

# OUTCOMES OF ENDOSCOPIC MYRINGOPLASTY IN TERMS OF GRAFT TAKE-UP AND HEARING IMPROVEMENT

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## ABSTRACT

**Objective:** To assess graft success and hearing improvement after endoscopic myringoplasty in patients with chronic suppurative otitis media (CSOM) who have a central tympanic perforation and no active ear discharge.

**Materials and Methods:** This cross-sectional study was conducted at Khyber Teaching Hospital, Peshawar, from November 2022 to November 2023. Eighty-seven patients, 39 (44.83%) males and 48 (55.17%) females, diagnosed with CSOM with a single central tympanic membrane perforation and no active ear discharge were enrolled. Patients with ossicular chain disorders, tympanosclerosis, revision surgeries, or mixed-type hearing loss were excluded. Endoscopic myringoplasty was performed using temporalis fascia grafts and a 4 mm endoscope via a transcanal approach under local anaesthesia and IV sedation. Graft integration was evaluated at 12 weeks postoperatively. Hearing outcomes were assessed by comparing preoperative and 12-week postoperative air-bone gap (ABG) closure and air conduction thresholds (ACT). SPSS v26.0 was used for analysis, and a p-value < 0.05 was considered significant.

**Results:** Mean participant age was  $28.05 \pm 9.68$  years. Graft success rate was 93.1% (83/87), and improvement in both ABG and ACT was observed. A significant reduction in postoperative ABG to  $8.98 \pm 4.64$  dB, compared to preoperative ABG of  $16.82 \pm 11.11$  dB, was found. Postoperative ACT also decreased significantly to  $30.03 \pm 10.54$  dB from preoperative ACT of  $71.36 \pm 14.36$  dB.

**Conclusion:** High graft uptake, significant hearing improvement, and minimal complications make endoscopic myringoplasty using temporalis fascia for treating central tympanic perforation in CSOM an excellent option.

**Keywords:** Endoscopic myringoplasty, CSOM, Hearing loss, Temporalis fascia graft, Tympanic Perforation.

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## INTRODUCTION

Chronic suppurative otitis media (CSOM) is a persistent middle ear inflammation that frequently prompts patients to seek treatment at otolaryngology clinics. It can result in significant long-term complications: irreversible damage to the tympanic membrane, cholesteatoma formation, atelectasis, tympanosclerosis, and the development of retraction pockets.<sup>1</sup> The symptoms associated with CSOM include conductive hearing loss, earache, a sensation of fullness in the ear, tinnitus, and ear discharge.<sup>2</sup>

Due to the persistent perforation of the tympanic membrane in patients with CSOM, conservative treat-

ments are generally ineffective in correcting the anatomical destruction or alleviating the symptoms of the disease. In almost all cases, surgical treatment in the form of tympanic membrane closure is mandatory. This procedure, called myringoplasty, involves the closure of the tympanic membrane with grafts such as those from the Perichondrial cartilage or the Temporalis fascia. Currently, the Temporalis fascia is preferred by surgeons for grafting purposes.<sup>3, 4</sup>

Several surgical techniques for myringoplasty have been developed over the years. Currently, the two most prevalent techniques involve the use of an auditory microscope or an endoscope. Endaural, transcanal, and postauricular approaches are all used, with transcanal endoscopic approaches becoming more popular recently. Small holes are often treated by the transcanal method. In the microscopic technique, a retroauricular approach is favoured for anterior perforations, while the endaural route is preferred for posterior perforations. The advent of endoscopic surgery has enhanced the ability of surgeons to visualize the internal structures of the ear more clearly, allowing for the precise identification and management of any anomalies. Additionally, endoscopic techniques can

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often obviate the need for mastoidectomy to achieve adequate middle ear aeration. However, endoscopic myringoplasty has its drawbacks. Despite improved visualization, the exact placement of the graft material can be challenging due to the need for the surgeon to manipulate the endoscope with one hand while positioning the graft with the other<sup>6-7</sup>. However, with time, experienced surgeons have overcome this difficulty, and the results of endoscopic myringoplasty are now comparable with microscopic myringoplasty<sup>8-11</sup>.

