DOI: https://doi.org/10.54393/pjhs.v6i8.3199

PAKISTAN JOURNAL OF HEALTH SCIENCES
(LAHORE)
https://thejas.com.pk/index.php/pjhs
ISSN (E): 2790-9352, (P): 2790-9344
Volume 6, Issue 08 (August 2025)

Original Article

OPEN ACCESS

Comparing the Efficacy of Microscopic Tympanoplasty (MT) and Endoscopic Tympanoplasty (ET) For Tympanic Membrane and Middle Ear Surgery

Sanaullah Bhatti[1*], Amber Irfan[2], Intasar Ashraf[2], Muhammad Mohsin Bashir[2], Hassan Saeed[2] and Saman Javaid[2]

[1]Department of ENT, Bakhtawar Amin Teaching Hospital, Multan, Pakistan
[2]Department of ENT, Ibn-e-Sina Hospital, Multan, Pakistan

ARTICLE INFO

Keywords:
Endoscopic Tympanoplasty, Microscopic Tympanoplasty, Middle Ear Surgery, Audiological Outcomes

How to Cite:
Bhatti, S., Irfan, A., Ashraf, I., Bashir, M. M., Saeed, H., & Javaid, S. (2025). Comparing the Efficacy of Microscopic Tympanoplasty (MT) and Endoscopic Tympanoplasty (ET) For Tympanic Membrane and Middle Ear Surgery: Microscopic Versus Endoscopic Tympanoplasty. Pakistan Journal of Health Sciences, 6(8), 46-51. https://doi.org/10.54393/pjhs.v6i8.3199

***Corresponding Author:**
Sanaullah Bhatti
Department of ENT, Bakhtawar Amin Teaching Hospital, Multan, Pakistan
s27562426@gmail.com

Received Date: 26th May, 2025
Revised Date: 21st July, 2025
Acceptance Date: 16th August, 2025
Published Date: 31st August, 2025

ABSTRACT

Endoscopic tympanoplasty and microscopic tympanoplasty is performed to restore hearing. But ET superior to MT as it less invasive. **Objective:** To evaluate the comparative efficacy of endoscopic tympanoplasty vs microscopic tympanoplasty for middle ear and tympanic membrane surgery. **Methods:** A prospective, quasi-experimental study was conducted in the ENT and Surgical Department of Bakhtawar Amin Memorial Trust Hospital, Multan from 15th October 2024 to 15th May 2025. A total of 100 adult patients undergoing type 1 endoscopic tympanoplasty or microscopic tympanoplasty were selected for the study by convenience sampling. Preoperative and postoperative air conduction, air bone gap and bone conduction were measured by pure tone. Picture archiving and communication system was used to perform preoperative speech audiometry to measure the perforation size. **Results:** The average surgery duration in endoscopic group was 79.23 ± 11.97 minutes and in microscopic group was 93.05 ± 19.81, which was significantly longer than the former ($p<0.001$). The length of hospital stay was also significantly short in endoscopic group (4.44 ± 1.11 min) due to less postoperative pain and minimally invasive procedure than microscopic group (8.09 ± 1.27 min) ($p<0.001$). On follow up, 5 (10%) patients in endoscopic group and 6 (12%) patients had a re-perforation ($p=1.0$). There was no significant difference between incidence of otorrhea (6% vs 12%, $p=0.360$) and pain (4% vs 2%, $p>0.050$). **Conclusions:** The audiological outcomes between type 1 endoscopic tympanoplasty and microscopic tympanoplasty were similar. However, surgical duration and length of hospital stay was better in endoscopic group.

INTRODUCTION

Tympanoplasty is common procedure performed to repair the tympanic membrane and middle ear for prevention of infection and hearing restoration. It is performed with the help of microscopes or endoscope to reconstruct the damages the hearing mechanism. Although endoscopes were previously employed for diagnosis and visualization only, at present, they are a major part of middle ear procedures performed for cochlear implants, otitis media and otosclerosis [1, 2]. When comparing both procedures, endoscopic tympanoplasty is superior to microscopic tympanoplasty as it less invasive, achieves favorable cosmetic outcomes and patients have reduces pain after the procedure [3, 4]. Although a relatively incision is made, it allows for a wider viewing plane for operating. It also provides an advantage to explore the direct view of the regions inaccessible by microscope such as sinus tympani, epi-tympanic space and fascial recess. However, endoscopic procedure has several limitations [5]. It does not provide a three-dimensional view unlike microscopic technique that determines the depth of structures. Secondly, only one hand of surgeons is actively involved in surgery while the other hand holds the endoscope which

