

# OUTCOME OF TYMPANOPLASTY IN PATIENTS WITH MUCOSAL CHRONIC OTITIS MEDIA

*Original Research*

Muhammad Saleem Afridi<sup>1</sup>, Muhammad Aimen Ikram<sup>2\*</sup>

<sup>1</sup>Assistant Professor, ENT Department, Divisional Headquarters Teaching Hospital, Kohat, Pakistan.

<sup>2</sup>Post Graduate Resident, ENT Department, Divisional Headquarters Teaching Hospital, Kohat, Pakistan.

**Corresponding Author:** Muhammad Aimen Ikram, Post Graduate Resident, ENT Department, Divisional Headquarters Teaching Hospital, Kohat, Pakistan, [aimenikhan9@hotmail.com](mailto:aimenikhan9@hotmail.com)

**Acknowledgement:** The authors acknowledge the support of the ENT Department for facilitating this research.

Submission Date: 02/02/2025

Acceptance Date: 02/04/2025

Publication Date: 18/04/2025

Conflict of Interest: None

Grant Support & Financial Support: None

## ABSTRACT

**Background:** Mucosal chronic otitis media (COM) is a prevalent cause of conductive hearing loss and tympanic membrane perforation, particularly in developing regions. Tympanoplasty remains the mainstay surgical intervention aimed at restoring tympanic membrane integrity and improving auditory function. While traditionally delayed in wet ears, evolving perspectives now suggest comparable outcomes regardless of aural status. This study evaluates the clinical efficacy of tympanoplasty in patients with mucosal COM, highlighting graft success, hearing outcomes, and associated complications.

**Objective:** To evaluate the surgical outcomes of tympanoplasty in patients with mucosal chronic otitis media.

**Methods:** This prospective observational study included 70 patients aged 18–50 years diagnosed with mucosal COM and scheduled for tympanoplasty at a tertiary care center between July 2024 and January 2025. Patients with cholesteatoma, sensorineural hearing loss, or prior ear surgery were excluded. All procedures were performed using the underlay technique with temporalis fascia grafts, approached postauricularly or permeatally. Preoperative assessments included otoscopy, endoscopy, and pure tone audiometry. Follow-up at 16 weeks assessed graft integrity via otoscopic examination, hearing thresholds through audiometry, and postoperative complications. Data were analyzed using SPSS v26.

**Results:** Of the 70 patients, 37 (52.9%) were male and 33 (47.1%) female, with a mean age of  $35.13 \pm 8.85$  years. Wet ears were noted in 46 (65.7%) and dry ears in 24 (34.3%). Graft uptake was successful in 66 patients (94.3%). Hearing improvement was observed in 64 (91.4%) cases. Postoperative discharge occurred in 3 (4.3%), re-perforation in 5 (7.1%), and earache relief was achieved in 63 (90.0%) patients.

**Conclusion:** Tympanoplasty demonstrated high efficacy in mucosal COM, irrespective of aural status, with excellent graft uptake, significant hearing improvement, and minimal complications.

**Keywords:** Chronic Otitis Media, Ear Discharge, Graft Uptake, Hearing Loss Conductive, Otologic Surgical Procedures, Tympanic Membrane Perforation, Tympanoplasty.

## INTRODUCTION

Chronic otitis media (COM) is a pervasive condition with a substantial global health burden, affecting between 65 and 330 million individuals worldwide, of whom approximately 90% reside in developing nations (1). The global prevalence of COM has been reported at 4.76 per thousand, which translates to around 31 million cases annually, with a significant 22.6% of these occurring in children under the age of five (2). Geographically, the highest rates of COM are found in Oceania, followed by sub-Saharan and central Africa, with prevalences of 9.37 and 7.56 per thousand, respectively (3). Beyond the disease burden itself, COM is a major contributor to hearing impairment across all age groups, with an estimated global prevalence of 30.82 cases of hearing loss per 10,000 individuals attributable to otitis media (4). COM is defined by a persistent abnormality of the pars tensa or pars flaccida of the tympanic membrane and often results from recurrent acute otitis media, chronic eustachian tube dysfunction, or otitis media with effusion (5). One of the major concerns linked to longstanding COM is sensorineural hearing loss (SNHL), which arises from dysfunction in the cochlear transduction system—the process responsible for converting mechanical signals from the middle ear into neural impulses via the auditory nerve (6). The potential relationship between mucosal COM and SNHL remains a subject of ongoing clinical investigation (7). The pathophysiological basis for this connection has been attributed to inflammatory mediators generated during middle ear infections, which may traverse the round window membrane and adversely affect cochlear structures, leading to irreversible auditory damage (8).