A review of the literature reveals a significant global increase in the use of endoscopy for myringoplasty over the past two decades compared to traditional microscopic techniques. This shift is attributed to enhanced visualization, the advantages of the transcanal approach, the minimally invasive nature of endoscopic procedures, and the growing expertise in this field. However, in Pakistan, the use of endoscopy for ear surgeries remains in its nascent stages. Therefore, this study aims to evaluate the outcomes of endoscopic myringoplasty within our setting.

## MATERIALS AND METHODS

This prospective observational study was carried out in the ENT department of a tertiary healthcare centre, Khyber Teaching Hospital, Peshawar, Pakistan, from November 2022 to November 2023. A certificate of ethical approval was obtained from the Institutional Review Board of the hospital (No.834/DME/KMC). A sample of 87 was calculated using the Online Raosoft calculator, taking the graft success rate in endoscopic myringoplasty at 94%, a margin of error of 5% and a confidence interval of 95%. Patients aged 20 to 60 years with CSOM and a single perforation in the central part of the tympanic membrane without active discharge from the diseased ear were included in the study. 3 Patients were excluded in the presence of ossicular chain disorders, tympanosclerosis, mixed-type hearing loss, or when presenting for revision surgeries.

Carefully selected patients were included in the research after obtaining appropriate informed consent. A thorough history was obtained from each patient. An extensive ENT examination was conducted, and relevant investigations, including tuning fork tests, pure tone audiometry, and an X-ray mastoid were ordered for each patient.

Pre- and postoperative pure tone audiometry was performed for all patients by an experienced audiologist. The results were reported in accordance with the guidelines of the American Academy of Otolaryngology-Head and Neck Surgery. 12 Pre- and postoperatively, the air bone gap (ABG) of each patient was calculated at the frequencies of 500 Hz, 1,000 Hz, and 2,000 Hz, as the three frequencies fall in the speech range, and the average of the three was taken as the average ABG.

Endoscopic myringoplasty, under local anaesthet-

ics and intravenous sedation, was performed in all patients using the Temporalis fascia graft for closure of tympanic membrane perforation. The endoscopic technique used a transcanal approach and a 4mm rigid endoscope with a 00 wide-angle. A circumferential incision in the wall of the canal was made approximately 5 mm away from the annulus, making a superior-based flap. The tympanomeatal flap and annulus were removed, lifting the mucosal layer of the residual tympanic membrane behind it. The temporalis fascia graft was harvested using a small two-centimetre incision made in the temporal area. The graft was then allowed to dry. The middle ear cavity was filled with gel foam, followed by grafting of the temporalis fascia on the mucosal layer of the tympanic membrane. The graft was then attached to the handle of the malleus bone and the bony part of the canal. The gel foam was also introduced into the external auditory canal.

Intravenous antibiotics, oral analgesics, and oral decongestants were given for 7 days postoperatively. This was followed by 4 weeks of antibiotic ear drops. Patients were followed up in the 1st, 2nd, 4th, 8th, and 12th weeks postoperatively and examined for possible infection on each visit. Each patient was also assessed for graft uptake, ACT, and ABG on the 12th week postoperatively using an otoscope, tuning fork tests, and a pure tone audiogram. Preoperative hearing levels were then compared to their counterpart postoperative values.

## RESULTS

A total of 87 patients fulfilling the inclusion criteria were studied. The age of the patients ranged from 20 to 60 years, with the mean age being  $28.05 \pm 9.68$  years. The categorical variables are described in Table 1. Most of the participants were in the age range of 20 to 29 years (72.4%). Females outnumbered the males 16:13. Forty-seven (54%) patients had the right ear diseased, and 40 (46%) had the left ear affected. After 12 weeks of follow-up, the graft was successful in 81 (93.1%) patients and failed in 6 (6.9%) patients.