DOI: https://doi.org/10.54393/pjhs.v6i8.3199

make the finer movements difficult. Lastly, the success of this procedure depends on ample practice and experience of surgeon to master it [6]. Previous studies conducted to compare the outcomes of these techniques involved performance of surgery by multiple surgeons which yielded variable results [7]. Additionally, most of these studies only focuses on hearing outcomes. In this study it was included that surgeries performed by three surgeons, experienced in both techniques, to limit the variability, excluded learning curve as confounding factor and evaluate a more controlled comparison. Additional surgical parameters were included such as frequency of complications, graft success rates, operative time and duration of hospital stay.

Despite increasing adoption of endoscopic tympanoplasty due to its minimally invasive nature, limited local evidence exists comparing its efficacy with microscopic tympanoplasty in the Pakistani population under standardized surgical expertise. Previous studies often involved multiple surgeons with varying skill levels, focused mainly on hearing outcomes, and inadequately assessed operative efficiency, complication rates, and hospital stay. This study aimed to provide a controlled comparison of endoscopic versus microscopic tympanoplasty by evaluating audiological improvement, graft success, surgical duration, postoperative complications, and recovery outcomes to determine the overall comparative effectiveness of both techniques. This study was conducted to evaluate the comparative efficacy of endoscopic tympanoplasty vs microscopic tympanoplasty for middle ear and tympanic membrane surgery.

METHODS

A prospective-quasi-experimental study was conducted in the ENT and Surgical Department of Bakhtawar Amin Memorial Trust Hospital, Multan from 15th October 2024 to 15th May 2025. A total of 100 adult patients undergoing type 1 endoscopic tympanoplasty or microscopic tympanoplasty without ossicular reconstruction were selected for the study by convenience sampling. The sample size was calculated by G power software for detecting a difference in postoperative air-bone gap reduction between groups keeping 0.8 power of test, 95% confidence interval, 0.05 statistical significance and a minimum effect size of 5 decibels as in Saini *et al* [8]. Patients with a previous history of otitis media surgery or mastoidectomy and those who could not attend follow-up for a minimum of 3 months were excluded.The study was approved by The Ethical Review Board was approved the study by Ref No.3437/BAMTH dated 10th Oct 2024. Patients were divided into two groups based on the surgical technique performed; endoscopic group and microscopic group. Preoperative and postoperative air conduction was measured by pure tone audiometry at frequencies 125, 250, 500, 1000, 2000, 3000, 4000 and 8000 Hz along with air bone gap at 500, 1000, 2000 and 4000 Hz and bone conduction at 250, 500, 1000, 2000, 3000 and 4000 Hz. Preoperative speech audiometry was performed and tympanic membrane perforation size was estimated from endoscopic or microscopic images retrieved from the PACS system. The relative perforation size was quantified as a of the total tympanic membrane area using image-based analysis. To limit selection bias, all surgeries were percentage conducted by three surgeons with over 5 years' experience in both techniques to standardize technical performance [9]. The endoscopic procedure was performed by making endomeatal incisions to elevate the tympanomeatal flap and the microscopic procedure was performed through traditional postauricular route. All patients were administered local infiltration anesthesia using 0.01 mg/mL epinephrine in 2% lidocaine to minimize bleeding. Grafts in endoscopic group were taken from tragal perichondrium and in microscopic group from temporalis fascia. Before making incisions, perforation margins were scarified. A 10 mm tympanomeatal flap elevation was done lateral to tympanic annulus. Keeping the chorda tympani nerve intact, annulus was detached from the tympanic sulcus to reach the middle ear and assess mobility and integrity of ossicles. Grafts were placed in the middle ear space by underlay technique between manubrium mallei and fibrous annulus supported by Wet Cutanplast to prevent medial migration. Dry Cutanplast in external ear canal was used to support healing and aid fixation. Tragal incisions were closed by unabsorbable sutures which were removed 1 week postoperatively. Cutanplast was removed 14 days after the surgery. The surgical site was covered with non-compressive dressing in endoscopic group and with postauricular compressive dressing in microscopic group. In the endoscopic group, the procedure was performed with the help of 3 mm rigid endoscope with 0- and 30-degree lenses connected to a 24-inch full monitor. Illumination was provided by Xenon light source and instrumentation was done using endoscope instrument for middle ear procedures. In microscopic group, surgical microscope was used to perform the procedures. All included patients completed a uniform minimum follow-up of 3 months. Follow-up visits were scheduled at 1 months, 3 months and 6 months postoperatively. The primary outcome variable was audiological improvement, measured by change in air-bone gap at 3 months postoperatively. Secondary outcomes included surgery duration, graft uptake, complication rates (re-perforation, otorrhea, otalgia), and hospital stay duration. Anatomical success was defined as intact graft on otoscopic examination. Functional success (air conduction, air bone gap) was defined as ≥10 dB improvement in ABG [10]. Data

