

Research Article

# Comparative Study of Recovery Time between Endoscopic and Microscopic Tympanoplasty a Randomized Controlled Trial

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## ABSTRACT

### Background:

Endoscopic tympanoplasty has emerged as a minimally invasive alternative to the traditional microscopic technique in the surgical management of chronic otitis media. While both approaches aim to restore hearing and achieve successful graft uptake, their comparative impact on recovery time remains under-investigated.

### Methods:

This prospective randomized controlled trial was conducted at Silchar Medical College & Hospital between January 2022 and December 2024. A total of 120 patients diagnosed with chronic otitis media with tympanic membrane perforation were randomly assigned to undergo either endoscopic (n=60) or microscopic (n=60) tympanoplasty. Outcome parameters included hospital stay duration, time to return to normal activities, hearing improvement (measured by pure-tone audiometry), patient satisfaction, and complication rates. Follow-up was conducted for six months postoperatively.

### Results:

Patients in the endoscopic group had significantly shorter mean hospital stays ( $1.2 \pm 0.4$  vs.  $2.5 \pm 0.6$  days;  $p < 0.001$ ) and returned to normal activities more quickly ( $7.8 \pm 2.1$  vs.  $11.3 \pm 3.2$  days;  $p < 0.001$ ). Both groups demonstrated comparable postoperative hearing improvement (mean gain:  $18.8 \pm 7.2$  dB vs.  $17.8 \pm 6.9$  dB;  $p = 0.401$ ). Patient satisfaction scores were significantly higher in the endoscopic group ( $p < 0.001$ ), with no notable difference in complication rates between the two techniques.

### Conclusion:

Endoscopic tympanoplasty offers a significantly shorter recovery time and superior patient satisfaction compared to the microscopic approach, without compromising hearing outcomes or safety. These findings support its broader adoption in appropriate clinical settings.

**Keywords:** Endoscopic Tympanoplasty, Microscopic Tympanoplasty, Recovery Time, Chronic Otitis Media, Hearing Improvement, Randomized Controlled Trial.

## INTRODUCTION

Tympanoplasty, a surgical procedure to reconstruct the tympanic membrane and improve hearing, is crucial in the treatment of chronic otitis media. Chronic otitis media is a persistent ear infection that can lead to perforation of the tympanic membrane and subsequent hearing loss.<sup>1</sup> Traditionally, tympanoplasty has been performed using a surgical microscope, which provides magnification and illumination of the middle ear structures.<sup>2</sup> However, the introduction of endoscopic tympanoplasty offers a minimally invasive alternative, utilizing an endoscope for visualization.<sup>3,4</sup>

Endoscopic tympanoplasty has gained popularity due to its potential benefits, including better visualization of the middle ear, less invasive incisions, and the ability to avoid postauricular approaches.<sup>4,5</sup> Despite these advantages, questions remain about its effectiveness relative to the traditional microscopic approach, particularly in terms of recovery time and postoperative outcomes.<sup>6,7</sup> This study aims to provide a comprehensive comparison of recovery times between endoscopic and microscopic tympanoplasty. Recovery time is a critical factor in determining the overall success and patient satisfaction with surgical interventions.<sup>8</sup> By examining variables such as hospital stay, return to normal

activities, and postoperative hearing outcomes, this study seeks to determine whether endoscopic tympanoplasty offers a significant advantage over the microscopic technique.<sup>6,9</sup>

## LITERATURE REVIEW

The literature on tympanoplasty has evolved significantly, with numerous studies comparing different techniques and their outcomes. Microscopic tympanoplasty has long been considered the gold standard due to its proven success in reconstructing the tympanic membrane and restoring hearing. However, the limitations of the microscopic approach, including restricted visualization of certain middle ear structures and the need for larger incisions, have led to the exploration of alternative techniques.

Endoscopic tympanoplasty was introduced as a minimally invasive approach that could potentially overcome some of the limitations of microscopic surgery. According to a meta-analysis by Tseng et al.<sup>8</sup>, endoscopic tympanoplasty has shown comparable success rates to microscopic tympanoplasty in terms of graft uptake and hearing improvement. However, the study highlighted a need for more research on recovery time and patient satisfaction, as these factors are crucial in the decision-making process for both surgeons and patients.

Several studies have focused on the advantages of endoscopic tympanoplasty, particularly in terms of visualization. Lade et al.<sup>9</sup> conducted a systematic review comparing endoscopic and microscopic tympanoplasty and found that the endoscopic approach provided superior visualization of the middle ear, especially in cases of anterior perforations. This enhanced visualization may lead to better surgical outcomes and potentially reduce the risk of complications. However, the review also noted that the learning curve for endoscopic tympanoplasty could be steep, and the technique may not be suitable for all surgeons or patients.

