoscopic skills and adopting precautionary hemostatic measures are paramount, a task more difficult to master by the surgeon with limited endoscopic training. Other caveats relate to heat dissipation and ototoxicity of antifog solutions.[14,15] Concern over thermal injury is warranted for elevated temperatures may occur up to 8 mm from the endoscope tip[15]; thus, smaller 3-mm endoscopes with submaximal light intensity (<60%), frequent removing–repositioning, irrigation of the surgical field, and suction are recommended.

Unlike the microscope that contemplates the surgical field from the outside, the endoscope itself is not immune to damage if unintentionally struck by a bone curette or a burr. Most instruments in use today were not customized for an endoscopic approach (EA), but rather migrated from traditional microscopic techniques; consequently, there will be a great demand for better and more refined tools in years to come.

Despite these potential drawbacks, the future of endoscopic ear surgery (EES) for minimally invasive functional reconstruction through a transcanal approach is enticing.

HAS THE ENDOSCOPE OUTPERFORMED THE MICROSCOPE?

In the narrow anatomy of the ear canal, surgery may be technically very demanding. To grant proper exposure, permeatal endaural incisions or postauricular approaches were used mainly for anterior and subtotal perforations and pediatric cases.[16] Without exception, all publications in the field agree that regardless of ear canal anatomy or age,[2,4,8,16–21] TP can be performed endoscopically through a transcanal approach. Increased postoperative pain, a numb or protruding pinna, and retroauricular scar or depression are frequently associated with more morbid approaches; therefore, a transcanal approach is preferred by patients because it grants improved comfort and aesthetics. As a result, endoscopic techniques for TP differ in 3 main aspects: (1) grafting material, (2) position of the graft in relation to the fibrous annulus and tympanic remnants, and (3) treatment of middle ear folds and ventilation routes.

Comparison of reported surgical outcomes between the endoscope and microscope may be explained not only by technique variants or differences in patients underlying pathology, age, or risk factors, but by the sole definition of success. Normal middle ear function after TP clearly requires more than an intact graft. An imperforate lateralized graft in the middle of the ear canal or a “Kevlar-armored” cartilage graft with poor audiological outcomes are equally undesirable. Therefore, a stricter definition of success, including anatomic and functional criteria as well as prevention of complications, has been promoted, even when confronted with more modest results (**Box 1**).[22]