Surgical management plays a central role in the treatment of COM, with tympanoplasty being one of the most frequently performed procedures. This technique aims to restore the integrity of the tympanic membrane and improve hearing function while preventing reinfection of the middle ear (9). In more extensive cases involving cholesteatoma or ossicular disruption, tympanoplasty may be accompanied by mastoidectomy and ossicular chain reconstruction (10). The evolution of tympanoplasty can be traced back to the 1950s, when overlay grafting techniques were first introduced to repair perforations and rehabilitate the conductive mechanism of the middle ear (11). Since then, various surgical innovations and modifications have enhanced the precision and outcomes of this procedure. Despite these advancements, there remains variability in patient outcomes following tympanoplasty, particularly in those with mucosal COM. While the structural success of the graft is often reported, the degree of hearing improvement and long-term efficacy remains inconsistent across studies. This underscores the need for further investigation into the specific outcomes of tympanoplasty in patients with mucosal COM to guide evidence-based treatment strategies and refine surgical protocols. Therefore, this study aims to evaluate the functional and anatomical outcomes of tympanoplasty in individuals with mucosal chronic otitis media, with the objective of informing clinical decision-making and optimizing patient care.

## METHODS

This prospective observational study was conducted at the Department of Otorhinolaryngology, Divisional Headquarters Teaching Hospital, Kohat, Pakistan from July 2024 to January 2025, following the approval of the Institutional Review Board (IRB). Informed written consent was obtained from all participants prior to inclusion in the study, and all procedures were conducted in accordance with the ethical standards of the Declaration of Helsinki. A total of 70 patients aged between 18 and 50 years, diagnosed with mucosal chronic otitis media and scheduled to undergo tympanoplasty, were enrolled through consecutive non-probability sampling. The inclusion criteria comprised adults with mucosal COM who had not previously undergone ear surgery and demonstrated conductive hearing loss. Patients with cholesteatoma, sensorineural hearing loss, or a history of otologic surgery were excluded to ensure homogeneity in the sample and to minimize confounding variables. All participants underwent a standardized preoperative evaluation protocol (3,7). This included a detailed otoscopic examination to assess the size of tympanic membrane perforation, which was classified as small, medium, or large, and to determine the aural status (wet or dry). Middle ear mucosal condition was assessed endoscopically to evaluate inflammation or edema. Baseline hearing thresholds were established through pure tone audiometry, and the air-bone gap (ABG) was documented for all patients.

Surgical intervention was performed by a senior otologic surgeon employing the underlay technique using temporalis fascia grafts. The choice of surgical approach—postauricular or permeal—was made based on the anatomical configuration of the external auditory canal. Standard intraoperative precautions were observed to optimize graft placement and minimize trauma to the middle ear structures. Postoperative follow-up assessments were scheduled at 16 weeks. Graft uptake was evaluated by otoscopic examination and defined as

a fully intact neotympanic membrane without signs of infection or residual perforation. Hearing improvement was determined by repeat pure tone audiometry, with successful outcomes defined as a minimum of 15 dB ABG closure when compared to baseline values. Any intraoperative or postoperative complications, such as graft rejection, otorrhea, or wound infections, were documented. Data were analyzed using IBM SPSS version 26. Descriptive statistics were used to summarize demographic and clinical variables, while categorical outcomes were reported as frequencies and percentages. Quantitative data such as hearing improvement were expressed as means and standard deviations. The chi-square test and paired t-tests were employed where applicable to assess the significance of postoperative outcomes, with a p-value of <0.05 considered statistically significant.

