

Comparison of Endoscopic Tympanoplasty to Microscopic Tympanoplasty**Abhinav Rathi¹, Rachit Jain², Viny Bhardwaj³**¹Professor, Department of Otorhinolaryngology, Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur, Rajasthan, India²Assistant professor, Department of Otorhinolaryngology, Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur, Rajasthan, India³Senior resident, Department of Otorhinolaryngology, Jaipur National University Institute for Medical Sciences and Research Centre, Jaipur, Rajasthan, India

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Conflict of interest: Nil

Abstract:**Background:** Tympanoplasty is a surgical procedure to repair tympanic membrane perforations, aiming to restore hearing and prevent recurrent infections. While microscopic tympanoplasty (MT) has been the conventional approach, endoscopic tympanoplasty (ET) offers a minimally invasive alternative. This study compares the outcomes of ET and MT to evaluate their efficacy and safety profiles.**Methods:** A retrospective study was conducted on patients undergoing tympanoplasty at a tertiary care center between January 2020 and December 2022. Patients were divided into ET and MT groups. Outcome measures included operative time, graft success rate, postoperative pain, and hearing improvement assessed by pure-tone audiometry.**Results:** The ET group demonstrated a shorter operative time and reduced postoperative pain compared to the MT group. Both groups had similar graft success rates and significant hearing improvement postoperatively. Complication rates were low and comparable between the two techniques.**Conclusion:** Endoscopic tympanoplasty is a viable alternative to microscopic tympanoplasty, offering comparable success rates with added benefits of reduced operative time and postoperative discomfort. ET should be considered a preferred option for suitable candidates.**Keywords:** Endoscopic tympanoplasty, Microscopic tympanoplasty, Tympanic membrane repair, Otologic surgery, Hearing improvement.

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Introduction

Chronic tympanic membrane perforations are a common otologic issue resulting from infections, trauma, or iatrogenic causes. These perforations can lead to conductive hearing loss and recurrent otorrhea, significantly impacting a patient's quality of life. Tympanoplasty is the surgical intervention aimed at closing these perforations to restore the integrity of the tympanic membrane and improve hearing function.

Microscopic tympanoplasty (MT) has been the gold standard for decades, utilizing an operating microscope to provide magnification and illumination of the surgical field [1]. This technique allows for precise manipulation of middle ear structures but often requires a postauricular incision, which may result in increased operative time and postoperative morbidity [2].

Endoscopic tympanoplasty (ET) has emerged as a minimally invasive alternative, employing rigid endoscopes to visualize the tympanic membrane

and middle ear without extensive incisions [3]. The endoscopic approach offers wide-angled views and the ability to navigate around anatomical constraints, potentially reducing operative time and patient discomfort [4].

Several studies have compared ET and MT, with some reporting similar graft success rates and hearing outcomes [5], while others suggest that ET may offer advantages in terms of reduced operative time and postoperative pain [6]. However, concerns about the learning curve associated with endoscopic techniques and the lack of depth perception remain [7].

This study aims to compare the efficacy and safety of ET and MT by evaluating operative time, graft success rates, postoperative pain, and hearing improvement. By providing a comprehensive analysis, we hope to contribute valuable data to inform surgical decision-making in the management of tympanic membrane perforations.

Materials and Methods

Study Design and Patient Selection: A retrospective cohort study was conducted at [Institution Name] from January 2020 to December 2022. Patients aged 18 to 60 years with chronic tympanic membrane perforations undergoing tympanoplasty were included.

Exclusion criteria were the presence of cholesteatoma, ossicular chain abnormalities, previous ear surgeries, and systemic conditions affecting wound healing.

Grouping: Patients were divided into two groups based on the surgical technique used:

- **Endoscopic Tympanoplasty Group (ET):** Patients who underwent tympanoplasty using endoscopic techniques.
- **Microscopic Tympanoplasty Group (MT):** Patients who underwent tympanoplasty using microscopic techniques.

Surgical Techniques

Endoscopic Tympanoplasty (ET):

- Performed under general anesthesia.
- A transcanal approach using 0° and 30° rigid endoscopes.
- Harvesting of tragal cartilage-perichondrium graft.
- Underlay graft placement technique.

Microscopic Tympanoplasty (MT):

- Performed under general anesthesia.
- A postauricular incision for access.
- Use of an operating microscope.
- Similar graft harvesting and placement as in ET.

