

Endoscopic versus Microscopic Tympanoplasty: A Randomized Comparative Study.

ABSTRACT

Background: Tympanoplasty is the standard surgical procedure for repair of tympanic membrane perforation and associated conductive hearing loss in chronic suppurative otitis media (CSOM). Operating microscopes have long been the standard visualization tool, but endoscopic ear surgery has emerged as a minimally invasive alternative offering a wider field of view and improved access to recesses such as the sinus tympani and facial recess.

Aim: To compare the surgical and audiological outcomes of endoscopic-assisted and microscopic-assisted tympanoplasty in patients with tubotympanic CSOM or traumatic tympanic membrane perforation.

Methods: A randomized prospective study was conducted over one year in the Department of ENT, Government Rajaji Hospital, on 44 patients aged 18–50 years with tubotympanic CSOM or traumatic perforation. Patients were randomly allocated to microscopic tympanoplasty via the postaural approach (n = 22) or endoscopic tympanoplasty via the transcanal approach (n = 22), both using the underlay temporalis fascia graft technique. Outcomes assessed were duration of post-operative hospital stay, graft uptake at 3 and 6 months, and improvement in air-bone (A-B) gap.

Results: Graft uptake at 6 months was higher in the endoscopic group than the microscopic group (94.45% vs 72.7%). A significantly greater proportion of endoscopic-group patients were discharged within 3 days (73%) compared with the microscopic group. There was no statistically significant difference between groups in post-operative pure tone audiometry (PTA) or A-B gap. Smaller perforations were preferentially managed endoscopically, while larger perforations were more often managed microscopically.

Conclusion: Endoscopic tympanoplasty achieved hearing outcomes comparable to the conventional microscopic approach, with the added advantages of higher graft uptake, shorter hospital stay, and better visualization of hidden middle-ear recesses, at the cost of a one-handed technique and reduced depth perception.

Keywords

Tympanoplasty; Endoscopic ear surgery; Microscopic ear surgery; Myringoplasty; Chronic suppurative otitis media; Graft uptake; Air-bone gap

1. INTRODUCTION

Chronic otitis media is a chronic inflammation of the middle ear cleft — mucosa, tympanic membrane, and ossicles — resulting in a permanent abnormality of the pars tensa or pars flaccida [1,2]. Myringoplasty and tympanoplasty are the surgical procedures used to repair the tympanic

membrane and middle ear. Surgical outcomes are influenced by several factors, including perforation size, Eustachian tube function, the state of the middle ear mucosa, degree of mastoid pneumatization, surgical approach, graft source, and graft placement technique (underlay or overlay).

Conventional tympanoplasty under the operating microscope improved surgical accuracy and outcomes, but the microscope's straight-line, magnified view, leaves several deep recesses of the temporal bone — such as the sinus tympani, anterior tympanic recess, and facial recess — poorly visualized without additional surgical exposure. The introduction of endoscopic techniques has enabled minimally invasive otologic surgery: the endoscope offers a wide field of view, with additional angled views achievable through prism-tipped optics. Using the ear canal as a natural access point, the endoscopic approach avoids unnecessary incisions and soft-tissue dissection while improving visualization of these hidden middle-ear recesses [3].

This study compares the outcomes of endoscopic tympanoplasty with conventional microscopic tympanoplasty, with respect to post-operative hospital stay, percentage graft uptake, and improvement in A-B gap.

2. MATERIALS AND METHODS

2.1 Study design and setting

This randomized prospective study was conducted over one year in the Department of ENT, Government Rajaji Hospital. Patients with tubotympanic-type CSOM or traumatic tympanic membrane perforation without cholesteatoma, attending the ENT outpatient department, were recruited and randomly allocated to study groups using a periodic random number method to minimize selection bias.

2.2 Participants

A total of 44 patients aged 18–50 years of either sex were enrolled. Inclusion criteria were: tympanic membrane perforation or conductive hearing loss due to tubotympanic-type CSOM or trauma. All patients underwent otoscopic examination, tuning fork tests, pre-operative pure tone audiometry, routine investigations, and computed tomography of the temporal bone prior to surgery.