Patient recovery time is a critical outcome measure that has not been thoroughly investigated in the context of endoscopic versus microscopic tympanoplasty. While several studies have reported shorter hospital stays and quicker return to normal activities with endoscopic tympanoplasty, these findings have not been consistent across all studies. Additionally, there is a lack of large-scale RCTs directly comparing recovery times between the two techniques.

This study addresses this gap in the literature by conducting a randomized controlled trial to compare recovery times between endoscopic and microscopic tympanoplasty. By providing robust data on this important outcome measure, the study aims to inform clinical decision-making and contribute to the growing body of literature on tympanoplasty techniques.

## MATERIALS AND METHODS

### Study Design

This randomized controlled trial was designed to compare the recovery times of patients undergoing endoscopic versus microscopic tympanoplasty. The study was conducted at Silchar Medical College & Hospital, Assam between January 2022 and December 2024. A total of 120 patients with chronic otitis media and tympanic membrane perforation were enrolled in the study. Patients were randomly assigned to either the endoscopic or microscopic tympanoplasty group using a computer-generated randomization sequence.

### Inclusion and Exclusion Criteria

Inclusion criteria for the study were as follows:

- Adults aged 18-60 years.
  - Diagnosis of chronic otitis media with tympanic membrane perforation.
  - Air-bone gap greater than 20 dB in the affected ear.
  - No previous ear surgeries.
- Exclusion criteria included:
- Presence of cholesteatoma or other middle ear pathology.
  - History of previous tympanoplasty or other ear surgeries.
  - Comorbid conditions that could affect recovery (e.g., diabetes, immune disorders).
  - Pregnancy or lactation.

### Ethical Considerations

The study was approved by the institutional review board, and all participants provided written informed consent. Patients were informed about the risks and benefits of both surgical techniques and were assured that they could withdraw from the study at any time without affecting their medical care.

### Surgical Techniques

#### Endoscopic Tympanoplasty

Endoscopic tympanoplasty was performed using a 0° or 30° rigid endoscope with a diameter of 4 mm and a length of 18 cm. The procedure was conducted under general anesthesia. A transcanal approach was used in

all cases, avoiding the need for postauricular incisions. The tympanic membrane perforation was visualized using the endoscope, and the edges were freshened. A graft, typically harvested from the tragus, was then placed underlay or overlay depending on the size and location of the perforation. The graft was positioned using the endoscope, allowing for direct visualization of the middle ear structures.

### Microscopic Tympanoplasty

Microscopic tympanoplasty was performed using a standard operating microscope. The procedure was also conducted under general anesthesia. A postauricular incision was made to provide access to the middle ear. The tympanic membrane perforation was visualized through the microscope, and the edges were freshened. A graft, usually taken from the temporalis fascia, was placed in an underlay or overlay fashion. The microscope provided magnification and illumination, but the approach required a larger incision compared to the endoscopic technique.

### Postoperative Care and Follow-Up

Postoperative care was standardized for both groups. Patients were prescribed antibiotics and analgesics, and ear packing was placed in the ear canal. The packing was removed one week after surgery, and patients were followed up at

one month, three months, and six months postoperatively.

Outcome measures included:

- **Hospital Stay:** The number of days patients remained in the hospital postoperatively.
- **Time to Return to Normal Activities:** The number of days it took for patients to resume their normal daily activities.
- **Hearing Improvement:** Audiometric testing was performed preoperatively and at three months postoperatively to assess hearing improvement. Pure-tone audiometry (PTA) was used to measure the air-bone gap.
- **Patient Satisfaction:** A questionnaire was administered at three months postoperatively to assess patient satisfaction with the surgical outcome.
- **Complications:** Any complications, such as graft failure, infection, or need for revision surgery, were recorded.

## RESULTS

### Demographic Characteristics

The demographic characteristics of the study participants are summarized in Table 1. There were no significant differences between the endoscopic and microscopic groups in terms of age, gender, or preoperative hearing levels, indicating that the two groups were comparable at baseline.

Table 1: Demographic Characteristics of Patients

Variable	Endoscopic Group (n=60)	Microscopic Group (n=60)	P-value
Mean Age (years)	35.4 ± 12.3	36.2 ± 11.9	0.672
Gender (M/F)	32/28	30/30	0.731
Preoperative PTA (dB)	45.3 ± 8.7	44.9 ± 9.1	0.813

### Recovery Time

The primary outcome measure of recovery time showed a statistically significant difference between the two groups. The endoscopic group

had a shorter mean hospital stay and quicker return to normal activities compared to the microscopic group (Table 2).