Outcome Measures

- **Operative Time:** Time from incision to closure measured in minutes.
- **Graft Success Rate:** Assessed at 3 months postoperatively; success defined as an intact graft without perforation.
- **Postoperative Pain:** Evaluated using a visual analog scale (VAS) on postoperative day 1.
- **Hearing Improvement:** Assessed by pure-tone audiometry preoperatively and at 3 months postoperatively; measured in decibels (dB).

Statistical Analysis

Data were analyzed using statistical software. Continuous variables were compared using the Student's t-test, while categorical variables were analyzed using the chi-square test. A p-value of <0.05 was considered statistically significant.

Results

Patient Demographics: A total of 200 patients met the inclusion criteria, with 100 patients in each group. The mean age was 35.2 ± 10.1 years in the ET group and 36.8 ± 9.7 years in the MT group. Gender distribution was similar, with a male-to-female ratio of 1:1.2 in both groups.

Operative Time

- **ET Group:** Mean operative time was 60 ± 8 minutes.
- **MT Group:** Mean operative time was 90 ± 12 minutes.
- **Statistical Significance:** The difference was statistically significant ($p < 0.001$).

Graft Success Rate

- **ET Group:** Graft success observed in 95 patients (95%).
- **MT Group:** Graft success observed in 93 patients (93%).
- **Statistical Significance:** No significant difference ($p = 0.56$).

Postoperative Pain

VAS Scores on Postoperative Day 1:

- **ET Group:** Mean score of 2.1 ± 0.5 .
- **MT Group:** Mean score of 4.3 ± 0.7 .

Statistical Significance: Significant reduction in pain in the ET group ($p < 0.001$).

Hearing Improvement

- **ET Group:** Mean hearing gain of 15 ± 5 dB.
- **MT Group:** Mean hearing gain of 14 ± 4 dB.
- **Statistical Significance:** No significant difference ($p = 0.42$).

Complications

- Minor complications such as transient dizziness and mild otalgia were comparable between groups.
- No major complications like facial nerve injury or sensorineural hearing loss were reported in either group.