At the 12th week after endoscopic myringoplasty, the hearing parameters had greatly improved. The ACT was  $71.36 \pm 14.36$  dB, and the ABG was  $16.82 \pm 11.11$  dB before surgery. The ACT had improved to  $30.034 \pm 10.54$  dB and the ABG to  $8.98 \pm 4.64$  dB postoperatively. A breakdown of the mean preoperative and postoperative ABGs and ACTs is given in Table 2. The table shows an improvement in the mean preoperative and postoperative values for both ACT and ABG.

A Wilcoxon signed-rank test indicated that preoperative ACT was significantly higher than postoperative ACT  $Z = [-8.10]$ ,  $p = [.001]$  and that preoperative ABG was significantly higher than postoperative ABG  $Z = [-7.43]$ ,  $p = [.001]$  (Table 3), confirming the significant improvement in hearing levels postoperatively.

Fisher's exact test showed that there was neither a statistically significant association between the gender of the patient and graft success rate (two-tailed  $p = 1.000$ ), nor a statistically significant association between the side of the ear affected and graft success rate (two-tailed  $p = 1.000$ ) (Table 4). Therefore, neither the gender of the patient nor the side of the affected ear made any difference to graft uptake success.

## DISCUSSION

The use of endoscopes to treat ear disorders dates to the 1960s. In 1992, the first endoscopic myringoplasty was reported by El-Guindy.<sup>11</sup> Endoscopy has several advantages while performing ear surgeries. It provides magnified panoramic views of the ear canal, allowing detailed examination of the tympanic membrane and the whole internal ear cavity without the need to adjust

**Table No 1: Frequency and percent of different categorical variables**

		Frequency	Percentage
Age Groups	20-29	63	72.4%
	30-39	13	15.0%
	40-49	4	4.6%
	50-60	7	8.1%
Gender	Female	48	55.2%
	Male	39	44.8%
Graft Uptake Success	Successful	81	93.1%
	Unsuccessful	6	6.9%
Side of Ear Diseased	Left	34	39.1%
	Right	53	60.9%

**Table No 2: Number of patients in different ranges of preoperative and postoperative air-bone gaps (ABGs) and air conduction thresholds (ACTs)**

Range (dB)	Number of Patients in ABG Range		Number of Patients in ACT Range	
	Preoperative	Postoperative	Preoperative	Postoperative
0 - 10	30 (34.5%)	66 (75.9%)	0 (0.0%)	11 (12.6%)
11 - 20	28 (32.2%)	19 (21.8%)	1 (1.1%)	67 (77.0%)
21 - 30	18 (20.7%)	2 (2.3%)	26 (29.9%)	7 (8.1%)
31 - 40	7 (8.1%)	0 (0.0%)	36 (41.4%)	2 (2.3%)
41 - 50	4 (4.6%)	0 (0.0%)	24 (27.6%)	0 (0.0%)

**Table No 3: Mean preoperative and postoperative air conduction thresholds (ACTs) and air-bone gaps (ABGs)**

Parameters	Mean (dB ± SD)	Sig. (2-tailed)
Preoperative ACT (dB)	71.36 ± 14.36	<0.001*
Postoperative ACT (dB)	30.03 ± 10.54	
Preoperative ABG (dB)	16.83 ± 11.11	<0.001*
Postoperative ABG (dB)	8.98 ± 4.64	

**Table No 4: Graft Uptake Success and Gender of Patient and Side of Ear Affected**

	Graft Uptake Success		p-value (Fischer's Exact Test)
	Successful	Unsuccessful	
Gender of Patient			
Male	36 (41.4%)	3 (3.5%)	1.000
Female	45 (51.7%)	3 (3.5%)	
Side of Ear Affected			
Right	49 (56.3%)	4 (4.6%)	1.000
Left	32 (36.8%)	2 (2.3%)	

the patient's head. Using the transcanal approach allows the anterior canal recess, anterior tympanic perforation, tympanic membrane retraction pocket, hypotympanum, and any sinuses in the tympanic membrane to be easily visualized. There is limited need for canaloplasty during this technique, except for curettage of the ear canal if required in a very limited number of cases. The modern microscope offers advantages like binocular vision, excellent stereoscopic surgical views, and good depth perception while allowing both hands to be free. However, it has the limitation of straight-line vision, making it difficult to see the many deep recesses in the middle ear. 13 Endoscopic cameras were developed to overcome this drawback.