DOI: https://doi.org/10.54393/pjhs.v6i8.3199

analysis was done by SPSS version 20.0. Categorical data (graft success, postoperative complications) was compared by chi-squared test while parametric data (surgery duration, hearing threshold) was evaluated by t-tests. Variables were calculated as mean ±SD. Baseline clinical variables were statistically compared to confirm intergroup comparability. The statistical significance was set at p<0.050.

RESULTS

A total of 100 patients divided into endoscopic and microscopic group were included for analysis. The mean age in endoscopic group was 50.82 ± 13.02 years with 74% women while the mean age in microscopic group was 44.11 ± 16.58 with 50% women. The difference in gender was significant (p=0.050). The laterality, perforation location and size, anesthesia and revision rate were statistically similar between both groups, table 1.

Table 1: Patients' Baseline Characteristics(n=100)

Variables	Endoscopic Group Mean ± SD / Frequency (%)	Microscopic Group Mean ± SD / Frequency (%)	p-Value
Mean age	50.82 ± 13.02	44.11 ± 16.58	0.050
Gender			
Male	13 (26)	25 (50)	0.020
Female	37 (74)	25 (50)	
Laterality			
Right	23 (46)	28 (56)	0.530
Left	27 (54)	22 (44)	
Perforation Location			
Anterior inferior quadrant	40 (80)	35 (70)	0.320
Posterior inferior quadrant	10 (20)	15 (30)	
Anesthetic			
General	45 (90)	49 (98)	0.190
Local	5 (10)	1 (2)	
Relative Perforation size	14.15 ± 10.38	14.18 ± 10.77	0.880
Revisions	1 (2)	2 (4)	1.000

There was no significant difference between preoperative and postoperative audiological parameters among groups but there was significant improvement them postoperatively, table 2.

Table 2: Preoperative Audiological Parameters(n=100)

Variables	Endoscopic Group Mean ± SD	Microscopic Group Mean ± SD	p-Value
Operative Side			
Mean air conduction	39.31 ± 16.86	39.47 ± 20.43	0.840
Mean bone conduction	20.22 ± 14.37	19.88 ± 15.39	0.700
Mean air bone gap	20.09 ± 8.68	21.55 ± 10.33	0.480
Speech discrimination score	95.80 ± 10.41	94.54 ± 17.11	0.660
Mean low tone	48.64 ± 20.85	45.10 ± 15.06	0.330
Mean high tone	49.49 ± 22.29	50.86 ± 23.47	0.900
Contralateral Side			
Mean air conduction	24.60 ± 15.90	18.29 ± 13.58	0.060
Mean bone conduction	24.42 ± 12.02	25.08 ± 15.53	0.760
Speech discrimination score	99.09 ± 4.89	99.24 ± 5.86	0.060

Both endoscopic and microscopic tympanoplasty significantly improved air conduction and air-bone gap postoperatively (p<0.001 for both). Bone conduction changes were not statistically significant in either group. Low-tone hearing improved significantly, while high-tone changes were non-significant. There were no significant differences between the two groups in any audiological outcomes, indicating comparable hearing restoration efficacy, table 3.