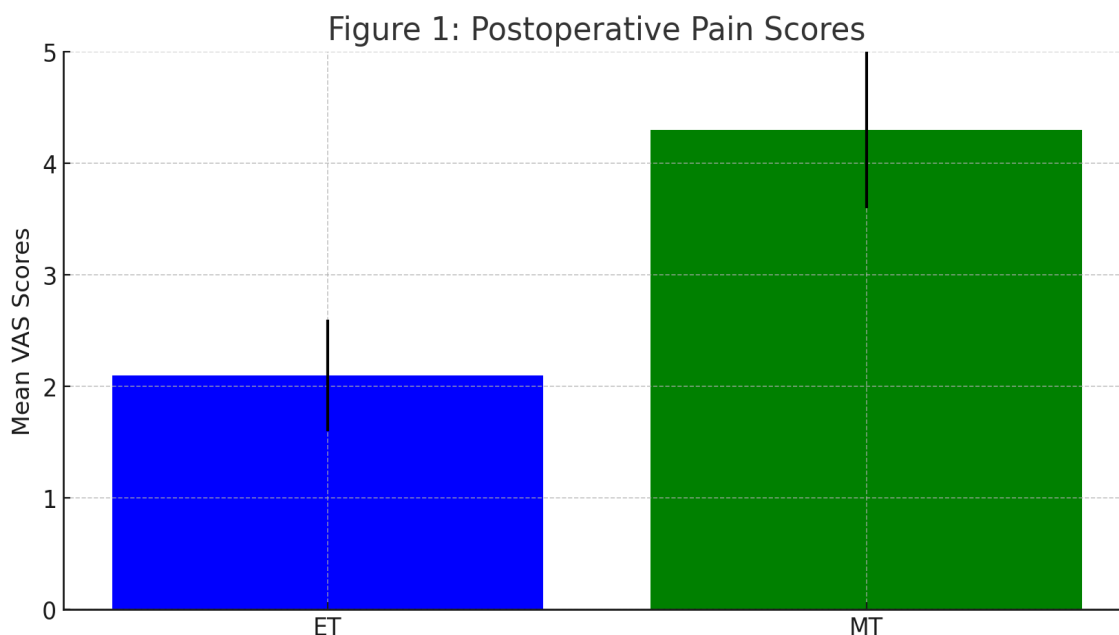
Tables and Figures

Table 1: Operative Time Comparison

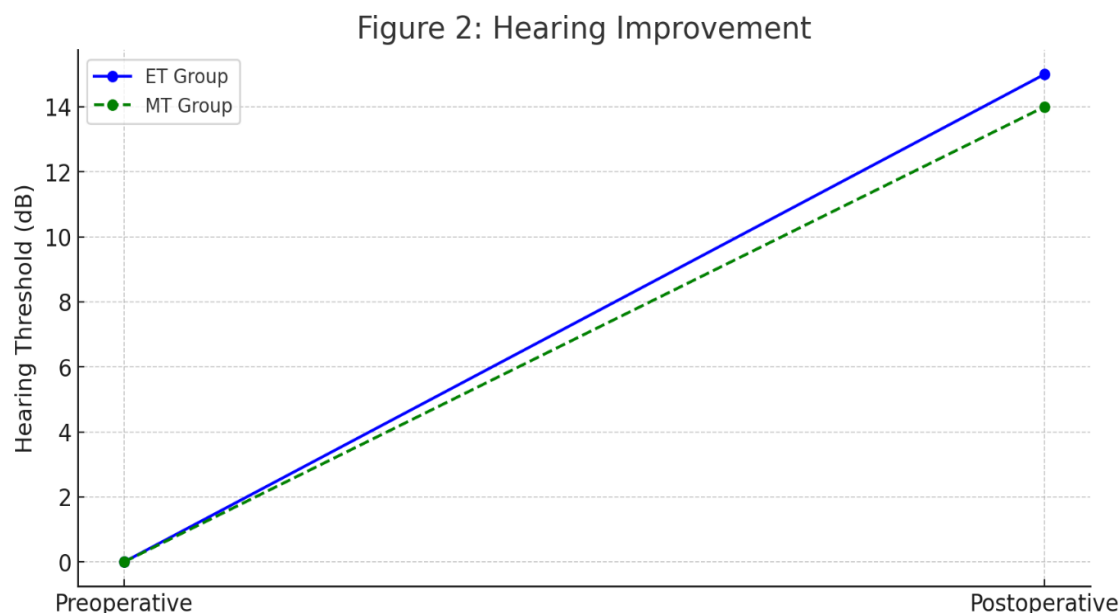
Group	Mean Operative Time (minutes)	Standard Deviation	p-value
ET	60	8	<0.001
MT	90	12	

Table 2: Graft Success Rate

Group	Graft Success (%)	p-value
ET	95	0.56
MT	93	

**Figure 1: Postoperative Pain Scores**

A bar graph illustrating the mean VAS scores for ET and MT groups.

**Figure 2: Hearing Improvement**

A line graph showing preoperative and postoperative hearing thresholds for both groups.

Discussion

The present study demonstrates that endoscopic tympanoplasty (ET) is as effective as microscopic tympanoplasty (MT) in terms of graft success rates

and hearing improvement while offering significant advantages in operative time and postoperative pain. The shorter operative time associated with ET can be attributed to the transcanal approach, which eliminates the need for time-consuming postauricular incisions and tissue dissection [8]. This finding is consistent with previous studies that

have reported reduced surgical durations with endoscopic techniques [9].

Patients in the ET group experienced less postoperative pain, likely due to the minimally invasive nature of the procedure that spares soft tissue and muscle [10]. Reduced pain not only improves patient comfort but may also facilitate quicker recovery and return to daily activities.

The graft success rates in both groups were high and comparable, aligning with literature that supports the efficacy of ET in achieving tympanic membrane closure [11]. The similar hearing outcomes further validate that ET does not compromise auditory restoration [12].

One of the challenges of ET is the necessity for single-handed surgical manipulation, as the other hand is occupied with holding the endoscope [13]. Surgeons must adapt to this technique, which can be mitigated with practice and the use of endoscope holders [14].

Our study's limitations include its retrospective design and potential selection bias. The surgeons' preference and experience with each technique could have influenced the outcomes. Future randomized controlled trials with larger sample sizes are recommended to strengthen the evidence base.

Conclusion

Endoscopic tympanoplasty is a safe and effective alternative to microscopic tympanoplasty for the repair of tympanic membrane perforations. It offers comparable graft success rates and hearing improvements while reducing operative time and postoperative pain. Given these advantages, ET should be considered a preferred technique in

suitable patients, with the potential to enhance surgical efficiency and patient satisfaction.

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