



Contents lists available at ScienceDirect

Auris Nasus Larynx

journal homepage: www.elsevier.com/locate/anl



Endoscopic transcanal myringoplasty for tympanic perforations: An outpatient minimally invasive procedure

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ARTICLE INFO

Article history:

Received 17 March 2017

Accepted 6 July 2017

Available online xxx

Keywords:

Endoscope

Myringoplasty

Perforation

Transcanal

Tympanic membrane

ABSTRACT

Objective: Since the 1950s, microscopic myringoplasty has been the standard surgery for repairing a perforated tympanic membrane. In addition to conventional microscopic myringoplasty, endoscopic myringoplasty has been an emerging technique since the late 1990s. This study evaluated the efficacy of endoscopic transcanal myringoplasty for repairing tympanic perforations and examined the minimally invasive feature of this technique (no postauricular incision, no canalplasty).

Methods: We retrospectively reviewed the medical records of patients who underwent endoscopic transcanal myringoplasty for perforations of the tympanic membrane. The main outcome was the overall rate of graft success of endoscopic transcanal myringoplasty.

Results: A total of 181 patients were included in the analysis. The overall graft success was determined in 163 of 181 patients (92.8%). The mean preoperative and postoperative air-bone gaps were 19.3 dB and 7.8 dB, respectively, revealing a significant improvement of 11.5 dB (Cohen's *d*, 1.27; 95% CI, 1.03–1.50; $P < 0.05$; paired *t* test) in the air-bone gap. The rate of graft success with partial visualization of the perforation margin was comparable to that with complete visualization of the perforation margin. Larger sizes of perforations were significantly associated with lower rates of graft success ($P < 0.01$).

Conclusion: Our study revealed that the rate of graft success and hearing results of endoscopic transcanal myringoplasty and microscopic myringoplasty are comparable for repairing perforations of the tympanic membrane. Visualization of the perforation margin by otoscopy did not affect the rate of graft success. However, endoscopic transcanal myringoplasty is less invasive because this technique does not require postauricular incision, canalplasty, and general anesthesia.

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1. Introduction

Since the 1950s, microscopic myringoplasty has been the standard surgery for repairing a perforated tympanic membrane [1–5]. This surgery can be performed using three (postauricular, endaural, and transcanal) approaches. A postauricular incision provides increased visibility of the operative site, whereas the transcanal approach is reserved for patients with small tympanic

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<http://dx.doi.org/10.1016/j.anl.2017.07.003>

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perforations and a wide ear canal [3,4]. Therefore, microscopic myringoplasty through the postauricular approach has been performed worldwide [3,4]. Despite having a high rate of graft take of more than 90%, this technique frequently requires postauricular incision, and general anesthesia [3,4].

In addition to conventional microscopic myringoplasty, endoscopic transcanal myringoplasty has been an emerging technique since the late 1990s [6–15]. The major difference between microscopy and endoscopy is the surgical view. The view during microscopic surgery is defined and limited by the narrowest segment of the ear canal. By contrast, transcanal endoscopy bypasses the narrowest segment of the ear canal and provides a wider view, even when a 0° endoscope is used [7,9]. Thus, endoscopic transcanal myringoplasty does not entail canalplasty, postauricular incision, and general anesthesia; thus, it is less invasive than the microscopic technique [6–15].

Although totally endoscopic transcanal myringoplasty was proposed in the 1990s, it has become an established technique only in the last 5–10 years [6–15]. Previous reports were limited by their small numbers of patients and inadequate follow-up periods. Therefore, the efficacy of endoscopic transcanal myringoplasty has not been well recognized. This study evaluated the efficacy of endoscopic transcanal myringoplasty for repairing tympanic perforations and examined the minimally invasive feature of this technique, which does not require postauricular incision and canalplasty.