We observed the graft success rate to be 93.1% which is comparable with the results shown by Jyothi AC et al., who found the graft success rate to be 91.67% in endoscopic myringoplasty. <sup>14</sup> In our study, the six cases of graft failure could be attributed to upper respiratory tract infections and entry of water into the ear, leading to infection and compromised healing. Plodpai Y et al compared endoscopic with microscopic tympanoplasty and found that the graft success rate was 97.1% in the endoscopic group. <sup>15</sup> Chen CK et al found the graft uptake success rate to be 86.3% in endoscopic myringoplasty. <sup>16</sup> These studies show similar results to ours for endoscopic myringoplasty. The slight differences may be accounted for by the difference in graft material or operative technique used.

The preoperative average ABG in the present study was  $16.83 \pm 11.11$  dB, and it reduced postoperatively to an average ABG of  $8.98 \pm 4.64$  dB. A study by Yanget Q et al. also showed comparable results, where the average preoperative ABG is  $19.26 \text{ dB} \pm 6.43$  dB, and it improved to an average ABG of  $7.72 \pm 4.00$  dB postoperatively after endoscopic myringoplasty. <sup>17</sup> Gulsen S et al also showed that the average ABG improved from  $28.9 \text{ dB} \pm 6.7$  to  $8.2 \pm 4.7$  dB postoperatively after endoscopic myringoplasty. <sup>18</sup> The average preoperative air conduction threshold (ACT) was  $71.36 \pm 14.36$  dB in our study, which improved to  $30.03 \pm 10.54$  dB. Mahawerawat K et al. also showed that ACT improved from preoperative ( $39.9 \text{ dB} \pm 13.7$ ) to postoperative ( $28.6 \text{ dB} \pm 14.2$ ) after endoscopic myringoplasty. <sup>19</sup>

The mean duration of the endoscopic myringoplasty we observed to be  $75.60 \pm 14.24$  minutes. Danishi A et al had comparable observations and noted  $76.7 \pm 38.8$  minutes as the mean operative time. <sup>20</sup> Chen CK et al. found the mean operative duration as  $79.8 \pm 16.5$  minutes which is also comparable to our study <sup>16</sup>.

Endoscopic ear surgery does have several limitations, such as operating with one hand, impairing vision with minimal bleeding, and the lack of three-dimensional images. These drawbacks can be overcome with the experience of the surgeon.

The present and past research's findings may be impacted by possible confounders, such as the surgeon's experience, making a comparison of results difficult. The present study enrolled patients from a single centre in a non-randomized fashion and involved an unblinded review. Further research needs to be conducted to examine other factors that impact the graft success rate and improvement in hearing levels after endoscopic myringoplasty.

## CONCLUSION

The present study observed a high graft success rate, significant improvements in air conduction threshold, and air-bone gap postoperatively. This, alongside a very low rate of complications, makes endoscopic myringoplasty using temporalis fascia graft for the treatment of central tympanic perforation without active ear discharge in CSOM an excellent option.