Table 3: Comparison of Preoperative and Postoperative Hearing Thresholds

Variables	Endoscopic Group			Microscopic Group			p-Value
	Preoperative Mean ± SD	Postoperative Mean ± SD	P	Preoperative Mean ± SD	Preoperative Mean ± SD	P	
Air conduction	39.31 ± 16.86	30.41 ± 18.28	<0.001	39.47 ± 20.43	30.31 ± 18.56	<0.001	0.750
Bone conduction	20.22 ± 14.37	17.87 ± 12.73	0.42	19.88 ± 15.39	18.87 ± 12.34	0.83	0.530
Air bone gap	20.09 ± 8.68	10.36 ± 6.97	<0.001	21.55 ± 10.33	11.83 ± 7.89	<0.001	0.540
Low tone	48.64 ± 20.85	26.28 ± 20.86	<0.001	45.10 ± 15.06	27.32 ± 15.94	<0.001	0.270
High tone	49.49 ± 22.29	45.89 ± 19.43	0.25	50.86 ± 23.47	47.30 ± 26.85	0.24	0.810

Functional success was achieved in 44 (88%) patients in the endoscopic group and 43 (86%) in the microscopic group (p=0.780). The average surgery duration in endoscopic group was 79.23 ± 11.97 minutes and in microscopic group was 93.05 ± 19.81, which was significantly longer than the former (p<0.001). The length of hospital stay was also significantly short in endoscopic group (4.44 ± 1.11 min) due to less postoperative pain and minimally invasive procedure than microscopic group (8.09 ± 1.27 min) (p<0.001). On follow up, 5(10%) patients in endoscopic group and 6 (12%) patients had a re-perforation (p=1.000). There was no significant difference between incidence of otorrhea (6% vs 12%, p=0.36) and pain (4% vs 2%, p>0.050), Table 4.

DOI: https://doi.org/10.54393/pjhs.v6i8.3199

Table 4: Operative Parameters and Postoperative Complications

Variable	Endoscopic Group Frequency (%) / Mean ± SD	Microscopic Group Frequency (%) / Mean ± SD	p-Value
Graft success rate	45 (90)	44 (88)	1.000
Complications			
Re-perforation	5 (10)	6 (12)	1.000
Otorrhea	3 (6)	6 (12)	0.360
Otalgia	1 (2)	2 (4)	1.000
Wound infection	-	-	1.000
Surgery duration (minutes)	79.23 ± 11.97	93.05 ± 19.81	<0.001
Length of hospital stay (days)	4.44 ± 1.11	8.09 ± 1.27	<0.001

DISCUSSION

Endoscopic approach for middle ear surgery is a more advantageous as it is less invasive and more visibility, however, it was not preferred by surgeons due to low resolution and poor imaging. These limitations were solved by new technology and updates in resolution systems but its longer learning curve and use of one hand during procedure are still major drawbacks. A study by Gkrinia *et al.*, favors the use of endoscope in events of limited visibility and when there is a suspected lesion in the tympanic canal [11]. It is also preferred to explore inaccessible structures of middle ear when there is risk of recurrence of lesions. However, hemorrhage or extensive bone removal, can obstruct the view of endoscope so it cannot fully replace the microscopic approach. This present study shows that there the audiological outcomes between endoscopic and microscopic procedure were similar but surgical duration and length of hospital stay was better in endoscopic group. Other studies also showed similar results [12, 13]. Yang *et al.*, also reported that type 1 endoscopic tympanoplasty has a shorter operative time, improved health outcomes and less discomfort [14]. But it yields similar graft success, hearing outcomes and improvement in air bone gap compared to microscopic tympanoplasty. The graft success rate was 45 (90%) in endoscopic group and 44 (88%) in microscopic group but the difference was not significant. Similarly, in Elnahal *et al.*, the difference between endoscopic group and microscopic group was insignificant (85% vs 86.4%) [15]. Zakir *et al.*, also showed no significant difference for graft success with a odds ratio of 0.70 (95% CI: 0.39-1.30, p=0.252), but the rate of recurrence was significantly higher microscopic surgery with odds ratio of 0.61 (95% CI: 0.42-0.88, p=0.005) [16]. In Ulkumen *et al.*, there were comparable results between both procedures for surgery duration (weighted mean difference: -20.08, 95% CI: -41.55-0.41), graft uptake rate (OR: 1.18, 95% CI: 0.79-1.83) and hearing outcomes (WMD: -1.22, 95% CI: -2.66-0.51) [17]. Gulsen *et al.*, reported different results as endoscopic tympanoplasty had a better pooled canaloplasty rate (OR: 8.02, 95% CI: 4.27-13.83, p=1) and cosmetic outcomes (OR: 20.35, 95% CI: 12.42-31.67, p=0.740) than microscopic tympanoplasty [18]. Hence, this literature indicates that endoscopic surgery is superior such as in terms of surgical duration and complications. As graft type was consistent within but not between groups, it was considered during interpretation of outcomes and may represent a potential confounding factor; however, both materials are widely used with comparable success in the literature. Similarly, since three surgeons had over five years of experience with both endoscopic and microscopic tympanoplasty and only patients who underwent type 1 tympanoplasty with no ossicular chain reconstruction were included, the surgeon skill and case complexity were not considered as confounding factors. It is integral to reduce the surgical duration to reduce the time under anesthetic which can consequently reduce complications. The surgical duration was significantly shorter in endoscopic group (79.23 ± 11.97 minutes vs 93.05 ± 19.81, p<0.001). This is similar to previous studies [19, 20].