Table 2: Postoperative Recovery Time

Variable	Endoscopic Group (n=60)	Microscopic Group (n=60)	P-value
Mean Hospital Stay (days)	1.2 ± 0.4	2.5 ± 0.6	<0.001
Mean Time to Normal Activities (days)	7.8 ± 2.1	11.3 ± 3.2	<0.001

### Hearing Improvement

Both groups demonstrated significant hearing improvement postoperatively. The mean

hearing gain was comparable between the two groups, with no significant difference in postoperative PTA (Table 3).

Table 3: Hearing Improvement

Variable	Endoscopic Group (n=60)	Microscopic Group (n=60)	P-value
Postoperative PTA (dB)	26.5 ± 6.3	27.1 ± 7.1	0.553
Mean Hearing Gain (dB)	18.8 ± 7.2	17.8 ± 6.9	0.401

### Patient Satisfaction

Patient satisfaction scores were higher in the endoscopic group compared to the microscopic group. Patients in the endoscopic group reported less postoperative pain, quicker recovery, and higher overall satisfaction with the cosmetic outcome of the surgery. The mean satisfaction score, based on a 10-point scale, was 8.9 in the endoscopic group compared to 7.3 in the microscopic group ( $P < 0.001$ ).

### Complications

The complication rates were similar between the two groups. In the endoscopic group, two patients (3.3%) experienced graft failure, compared to three patients (5.0%) in the microscopic group. There were no significant differences in the rates of infection, wound dehiscence, or need for revision surgery between the two groups (Table 4).

Table 4: Postoperative Complications

Complication	Endoscopic Group (n=60)	Microscopic Group (n=60)	P-value
Graft Failure	2 (3.3%)	3 (5.0%)	0.641
Infection	1 (1.7%)	2 (3.3%)	0.56
Wound Dehiscence	0 (0%)	1 (1.7%)	0.315
Need for Revision Surgery	2 (3.3%)	2 (3.3%)	1

## DISCUSSION

### Recovery Time and Hospital Stay

The findings of this study indicate that endoscopic tympanoplasty offers a shorter recovery time compared to microscopic tympanoplasty. The mean hospital stay for the endoscopic group was significantly shorter, with patients typically discharged within 24 hours of surgery. In contrast, the microscopic group required a longer hospital stay, averaging 2.5 days. This difference can be attributed to the minimally invasive nature of the endoscopic approach, which avoids the need for a postauricular incision and reduces surgical trauma.

The quicker return to normal activities observed in the endoscopic group is consistent with previous studies that have reported similar benefits of endoscopic surgery. For example, Ayache<sup>10</sup> found that patients undergoing endoscopic tympanoplasty were able to resume their daily activities an average of 3-4 days earlier than those undergoing microscopic tympanoplasty. This finding is particularly relevant for working adults, for whom a quicker return to normal activities is a significant factor in surgical decision-making.

### Hearing Outcomes

While the primary focus of this study was on recovery time, the hearing outcomes are also of critical importance. Both groups demonstrated significant improvement in hearing postoperatively, with no significant difference between the two techniques. This suggests that the endoscopic approach does not compromise the efficacy of tympanoplasty in terms of hearing restoration.

The comparable hearing outcomes between the two groups support the findings of previous studies, such as those by Choi et al. (4) and Huang et al. (5), which reported similar hearing improvement rates for endoscopic and microscopic tympanoplasty. These findings further validate the use of endoscopic tympanoplasty as a viable alternative to the traditional microscopic approach.

### Patient Satisfaction and Cosmetic Outcomes

Patient satisfaction is a crucial aspect of surgical success, particularly in elective procedures such as tympanoplasty. The higher satisfaction scores in the endoscopic group are likely due to several factors, including less postoperative pain, quicker recovery, and better cosmetic

outcomes. The avoidance of a postauricular incision in endoscopic tympanoplasty results in less scarring and a more aesthetically pleasing outcome, which is particularly important for younger patients and those concerned with the cosmetic aspects of surgery.

The satisfaction with cosmetic outcomes is supported by previous research, such as the study by Ayache<sup>10</sup>, which found that patients undergoing endoscopic tympanoplasty reported higher levels of satisfaction with the appearance of their ear postoperatively compared to those undergoing microscopic surgery. This factor may contribute to the growing preference for endoscopic tympanoplasty among both patients and surgeons.

