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Journal of Otology xx (2017) 1–6



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Review

## Endoscopic tympanoplasty

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Received 20 January 2017; revised 18 April 2017; accepted 19 April 2017

### Abstract

Middle ear surgery is usually performed using a surgical microscope. Initially, in otorhinolaryngology practice, endoscopes were used for paranasal sinus surgeries. It was only later that they were applied in the area of otology. In otologic surgeries, endoscopes were first used to visualize the middle ear, before being used to assist with visualization of instruments during cholesteatoma surgeries, although they are still not used alone in various otologic surgeries. As in other surgical fields, there is also a trend towards minimally invasive intervention in the field of otorhinolaryngology. Smaller incisions performed under the guidance of endoscopes are preferred over conventional large incisions. Using this approach, improved outcomes can be achieved and postoperative morbidities can be reduced. In addition, the outcomes of grafts performed using the endoscopic approach are similar to that achieved by the microscopic approach. Therefore, endoscopic ear surgery implementations are becoming increasingly popular.

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**Keywords:** Endoscopic; Tympanoplasty; Myringoplasty

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Peer review under responsibility of PLA General Hospital Department of Otolaryngology Head and Neck Surgery.

<http://dx.doi.org/10.1016/j.joto.2017.04.004>

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Please cite this article in press as: Akyigit, A., et al., Endoscopic tympanoplasty, Journal of Otology (2017), <http://dx.doi.org/10.1016/j.joto.2017.04.004>

## 1. Introduction

Although microscopes have been effectively used in otology practice for many years, recently there has been no significant improvement in their basic optical characteristics. Endoscopes have long been used in the field of otorhinolaryngology for sinus surgeries. However, their implementation in otology practice has been gradual. Endoscopes were initially used only to visualize the middle ear. They later started to be used in addition to microscopes during all surgical procedures involving the middle ear, and eventually they are now sometimes used as standalone instruments (Tuncer, 2016). For surgical purposes, the earliest use of endoscopes in otology dates back to the 1990s (Thomassin et al., 1993; McKennan, 1993). Tarabichi (1997) published the first report of patients treated using the endoscopic approach alone. There has been a recent increase in the number of publications reporting that standard otologic interventions can be performed endoscopically (Thomassin et al., 1990; Tarabichi, 2010). The endoscopic approach can also be preferred in procedures such as ventilation tube insertion, myringoplasty, tympanoplasty, ossicular reconstruction for malformation and ossicle trauma, cholesteatoma surgeries, otosclerosis surgeries and cochlear implantation (Tarabichi, 2000; Migirov et al., 2011; Ayache et al., 2008; Kakehata et al., 2006; Poe and Bottrill, 1994).

### 1.1. Myringoplasty and tympanoplasty

Tympanoplasty and myringoplasty are commonly used procedures for the treatment of chronic otitis media. Myringoplasty is a surgical procedure performed only on the tympanic membrane, without manipulation on the middle ear or the ossicles (Sarkar, 2013). Tympanoplasty involves eradication of the disease in the middle ear, repair of the perforated tympanic membrane and restoration of hearing. Endaural, transcanal and postauricular approaches are used during myringoplasty and tympanoplasty. Recently, transcanal endoscopic approaches have become popular. The endoscopic approach provides a much larger field of view. When training interns, this view translates into a better visual image, as the middle ear and the ossicles can be visualized through the perforation. In the microscopic approach, a retroauricular approach is preferred for anterior perforations, while the endaural approach is preferred for posterior perforations, and small perforations are commonly treated using the transcanal approach (Coskun et al., 2006; Kessler et al., 1994; Jako, 1967). The tortuous anatomy of the outer ear and bone protrusions negatively affect microscopic views and impair visualization of deep structures. Canalplasty may be required in such cases. On the other hand, the panoramic and wide angled views obtained by the back and forth movements of the endoscope are not affected by the tortuous anatomy of the external ear canal. The view beyond the end of the endoscopy is easily presented to the surgeon, while magnification can also be achieved through various endoscope manipulations, eliminating the need for canalplasty (Patel et al., 2015).

### 1.2. Equipment for endoscopic approach

**Endoscopes:** 0°, 30° and 45° rigid endoscopes with diameters of 2.7 mm, 3 mm and 4 mm and lengths of 16–18 cm (Fig. 1).

**Video equipment:** High-resolution camera and monitor, light source, fiberoptic cable.

**Instruments:** Surgical instruments used for conventional otologic surgeries.

The monitor should be placed facing the surgeon. A microscope can be made available to enable a switch to microscopic surgery, when necessary.

#### 1.2.1. Advantages and disadvantages of endoscopic approach

##### Advantages

1. Endoscopes provide a wider and angled view of the fine structures in the middle ear (Kojima et al., 2014) (Fig. 2).
2. Do not require large incisions (postauricular, endaural incisions).
3. Do not require curettage, range or canalplasty of the external ear canal.
4. Operation time is shorter.
5. Provide less postoperative pain and sooner recovery.
6. Provide better cosmetic outcomes (Badr-El-Dine et al., 2013; Pothier, 2013).
7. Monitor used during endoscopic surgery provides visual content for training purposes (Kojima et al., 2014).
8. Hidden deep regions, such as the anterior tympanic perforation, facial recess and hypotympanum can be directly visualized.
9. Contrary to microscopy, views can be obtained from more than one angle.
10. High-resolution and relatively clear images can be obtained.

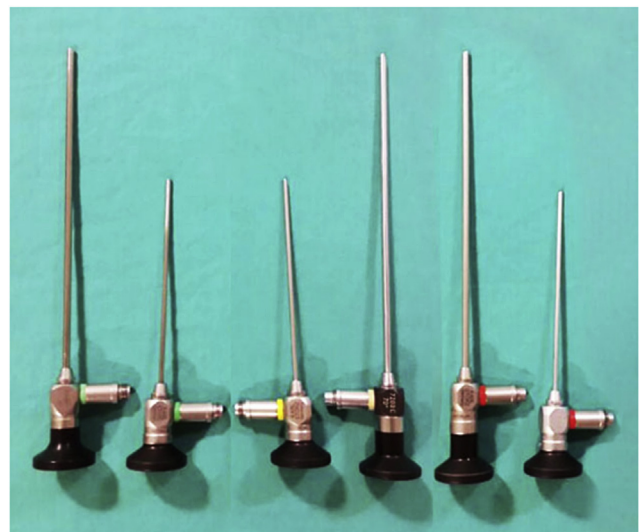


Fig. 1. Endoscopes used in otologic surgery.

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