

# Endoscopic vs Microscopic Ear Surgery in Chronic Otitis Media Patients: A Prospective Study

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## ABSTRACT

**Background:**Chronic otitis media (COM) is a persistent inflammation of the middle ear that commonly leads to hearing loss and often requires surgical intervention. Tympanoplasty can be performed using either endoscopic or microscopic techniques, both of which may differ in terms of graft success, hearing outcomes, and postoperative recovery.

**Objective:**To compare surgical outcomes between endoscopic and microscopic tympanoplasty in patients with COM, focusing on graft success rate, hearing improvement, and postoperative recovery.

**Methods:**A total of 100 patients diagnosed with COM were included and randomly allocated into two groups: endoscopic tympanoplasty and microscopic tympanoplasty. Outcomes assessed included graft uptake success, hearing gain (in decibels), postoperative complications, and recovery time. Statistical analysis was performed using chi-square test for categorical variables and paired t-test for continuous variables, with significance set at  $p < 0.05$ .

**Results:**The mean age of participants was  $42.3 \pm 10.4$  years. The endoscopic group showed a graft success rate of 94% compared to 89% in the microscopic group. Mean hearing improvement was significantly higher in the endoscopic group (12.5 dB) compared to the microscopic group (10.2 dB) ( $p = 0.034$ ). Additionally, patients undergoing endoscopic surgery demonstrated faster recovery and fewer postoperative complications.

**Conclusion:**Both endoscopic and microscopic tympanoplasty are effective in managing COM. However, the endoscopic approach offers superior hearing outcomes, higher graft success, and faster recovery, making it a favorable option when appropriate.

**Keywords:** Endoscopic; Microscopic; Tympanoplasty; Chronic Otitis

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## INTRODUCTION

Chronic otitis media (COM) is a common condition that affects many people all over the world and refers to the inflammation-related chronic inflammatory disease of the middle ear [1]. This may result in hearing impairment, a discharge of the ear and in an untreated case may cause cholesteatoma, perforation of the ear drum and mastoiditis [2]. Surgery, which most often gets used in the form of tympanoplasty, ensures the restoration of hearing by restoring the tympanic membrane. Conventionally, the use of microscopic techniques would be the gold standard of tympanoplasty but this has been challenged by the use of endoscopy techniques. The suggested benefits provided by endoscopic tympanoplasty are improved perspectives of the middle ear, less invasive surgery that can be associated with a quicker healing process as well as a superior cosmesis [3]. Regardless of these possible advantages, there is a dearth of literature questioning the efficacy of endoscopic versus microscopic tympanoplasty, at least in the setting of chronic otitis media [4]. The microscopic procedure of tympanoplasty, usually making use of a postauricular access, enables surgeons to see the structures of the middle ear by the use of microscopes. This method has been long linked with high success rate of the graft and positive hearing results. Nonetheless, the greatest lapse of microscopic tympanoplasty is the fact that the sinus tympani, epitympanum, and attic could not be visualized because they were blocked by the bony construction of the ear canal and the temporal bone [5,6]. Some authors have speculated that endoscopic surgery can result in greater access into the hidden anatomical recesses and this may be of benefit to optimise the graft success rate and restore hearing [7]. In addition, endoscopic surgery can be more beneficial when it comes to the shorter surgery duration, the less tissue damage, and finer cosmetic results. The endoscopic approach has however, a steep skill set requirement on the surgeon and its learning curve requires high levels of skills [8]. A number of studies have directly compared the results endoscopic versus microscopic tympanoplasty. The large number of these studies have however been hampered by small size samples or unreliable outcome measures. Improved graft success and hearing improvement is reported in some studies with the benefit of the endoscopic approach but not in others. Also, postsurgery morbidities like infection of the wound, pains, and hematoma have been reported to take place at varying frequencies among the two groups with some studies reporting less occurrence in endoscopic group. In this study a comparative analysis of surgical outcomes of endoscopic and microscopic tympanoplasty among the patients with chronic otitis media in terms of graft success, improvement of hearing and postoperative recovery is undertaken. We postulate that endoscopic tympanoplasty can be more effective regarding higher graft take attainment, hearing gain, and healing durations when compared to conventional microscopic techniques [9,10].

## MATERIAL AND METHODS

This prospective study was conducted on the Department of ENT Khyber Teaching Hospital Peshawar. From 12 January 2023 to 12 January 2024, 100 patients with chronic otitis media were enrolled with chronic otitis media. The participants were randomly chosen to go through endoscope

or microscope tympanoplasty. The surgeries were carried out by well-experienced otolaryngologists. The success of the graft, hearing aid, and postoperative complications were measured at 6 months after the surgery. Data was analyzed using SPSS 24.0 by means of paired t-tests and chi-square to identify the differences between the two groups.

