Incorporating Endoscopic Ear Surgery into Your Clinical Practice

Elliott D. Kozin, MD[a,b], Ruwan Kiringoda, MD[a,b], Daniel J. Lee, MD[a,b,*]

KEYWORDS

• Endoscopic ear surgery • Neurotology • Cholesteatoma • Endoscope • EES • Otology • Transcanal surgery

KEY POINTS

- Endoscopes allow for improved transcanal visualization of the tympanic cavity because the light source is located at the distal tip of the instrument, and angled optics offer a wide perspective of the operative field.
- For the right-handed surgeon, the authors recommend starting with left-sided transcanal endoscopic ear surgery (EES) cases because (1) the endoscope trajectory is ideal for visualizing disease in the posterosuperior mesotympanum and epitympanum, (2) the dissection instruments do not rest against the anterior canal wall, and (3) the camera hand can be rested against the patient's shoulder and bed.
- Until greater proficiency is achieved, the surgeon should always use the dominant hand for dissection.
- Room set-up and equipment position are crucial when beginning EES. To optimize ergonomics, a surgical chair with armrests should be used, and the video tower or boom-mounted video screen should be placed directly across from the surgeon and as close to eye level as possible.
- Essential equipment for EES includes a xenon, halogen, or light-emitting diode light source, rigid endoscopes (ideally, 14 cm in length and 3 mm in diameter), a high-definition (HD) 3-chip camera, and HD video monitor.

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[a] Department of Otolaryngology, Massachusetts Eye and Ear Infirmary, 243 Charles Street, Boston, MA 02114, USA; [b] Department of Otology and Laryngology, Harvard Medical School, Boston, MA, USA
* Corresponding author. Massachusetts Eye and Ear Infirmary, 243 Charles Street, Boston, MA 02114.
E-mail address: Daniel_Lee@meei.harvard.edu

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INTRODUCTION

Otologic surgery has progressed rapidly over the past century. Before the 1920s, ear surgery was completed either with loupes or without microscopic assistance. With the refinement of the binocular operating microscope in the 1950s, otologic surgery entered its modern era.[1,2] Until the 1990s, visualization of the tympanic cavity by surgeons was performed exclusively with operative microscopy (except by a handful of surgeons beginning in the 1960s), and approaches to the middle ear and mastoid were constrained by the surgeon's line of sight. Although modern microscopes provide excellent views of the surgical field, visualization of deeper recesses of the middle ear is limited. The optical properties of a microscope require an adequate amount of light to reach the surgical plane. Accordingly, microscope-based operative approaches frequently necessitate soft tissue retraction and/or bony drilling, such as mastoidectomy, to adequately visualize and access abnormality.

In contrast to microscopes, endoscopes allow for improved visualization because the light source is located at the distal tip of the instrument, and angled optics offer a wide perspective of the operative field. The use of endoscopy to visualize the middle ear was introduced in the late 1960s; however, poor image resolution in comparison to the operative microscope limited its application[3] (**Fig. 1**). With the introduction of 3-chip camera systems and high-definition (HD) video systems, endoscopes now provide ultrahigh resolution images of the middle ear never previously seen. Advocates of endoscopic ear surgery (EES) espouse its wide-field view, magnification, and the ability to look around corners. Furthermore, transcanal endoscopic ear surgery (TEES) approaches transform the external auditory canal into a minimally invasive surgical portal to access middle ear (and inner ear) disease (**Fig. 2**). It is important to emphasize that the endoscope is not meant to replace the microscope in all patients, but may serve a specialized purpose in select cases.

Initially, endoscopes were used in the ear predominately as an adjunct to microscopes for diagnostic purposes.[4,5] The improved image clarity, wide-angle view, and superior illumination of endoscopes afforded visualization of the middle ear cavity through transtympanic or transmastoid approaches with relative ease. Consequently, early studies on the application of endoscopes in middle ear surgery focused on the microanatomy of the middle ear. In the 1990s, as an extension of these anatomic studies, investigators examined the application of endoscopes as observational tools in cholesteatoma procedures to evaluate for residual or recurrent disease.[6–10] Recent studies from the past 10 years have demonstrated that the endoscope may be a reasonable alternative to the microscope to perform otologic surgery. Endoscopes revolutionized sinus surgery and may have a similar impact on otology for the following reasons:

1. *Visualization of middle ear anatomy is vastly improved with the endoscope.* The wide-angle and high-resolution image provided by the endoscope allows for improved visualization of the ear during surgery. This enhanced surgical view invites a more robust understanding of all middle ear structures and their spatial relationships.
2. *The endoscope expands the surgical reach of a transcanal approach to access complex middle disease.* EES transforms the external auditory canal into a minimally invasive portal for middle ear surgery (and inner ear surgery in selected cases).