2. Patients and methods

The joint institutional review board of the Taipei Medical University approved our study protocol. Oral informed consent was obtained from each patient. The present study was a retrospective review of the medical records of patients who underwent endoscopic transcanal myringoplasty from March 1, 2014 to September 1, 2015 at the Pojen General Hospital. The indication of myringoplasty was tympanic perforations without active inflammation during the 3 weeks prior to surgery. The patients with perforations of the tympanic membrane due to chronic otitis media were enrolled; these patients were followed for at least 12 months. Final follow-up was completed on September 1, 2016. The patients with ossicular chain disease and cholesteatoma were excluded. The same surgeon performed all the procedures.

The main outcome was the overall rate of graft success of endoscopic transcanal myringoplasty. Postoperative complications of residual or recurrent perforations, infections, hemorrhage, and hearing loss were examined. We followed up the recommendations of the American Academy Guideline to report hearing results [16]. These recommendations include the four-tone pure tone average, postoperative air-bone gap average, and postoperative air-bone gap in bins. We performed preoperative and postoperative audiograms at frequencies of 500, 1000, 2000, and 3000 Hz to assess the closure of the air-bone gap. When the threshold at 3000 Hz was unavailable, we interpolated a 3000 Hz threshold by averaging the thresholds at 2000 and 4000 Hz.

We used an otoscope to evaluate the visualization of the perforation margin preoperatively. If this margin could be completely observed, visualization was defined as complete; any other visualization was defined as partial (Figs. 1 and 2). The tympanic membrane was divided into 4 quadrants according to the position of the malleus handle, each quadrant accounting for 25% of the size of the tympanic membrane. According to the size of the perforation, all patients were divided into four groups (<25%, 25–50%, >50%, and subtotal). Graft success was defined as the presence of an intact graft whereas graft failure was defined as a residual or recurrent perforation at 12 postoperative months. We defined the operative time as the duration between the start of local anesthesia and end of wound dressing.

We analyzed the association between the rate of graft success and prognostic factors. The prognostic factors included age (<60 years or >60 years), sex, perforation site, the size of perforation, graft material, and visualization of the perforation margin.

2.1. Surgical techniques

Two rigid endoscopes (Karl Storz) were used in our surgical techniques (4.0-mm, 0°, 18-cm long lens and 3-mm, 0°, 14-cm long lens). Patient ears were prepared and draped under sterile conditions without hair shaving. Each patient was administered intravenous sedation (50-mg meperidine + 5-mg midazolam) 10 min preoperatively by an anesthesiologist. The periaural area and external ear canal were infiltrated with 2% lidocaine with 1:100 000 epinephrine. Transcanal injections (1 c.c.) were administered in all 4 quadrants by using a 26-gauge needle under direct endoscopic vision. Meanwhile, blanching of the canal skin was observed, and hemorrhagic bulbs were prevented by slowly and carefully injecting local anesthesia.

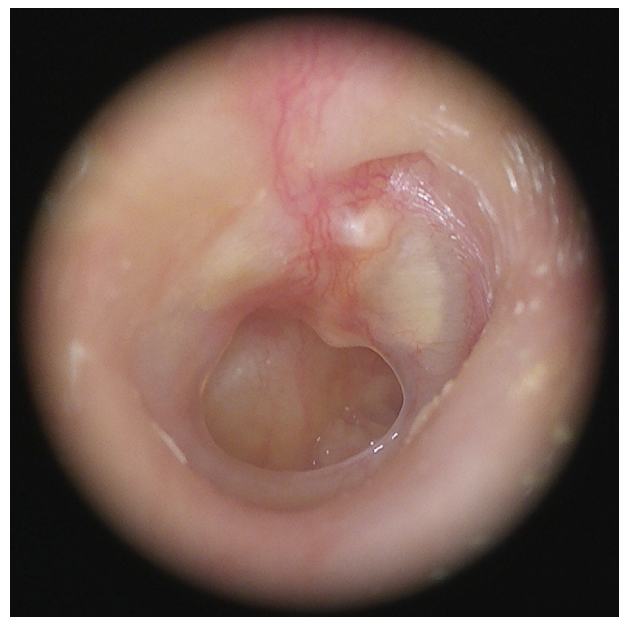


Fig 1. Otoscopic view of a tympanic perforation with complete visualization of the perforation margin.

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