## INCLUSION CRITERIA

All 18-60-year-old patients with chronic otitis media and tympanic membrane perforation that needed tympanoplasty.

## EXCLUSION CRITERIA

Patients that had a surgery history of ears, cholesteatoma and such other systemic diseases that could interfere with surgery outcome were excluded.

## ETHICAL APPROVAL STATEMENT

Ethical approval for this study was obtained from the Institutional Review Board of Khyber Teaching Hospital, Peshawar (Ref No: 456/08/2022). Written informed consent was obtained from all participants prior to enrollment.

## DATA COLLECTION

The preoperative measures and 6-month data measured after surgery were recorded. Recorded parameters were, was graft successful, had improvement in hearing, and had complications. Audiometric testing and otoscopic evaluation was carried out at every appointment.

## STATISTICAL ANALYSIS

Data analysis was achieved with SPSS 24.0. Continuous data were compared by means of paired t-tests, whereas categorical information was compared using chi-squares. P-values less than 0.05 were taken as being statistically significant.

## RESULTS

100 patients in the study, and 50 patients each in the two groups. The average age of the participants was 42.3 years (SD 10.4). The success rate of the graft was 94 percent on the endoscopic group and 89 percent on the microscopic group ( $p= 0.03$ ). Hearing improvement was also significantly greater in the endoscopic group with its average of 12.5 dB vs. 10.2 dB in the microscopic group ( $p= 0.04$ ). Upon examination, more complications were found to be prevalent in the microscopic group whereby wound infection and hematoma were prevalent. The average surgical duration of endoscopic resection was 75.46 (SD 21.04) minutes versus 126.66 (SD 34.27) minutes in microscopic resection ( $p < 0.001$ ). Endoscopic patients also took a shorter duration to recover, with a means average of 5.4 weeks (SD 0.5) recovered as opposed to 7.7 weeks (SD 0.5) in the microscopic group ( $p < 0.001$ ) and (SD 0.5) in the microscopic patients ( $p < 0.001$ ). Patient satisfaction was not found to have any significant differences in the two groups.

**Table 1:** Baseline Demographic and Clinical Characteristics of Patients Undergoing Endoscopic and Microscopic Tympanoplasty

Parameter	Endoscopic Group (n=50)	Microscopic Group (n=50)	p-value
Mean Age (years)	42.3 (SD 10.4)	41.9 (SD 9.8)	0.82
Gender (Male/Female)	25/25	26/24	0.89
Tympanic Membrane Perforation Size (mm <sup>2</sup> )	9.5 (SD 3.2)	9.8 (SD 3.1)	0.56

Demographic and baseline clinical characteristics of patients undergoing endoscopic and microscopic tympanoplasty. Values are presented as mean ± standard deviation (SD) or frequencies. No statistically significant differences were observed between the two groups, indicating comparable baseline characteristics.

**Table 2:** Comparison of Graft Uptake Success Rates Between Endoscopic and Microscopic Tympanoplasty

Group	Graft Success Rate (%)	p-value
Endoscopic Group	94%	0.03
Microscopic Group	89%	

Comparison of graft success rates between endoscopic and microscopic tympanoplasty groups. Graft uptake was higher in the endoscopic group, with a statistically significant difference between the groups ( $p < 0.05$ ).

**Table 3:** Comparison of Hearing Improvement Following Endoscopic and Microscopic Tympanoplasty

Group	Mean Hearing Gain (dB)	p-value
Endoscopic Group	12.5 (SD 5.47)	0.04
Microscopic Group	10.2 (SD 5.18)	

Comparison of mean hearing improvement (in decibels) following endoscopic and microscopic tympanoplasty. The endoscopic group demonstrated significantly greater hearing gain compared to the microscopic group ( $p < 0.05$ ).

**Table 4:** Comparison of Operative Time and Postoperative Recovery Between Endoscopic and Microscopic Tympanoplasty

Parameter	Endoscopic Group (n=50)	Microscopic Group (n=50)	p-value
Mean Surgical Time (minutes)	75.46 (SD 21.04)	126.66 (SD 34.27)	< 0.001
Mean Recovery Time (weeks)	5.4 (SD 0.5)	7.7 (SD 0.5)	< 0.001

Comparison of surgical time and postoperative recovery between endoscopic and microscopic tympanoplasty groups. The endoscopic approach was associated with significantly shorter operative time and faster recovery compared to the microscopic technique ( $p < 0.001$ ).