## REFERENCES

1. Tasleem M, Rahman A, Aslam M. Comparative Study of Outcome of Endoscopic Myringoplasty in Active and Inactive Mucosal Chronic Otitis Media Patients. *Indian J Otolaryngol Head Neck Surg.* 2017;69(3):319-22.
2. Shakya D, Kc A, Nepal A. A Comparative Study of Endoscopic versus Microscopic Cartilage Type I Tympanoplasty. *Int Arch Otorhinolaryngol.* 2020;24(1):e80-e5.
3. Lou ZC. Endoscopic myringoplasty: comparison of double layer cartilage-perichondrium graft and single fascia grafting. *J Otolaryngol Head Neck Surg.* 2020;49(1):40.
4. 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 (Kaunas).* 2023;59(6).
5. Beckmann S, Anschuetz L. Minimally Invasive Tympanoplasty: Review of Outcomes and Technical Refinements. *Operative Techniques in Otolaryngology-Head and Neck Surgery.* 2021;32.
6. Abdel-Shafy I, Hamdan A. Endoscopic Transcanal Simple Myringoplasty Using Push Through Technique with Cartilage Ring Graft Versus Temporalis Fascia Graft 2022; 23(23):[1-8 pp.].
7. Manna S, Kaul VF, Gray ML, Wanna GB. Endoscopic Versus Microscopic Middle Ear Surgery: A Meta-analysis of Outcomes Following Tympanoplasty and Stapes Surgery. *Otol Neurotol.* 2019;40(8):983-93.
8. Lee SY, Lee DY, Seo Y, Kim YH. Can Endoscopic Tympanoplasty Be a Good Alternative to Microscopic Tympanoplasty? A Systematic Review and Meta-Analysis. *Clin Exp Otorhinolaryngol.* 2019;12(2):145-55.
9. Demir E, Coskun ZO, Celiker M, Terzi S, Erdivanli OC, Balaban GA, et al. Endoscopic butterfly inlay myringoplasty for large perforations. *Eur Arch Otorhinolaryngol.* 2019;276(10):2791-5.
10. Monteiro EMR, Beckmann S, Pedrosa MM, Siggemann T, Morato SMA, Anschuetz L. Learning curve for endoscopic tympanoplasty type I: comparison of endoscop-

- ic-native and microscopically-trained surgeons. *Eur Arch Otorhinolaryngol.* 2021;278(7):2247-52.
11. el-Guindy A. Endoscopic transcanal myringoplasty. *J Laryngol Otol.* 1992;106(6):493-5.
  12. Adkins WY. Composite autograft for tympanoplasty and tympanomastoid surgery. *Laryngoscope.* 1990;100(3):244-7.
  13. Tarabichi M. Endoscopic transcanal middle ear surgery. *Indian J Otolaryngol Head Neck Surg.* 2010;62(1):6-24.
  14. Jyothi AC, Shrikrishna BH, Kulkarni NH, Kumar A. Endoscopic Myringoplasty Versus Microscopic Myringoplasty in Tubotympanic CSOM: A Comparative Study of 120 Cases. *Indian J Otolaryngol Head Neck Surg.* 2017;69(3):357-62.
  15. Plodpai Y. Endoscopic vs Microscopic Overlay Tympanoplasty for Correcting Large Tympanic Membrane Perforations: A Randomized Clinical Trial. *Otolaryngol Head Neck Surg.* 2018;159(5):879-86.
  16. Chen CK, Hsu HC, Wang M. Endoscopic tympanoplasty with post-conchal perichondrium in repairing large-sized eardrum perforations. *Eur Arch Otorhinolaryngol.* 2022;279(12):5667-74.
  17. Yang Q, Wang B, Zhang J, Liu H, Xu M, Zhang W. Comparison of endoscopic and microscopic tympanoplasty in patients with chronic otitis media. *Eur Arch Otorhinolaryngol.* 2022;279(10):4801-7.
  18. Gulsen S, Baltacı A. Comparison of endoscopic transcanal and microscopic approach in Type 1 tympanoplasty. *Braz J Otorhinolaryngol.* 2021;87(2):157-63.
  19. Mahawerawat K, Kasemsiri P. Comparison of the clinical outcome of endoscopic push-through myringoplasty and microscopic overlay myringoplasty: matching co-variated designs. *BMC Surgery.* 2022;22(1):44.
  20. Daneshi A, Daneshvar A, Asghari A, Farhadi M, Mohebbi S, Mohseni M, et al. Endoscopic Versus Microscopic Cartilage Myringoplasty in Chronic Otitis Media. *Iran J Otorhinolaryngol.* 2020;32(112):263-9.

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**Authors Contribution:**

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
Haq IU	✓	✓	✗	✗	✓	✓
Din IU	✗	✗	✗	✓	✓	✗
Omar M	✓	✓	✗	✗	✗	✓
Liaqat N	✗	✗	✗	✓	✓	✗
Ullah S	✓	✓	✗	✗	✓	✓

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**Ethical Approval:**

**This Manuscript was approved by the Ethical Review Board of Khyber Teaching Hospital, Peshawar. Vide No. 834/DME/KMC.**

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