This study has some limitations. The number of patients included was limited as only the cases handled by the authors were selected. Secondly, the follow-up was shorter and it was not possible to test the hearing simultaneously in all patients. Large studies preferably randomized studies are recommended to achieve specific results with a longer follow-up. Future research should involve larger multicenter randomized controlled trials with longer follow-up periods, standardized graft materials, and broader patient populations to better assess long-term hearing outcomes, recurrence rates, and procedural superiority.

CONCLUSIONS

The audiological outcomes between type 1 endoscopic tympanoplasty and microscopic tympanoplasty were similar. However, surgical duration and length of hospital stay was better in endoscopic group.

Authors' Contribution

Conceptualization: SB
Methodology: MMB, SJ
Formal analysis: IA, HS, SJ
Writing and Drafting: SB, AI
Review and Editing: SB, AI, HS, SJ, MMB

All authors approved the final manuscript and take responsibility for the integrity of the work

DOI: https://doi.org/10.54393/pjhs.v6i8.3199

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] Stefan I, Stefanescu CD, Vlad AM, Zainea V, Hainarosie R. Postoperative outcomes of endoscopic versus microscopic myringoplasty in patients with chronic otitis media-a systematic review.Medicina.2023Jun;59(6):1074.doi:10.3390/medicina59061074.

[2] Verma PK, Singh C, Kumar S, Rana AK. Comparative study of minimally invasive endoscopic tympanoplasty with microscopic tympanoplasty. Indian Journal of Otology.2023Jan;29(1):27-32.doi: 10.4103/indianjotol.indianjotol_145_22.

[3] Wang TC, Shih TC, Chen CK, Hsieh VC, Lin DJ, Tien HC *et al*. Endoscopic Versus Microscopic Type I Tympanoplasty: An Updated Systematic Review and Meta-analysis. Otolaryngology-Head and Neck Surgery.2024Mar;170(3):675-93.doi:10.1002/ohn.597.

[4] Bianchini AJ, Berlitz VG, Mocelin AG, Ribeiro JF, Keruk JG, Hamerschmidt R. Endoscopic or microscopic tympanoplasty advantages and disadvantages: a theory domain systematic review. International Archives of Otorhinolaryngology.2023Jul;27(03): e528-35. doi: 10.1055/s-0042-1748808.

[5] Iynen I and Dündar R. Chorda Tympani nerve injury during tympanoplasty. Comparison of endoscopic and microscopic methods. Annali Italiani di Chirurgia. 2021 Mar; 92(2): 119-22.

[6] Monteiro EM, Beckmann S, Pedrosa MM, Siggemann T, Morato SM, Anschuetz L. Learning curve for endoscopic tympanoplasty type I: comparison of endoscopic-native and microscopically-trained surgeons. European Archives of Oto-Rhino-Laryngology.2021Jul;278(7):2247-52.doi:10.1007/s00405-020-06293-0.

[7] Ojha T, Yogi V, Kansara A, Sharma K. Endoscopic Tympanoplasty: Is it Better than Microscopic Tympanoplasty? Our Experience. Journal of Mahatma Gandhi University of Medical Sciences and Technology.2021Jan;4(2):53-6.doi:10.5005/jp-journals-10057-0104.