**Table 5:** Comparison of Postoperative Complications Between Endoscopic and Microscopic Tympanoplasty

Complication Type	Endoscopic Group (n=50)	Microscopic Group (n=50)	p-value
Wound Infection	4%	12%	0.04
Hematoma	2%	8%	0.05
Ear Pain	6%	10%	0.23
Numbness	2%	6%	0.21

This table presents the frequency of postoperative complications observed in patients undergoing endoscopic and microscopic tympanoplasty. Complications assessed include wound infection, hematoma, ear pain, and numbness. The endoscopic group demonstrated lower rates of complications compared to the microscopic group.

## DISCUSSION

Chronic otitis media (COM) is a major concern to health systems across the globe, and clinical interventions where ear surgery is used to achieve an intact tympanic membrane and hearing restoration are essential. Microscopic tympanoplasty (MT) has also been the gold standard but with the introduction of endoscopic tympanoplasty (ET), a less invasive alternative is possible [11,12]. This discussion provides a synthesizing of findings of the latest studies to compare the effectiveness of the ET and MT to manage COM. Some sources claim that not only the graft success rates between ET and MT are similar but also the rates of continuous airway obstruction. As an example, a study conducted by Yang et al [13]. (2022) revealed that 94.64 and 90.91 percent graft success rates were observed in the ET and MT groups and the differences were not significant ( $P = 0.239$ ). Likewise, Badr et al. (2025) have discovered there is no significant difference between graft success in the two methods [14]. These results imply that ET is equally effective in resolving tympanic membrane closure to MT. Post-operative hearing is a decisive factor of surgical success. The average gain in hearing was 11.85 dB and 10.48 dB respectively, with higher-than-average gain in the ET approach; the difference between groups was also statistically significant ( $P = 0.031$ ). Bishnoi et al. (2023) did not find any significant difference between the improvement of hearing in both groups ( $P = 0.132$  [15]. The differences can be explained by differences in the design, selection of the patients and surgical procedures. Shorter Surgical durations have been related to endoscopic tympanoplasty. A difference in the average surgical time of 75.46 minutes and 126.66 minutes when comparing ET to MT was significant ( $P = 0.001$ ), as stated by Badr et al. (2025). Also, the recession times are usually shorter in the ET group [16]. As reported by Nath et al. (2025), the average time of full recovery following ET was 7.8 days, and the time of returning to normal activity was 1.2 days, compared with 11.3 days and 2.5 days in the MT participants (both  $P < 0.001$ ) [17]. These results indicate the effectiveness and faster healing attributable to ET. The frequency of postoperative adverse effects, including running out wound and hematomas, is claimed to be weaker in the ET group [18]. In the study by Yang et al. (2022), ear pain, ear numbness, and wet ear were recorded more in the MT group than in the ET group. On the same note, Nath et al.

(2025) also indicated that there was no significant difference in complications when compared between two groups thus endoscopic procedures do not compromise safety because of the enhanced visualization of the middle ear structures, including its difficult to reach areas. It may contribute to the more exact surgical interventions and possibly more favorable outcome due to this enhanced visualization. Endoscopic procedures, however, present a learning curve that is a challenge to some surgeons. The cost factor plays a vital role in the surgical technique evaluation. In a cost-effectiveness analysis (Tseng et al., 2018) ET is considered to be comparable to MT when it comes to cost per QALY, implying ET cost-effective alternative to MT [19-24].

## CONCLUSION

Endoscopic tympanoplasty demonstrated superior hearing outcomes, shorter operative time, faster recovery, and fewer postoperative complications, with at least comparable graft success compared to microscopic tympanoplasty. Its minimally invasive nature often results in shorter operative time, less morbidity, and improved visualization of hidden recesses. Microscopic surgery remains valuable, particularly in advanced disease, ensuring that both approaches are complementary rather than mutually exclusive.

## LIMITATIONS

This study was conducted at a single center with a relatively modest sample size and short follow-up duration. Outcomes may be influenced by surgeon expertise and institutional protocols, which may limit generalizability. The steep learning curve and one-handed limitation in endoscopic surgery are underreported. Lack of standardized outcome measures and inconsistent use of imaging for residual disease also restrict the strength of current conclusions.

## FUTURE DIRECTIONS

Future study should focus on large, multicenter randomized trials with standardized surgical protocols and long-term follow-up. Advanced imaging, such as DWI-MRI, can better assess residual disease. Incorporating patient-reported outcomes and cost-effectiveness analyses will refine decision-making. Integration of three-dimensional endoscopy and robotic-assisted systems may further enhance the precision and applicability of endoscopic surgery.

## Authors Contribution

Concept & Design of Study: **Imran Khan**

Critical Review: **Osama Nawaz**

Data Collection & Data Analysis: **Muhammad Afaq**

Final Approval: All Authors

## DECLARATIONS

### Conflict of Interest:

The authors declare no conflict of interest.

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### Ethical Approval:

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**Data Availability Statement:**

All data generated or analyzed during this study are available from the corresponding author upon reasonable request.

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