2.3 Surgical technique

All patients received premedication (pentazocine 30 mg, promethazine 25 mg, atropine 0.4 mg) 30 minutes before surgery and were positioned supine with the head turned away from the operated side. Postauricular and canal-wall infiltration was performed with 2% xylocaine and 1:1,00,000 adrenaline. Microscopic tympanoplasty was performed via a postaural approach while Endoscopic tympanoplasty was performed via a transcanal approach, with the temporalis fascia graft harvested through a separate incision 1 cm above the helix. In both groups, perforation margins were freshened, a tympanomeatal flap was elevated, the ossicular chain and middle-ear landmarks (Eustachian tube opening, oval and round windows, facial recess, sinus tympani) were inspected, and the temporalis fascia graft was placed by the underlay technique over gelfoam packing. The tympanomeatal flap was repositioned, the canal packed with antibiotic-soaked cotton, and postauricular sutures removed on post-operative day 7. Patients were followed up at 1 week and at 1, 3, and 6 months.

2.4 Outcome measures

- Duration of post-operative hospital stay
- Graft status (intact vs perforation) at 3 and 6 months
- Post-operative pure tone audiometry and air-bone gap at 3 and 6 months

2.5 Statistical analysis

Statistical analysis was done using SPSS software with appropriate statistical tools.

3. RESULTS

A total number of 44 subjects were recruited into the study. Out of this 22 patients underwent conventional microscopic myringoplasty while 22 patients underwent endoscopic myringoplasty. Majority of the study population (75%) were in the age group of 21-40 years. Males and females were equally (47.7% Vs 52.3%) distributed. 30 out of 44 patients, had chronic suppurative otitis media and 14 patients had Traumatic central perforation.

Majority of the large (100%) and medium size(65%) perforations were corrected using Microscopic assisted surgery, while majority of the small size perforations (89%) were corrected

using Endoscopy assisted surgery. The results were found to be statistically significant. (p-value: 0.00).

As shown in Figure 1, pre-operative PTA (p-value- 0.084) and ABG values (p-value-0.486) were less in patients who underwent endoscopic tympanoplasty compared to those who had microscopic tympanoplasty.

73% of those who underwent endoscopic tympanoplasty had a short hospital stay of less than 3 days compared to none in the microscopic tympanoplasty group. The results were statistically significant (p value <0.001).

94.45% of patients who underwent endoscopic tympanoplasty had an intact graft after 6 months while only 72.7% of those who underwent microscopic tympanoplasty had an intact graft postoperatively. The result was statistically significant. (p value – 0.047)

Table 1. Post-operative outcomes–Hospital stay and Graft uptake at 6 months

Outcome	Endoscopic group	Microscopic group	Significance
Hospital stay < 3 days	73%	0%	p value <0.001
Graft intact at 6 months	94.45%	72.7%	p value - 0.047

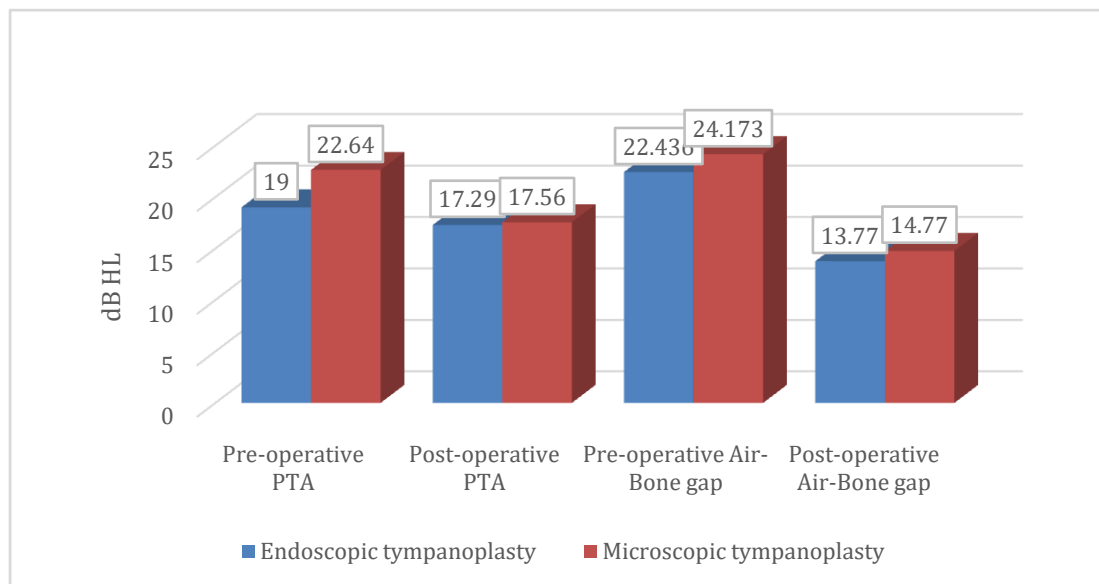


Figure 1: Comparison of pre-operative and post-operative PTA and ABG in both groups