[8] Saini S, Khan SR Beig S, Singhal V, BEIG S. Audiological Outcome of Tympanoplasty With Mastoidectomy in M,iddle-Aged and Younger Patients With Chronic Otitis Media.Cureus.2024Dec; 16(12). doi: 10.7759/cureus.75121.

[9] Lee HS, Yoon CY, Pak D, Lee JH, Seo YJ, Kong TH. Learning curve comparable study of microscopic and endoscopic type 1 tympanoplasty. European Archives of Oto-Rhino-Laryngology.2023Jun;280 (6): 2741-8. doi: 10.1007/s00405-022-07777-x.

[10] Uştu EK, Tahir E, Kemal Ö, Aktaş M. Comparison of Endoscopic and Microscopic Type 1 Tympanoplasty on Surgical Outcomes and Quality of Life. The Turkish Journal of Ear Nose and Throat. 2023Dec;33(4):105-10. doi: 10.26650/Tr-ENT.2023.1348679.

[11] Gkrinia E, Ntziovara AM, Brotis AG, Tzimkas-Dakis K, Saratziotis A, Korais C *et al*. Endoscopic versus microscopic tympanoplasty: a systematic review and metanalysis. The Laryngoscope.2024Aug;134(8): 3466-76. doi: 10.1002/lary.31365.

[12] Crotty TJ, Cleere EF, Keogh IJ. Endoscopic versus microscopic type-1 tympanoplasty: A meta-analysis of randomized trials. The Laryngoscope.2023Jul; 133(7): 1550-7. doi: 10.1002/lary.30479.

[13] Kim DJ, Lee HM, Choi SW, Oh SJ, Kong SK, Lee IW. Comparative study of endoscopic and microscopic tympanoplasty performed by a single experienced surgeon. American Journal of Otolaryngology. 2021 Jan; 42(1): 102788. doi: 10.1016/j.amjoto.2020.102788.

[14] Yang Q, Wang B, Zhang J, Liu H, Xu M, Zhang W. Comparison of endoscopic and microscopic tympanoplasty in patients with chronic otitis media. European Archives of Oto-Rhino-Laryngology.2022 Oct;279(10):4801-7.doi:10.1007/s00405-022-07273-2.

[15] Elnahal KB, Hassan MA, Maarouf AM. Comparison of endoscope-assisted and microscope-assisted type I tympanoplasty; a systematic review and meta-analysis. European Archives of Oto-Rhino-Laryngology.2024 May; 281(5): 2243-52. doi: 10.1007/s00405-023-08305-1.

[16] Zakir I, Ahmad AN, Pasha HA, Aqil S, Akhtar S. Comparison of endoscopic versus microscopic tympanoplasty. Iranian Journal of Otorhinolaryngology.2022May;34(122):139-143.doi:10.22038/IJORL.2022.61234.3104.

[17] Ulkumen B and Yuceturk AV. Endoscopic versus microscopic tympanoplasty: A prospective randomized comparison of outcomes: Endoscopic versus microscopic tympanoplasty. Journal of Surgery and Medicine.2025Feb;9(2):18-22.doi: 10.28982/josam.8054.

[18] Gulsen S and Baltacı A. Comparison of endoscopic transcanal and microscopic approach in Type 1 tympanoplasty.Brazilian Journal of Otorhinolaryngology.2021Mar;87(2):157-63.doi:10.1016/j.bjorl.2019.07.005.

DOI: https://doi.org/10.54393/pjhs.v6i8.3199

[19] Kumar P, Gulia JS, Arora N, Kumar B, Jangra P. Endoscopes as an alternative to microscopes for tympanoplasty: a comparative study. International Journal of Otorhinolaryngology and Head and Neck Surgery.2024Jul;10(4):1.doi:10.18203/issn.2454-5929.ijohns20242042.

[20] Kallyadan A, Sarkar S, Pradhan P, Karakkandy V, Parida PK, Chappity P *et al*. Endoscopic Tympanoplasty as an alternative to microscopic tympanoplasty: A comparative study on surgical outcomes and patient satisfaction. Indian Journal of Otolaryngology and Head & Neck Surgery. 2024 Feb; 76(1): 469-76. doi: 10.1007/s12070-023-04184-4.