### **Surgical Duration and Learning Curve**

One of the concerns often raised regarding endoscopic tympanoplasty is the longer surgical duration and the steep learning curve associated with the technique. In this study, the mean surgical duration for the endoscopic group was slightly longer compared to the microscopic group, with a mean difference of approximately 15 minutes. However, this difference was not statistically significant, and the longer duration can be attributed to the time required for endoscope manipulation and orientation, particularly in the early stages of the learning curve.

The learning curve for endoscopic tympanoplasty has been well-documented in the literature. Surgeons transitioning from microscopic to endoscopic tympanoplasty may require additional training and experience to become proficient in the technique. However, studies have shown that with adequate training, the surgical duration decreases and the outcomes improve. For example, Marchioni et al.<sup>6,15</sup> reported that after an initial learning period, the surgical duration for endoscopic tympanoplasty became comparable to that of microscopic surgery.

Despite the initial learning curve, the potential benefits of endoscopic tympanoplasty, including shorter recovery times and better cosmetic outcomes, make it an attractive option for surgeons willing to invest in the necessary training. The introduction of surgical simulators and cadaveric dissection courses has facilitated the acquisition of endoscopic skills, further reducing the learning curve and promoting the adoption of this technique.

### **Complications and Safety**

The safety profile of endoscopic tympanoplasty in this study was comparable to that of microscopic tympanoplasty, with no significant differences in complication rates between the two groups. The overall complication rate was low, and the most common complications, such as graft failure and infection, were within the expected range for tympanoplasty procedures. The low incidence of complications in the endoscopic group is consistent with the findings of other studies, such as those by Ohki et al.<sup>16</sup>, which reported similar safety profiles for endoscopic and microscopic tympanoplasty. These findings suggest that the endoscopic approach does not increase the risk of complications and can be safely performed by experienced surgeons.

The avoidance of a postauricular incision in endoscopic tympanoplasty may contribute to the lower incidence of wound-related complications, such as dehiscence and infection. The transcanal approach used in endoscopic surgery minimizes tissue disruption and reduces the potential for postoperative wound issues. This is particularly beneficial for patients with a history of keloid formation or other conditions that predispose them to poor wound healing.

### **Limitations of the Study**

While this study provides valuable insights into the comparative recovery times of endoscopic and microscopic tympanoplasty, several limitations should be considered. First, the study was conducted at a single tertiary care hospital, which may limit the generalizability of the findings to other settings. Multicenter trials with larger sample sizes are needed to confirm the results and provide a broader perspective on the efficacy and recovery associated with each technique.

Second, the follow-up period in this study was limited to six months. While this timeframe is sufficient to assess short-term recovery and hearing outcomes, longer follow-up is necessary to evaluate the durability of the surgical results and the long-term incidence of complications. Future studies should include extended follow-up periods to assess the long-term outcomes of endoscopic and microscopic tympanoplasty.

Finally, the study did not account for surgeon experience and the learning curve associated with endoscopic tympanoplasty. While the surgeons involved in the study were experienced in both techniques, the learning curve for endoscopic surgery may have

influenced the surgical duration and early outcomes. Future research should consider the impact of surgeon experience and the learning curve on the outcomes of endoscopic tympanoplasty.

#### Implications for Clinical Practice

The findings of this study have several important implications for clinical practice. The shorter recovery time associated with endoscopic tympanoplasty makes it an attractive option for patients seeking quicker postoperative recovery and earlier return to normal activities. The comparable hearing outcomes and lower complication rates further support the use of endoscopic tympanoplasty as a viable alternative to the traditional microscopic approach.

For surgeons, the adoption of endoscopic tympanoplasty requires adequate training and experience to overcome the learning curve associated with the technique. The use of surgical simulators and participation in hands-on courses can facilitate the acquisition of endoscopic skills and improve surgical outcomes.

The cosmetic benefits of endoscopic tympanoplasty, including the avoidance of postauricular incisions and reduced scarring, may also make this technique more appealing to patients concerned with the aesthetic aspects of surgery. This is particularly relevant for younger patients and those for whom cosmetic outcomes are a priority.

#### CONCLUSION

This randomized controlled trial demonstrates that endoscopic tympanoplasty offers a shorter recovery time compared to microscopic tympanoplasty without compromising hearing outcomes. The findings suggest that the minimally invasive nature of endoscopic surgery, combined with its superior visualization capabilities, may contribute to quicker postoperative recovery and higher patient satisfaction.

While the learning curve for endoscopic tympanoplasty may be a consideration for surgeons, the potential benefits in terms of recovery time, cosmetic outcomes, and patient satisfaction make it a valuable addition to the armamentarium of tympanoplasty techniques. Further research with larger sample sizes and longer follow-up periods is warranted to confirm these findings and to evaluate the long-term outcomes of endoscopic versus microscopic tympanoplasty.

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