RESULTS

The study included 70 participants diagnosed with mucosal chronic otitis media, with ages ranging from 18 to 50 years and a mean age of  $35.13 \pm 8.85$  years. Gender distribution was relatively balanced, with 37 males (52.9%) and 33 females (47.1%). Regarding clinical characteristics, 46 patients (65.7%) presented with wet ear status, while the remaining 24 (34.3%) had dry ears at the time of evaluation. The size of tympanic membrane perforation varied among the cohort, with 20 patients (28.6%) showing small perforations, 45 (64.3%) having medium-sized perforations, and 5 (7.1%) exhibiting large perforations. Postoperative assessments at 16 weeks revealed that 64 patients (91.4%) experienced significant improvement in hearing, while 6 patients (8.6%) showed no measurable change. Graft uptake, defined as an intact tympanic membrane without residual perforation or discharge, was achieved in 66 cases (94.3%), with 4 patients (5.7%) showing graft failure. Relief from preoperative earache was noted in 63 patients (90.0%), whereas 7 patients (10.0%) continued to report pain following the procedure. Complications following tympanoplasty were infrequent. Only 3 patients (4.3%) developed postoperative ear discharge, and re-perforation of the tympanic membrane necessitated further intervention in 5 patients (7.1%). The majority of the cohort (92.9%) did not require any additional surgical procedures, indicating overall procedural success. In addition to descriptive outcomes, a statistical comparison of hearing thresholds was conducted to quantify auditory improvement following tympanoplasty. The mean preoperative air-bone gap (ABG) was  $34.33 \pm 4.47$  dB, which significantly reduced to a postoperative mean of  $17.80 \pm 5.89$  dB. This yielded an average ABG closure of  $16.53 \pm 7.12$  dB, reflecting a substantial enhancement in conductive hearing function. These findings support the effectiveness of tympanoplasty in restoring auditory performance in patients with mucosal chronic otitis media and align with the high percentage (91.4%) of patients who reported subjective hearing improvement.

Table 1: Demographics and ABG Analysis

Parameter	Value
Age (mean $\pm$ SD)	$35.13 \pm 8.85$ years
Age range	18 - 50 years
Gender - Male	37 (52.9%)
Gender - Female	33 (47.1%)

Table 2: Clinical profile of the patients

Clinical profile		Frequency	Percentage
Ear status	Wet	46	65.7%
	Dry	24	34.3%
Size of perforation	Small	20	28.6%
	Medium	45	64.3%
	Large	5	7.1%

Table 3: Outcomes of tympanoplasty

Outcomes of tympanoplasty		Frequency	Percentage
Improvement in hearing	Yes	64	91.4%
	No	6	8.6%
Discharge	Yes	3	4.3%
	No	67	95.7%
Re-perforation needed	Yes	5	7.1%
	No	65	92.9%
Earache relief	Yes	63	90.0%
	No	7	10.0%
Graft uptake	Yes	66	94.3%
	No	4	5.7%

Table 4: Pre- and Postoperative ABG Comparison

Hearing Measure	Mean ± SD (dB)
Preoperative ABG	34.33 ± 4.47
Postoperative ABG	17.80 ± 5.89
Mean ABG Closure	16.53 ± 7.12