As illustrated in Figure 1, the mean postoperative PTA demonstrated improvement in both groups. In the endoscopic tympanoplasty group, the mean PTA decreased from 19.00 dB preoperatively to 17.29 dB postoperatively, whereas in the microscopic tympanoplasty group, it decreased from 22.64 dB to 17.56 dB (p value- 0.859). Both surgical techniques resulted in improvement in the mean ABG. The endoscopic tympanoplasty group demonstrated a reduction from 22.43 dB preoperatively to 13.77 dB postoperatively, whereas the microscopic tympanoplasty group showed a reduction from 24.17 dB to 14.77 dB (p value- 0.446). But both the audiological outcomes did not show statistical significance.

4. DISCUSSION

In the present study, three-quarters of patients were aged 21–40 years, comparable to the mean age of approximately 30 years reported by Shakya et al. [4]. The near 1:1 male-to-female ratio observed here is consistent with prior studies.

Akyigit et al. reported that endoscopes provide superior visualization of the middle ear compared with microscopes, along with better cosmetic outcomes and lower postoperative morbidity [5]. Similarly, Huang reported that endoscopic tympanoplasty offers improved visualization and shorter operative time than microscopic surgery, while achieving equivalent hearing outcomes

[6]. Mokbel et al., in a series of 80 patients, concluded that subtotal tympanic membrane perforations are better managed by transcanal endoscopic tympanoplasty, which avoids a postaural incision and yields better hearing outcomes [7].

Graft uptake at 6 months was higher in our endoscopic group (94.45%) than in the microscopic group (72.7%), broadly in line with another series reporting 90% versus 85% graft uptake between the two approaches, with no significant difference in A-B gap improvement [8]. Hospital stay was significantly shorter in the endoscopic group, with 73% discharged within 3 days versus none in the microscopic group.

El-Guindy et al. reported a 91.7% graft uptake rate with air-bone gap closure to under 10 dB in 83.3% of patients [9]. Patel et al. found comparable graft success between endoscopic and microscopic tympanoplasty, while noting that the single-handed nature of the endoscopic technique — and the corresponding need for meticulous canal haemostasis — was its principal drawback [10]. Kuo et al. similarly reported graft success of 100% (endoscopic) versus 95.8% (microscopic), a difference that did not reach statistical significance [11]. A comparison of inlay butterfly cartilage tympanoplasty by approach found graft uptake of 96.7% (microscopic) versus 100% (endoscopic), with the endoscopic approach additionally offering trainees a clearer understanding of middle-ear anatomy [12].

Consistent with Gaur et al. [13] and Kuo and Wu [11], we found comparable success rates, hearing improvement, and complication rates between the two techniques. Hsu et al. reported shorter surgical and anaesthesia time with transcanal endoscopic ear surgery, supporting its use as an alternative for managing CSOM without cholesteatoma [14]. Amaran et al. likewise found endoscopic myringoplasty advantageous in terms of operative duration, instrument cost, and magnification [15].

Taken together, our findings and the wider literature support endoscopic tympanoplasty as achieving hearing and graft outcomes comparable to the microscopic approach, while offering better visualization, shorter operative and recovery time, and improved cosmesis — balanced against the technical demand of one-handed instrumentation and reduced depth perception.

5. CONCLUSION

In this comparative study of 44 patients with tubotympanic CSOM or traumatic perforation, endoscopic tympanoplasty achieved a success rate comparable to conventional microscopic tympanoplasty in terms of hearing improvement, with better graft uptake at 6 months and a shorter hospital stay. The endoscope's minimally invasive access and superior visualization of recesses such as the sinus tympani and facial recess make it a valuable technique, with its principal limitations — loss of depth perception and one-handed operation — readily overcome with experience.

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