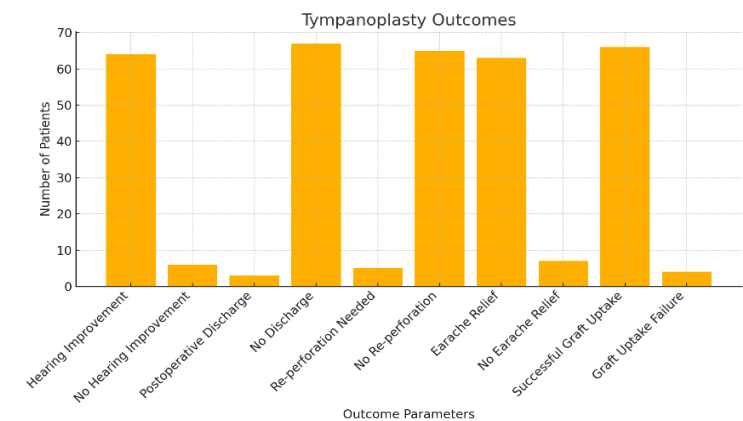


Figure 1 Tympanoplasty Outcomes

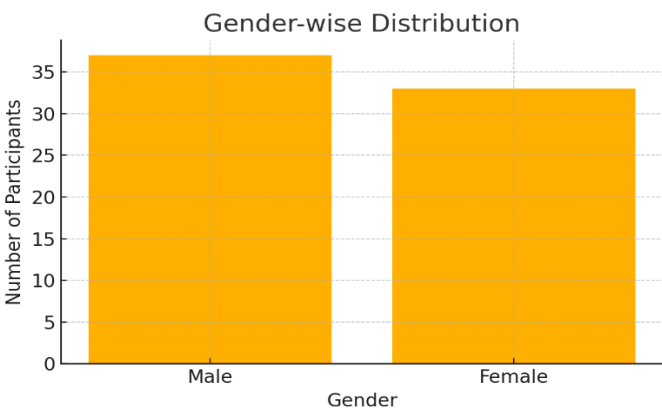


Figure 2 Gender-Wise Distribution

DISCUSSION

The findings of this study contribute to the growing body of evidence supporting the effectiveness of tympanoplasty in patients with mucosal chronic otitis media (COM), particularly in young to middle-aged adults. The demographic profile, with a mean age of 35.13 ± 8.85 years and near-equal gender distribution, was consistent with patterns observed in previous studies, indicating that mucosal COM affects both males and females in their most productive years (12). This reinforces the clinical importance of timely and effective management to minimize long-term auditory disability in this age group. The clinical presentation revealed that a majority of the patients (65.7%) had wet or active ear disease at the time of surgery. This aligns closely with prior research in which a similar proportion of active mucosal disease was reported (13). However, other studies have demonstrated a higher incidence of dry ear status, which may reflect differences in patient population, access to healthcare, or clinical protocols emphasizing preoperative aural dryness. The current findings provide support to the evolving viewpoint that tympanoplasty can be successfully performed in the presence of active middle ear discharge, challenging older surgical doctrines that advocated for deferring intervention until the ear was dry (14,15).

The study demonstrated a high rate of hearing improvement following tympanoplasty, with 91.4% of participants showing audiometric gains. These outcomes are comparable to those reported in previous literature, supporting the procedure’s functional success in both wet and dry ear conditions. Similarly, graft uptake was achieved in 94.3% of patients, again aligning with earlier studies that reported graft

success rates exceeding 90%. These consistent outcomes across multiple investigations validate tympanoplasty as a reliable intervention for anatomical restoration of the tympanic membrane, even in non-ideal middle ear environments Postoperative complications in this cohort were minimal (16). Discharge occurred in only 4.3% of cases, and the need for revision surgery due to re-perforation was limited to 7.1%. These rates are relatively low compared to previous findings where complication rates have ranged more broadly. Additionally, earache resolution was observed in 90% of the participants, suggesting that tympanoplasty not only addresses structural deficits but also contributes substantially to symptomatic relief (17,18). Differences in complication and pain relief rates across studies may stem from variations in surgical expertise, postoperative care, and analgesic protocols (19). Despite these positive outcomes, the study does carry limitations. A critical gap was the absence of analysis correlating the size of tympanic membrane perforation with surgical success. Since perforation size may influence graft uptake and hearing outcomes, future studies should aim to explore this relationship to guide more personalized surgical planning. Additionally, the relatively small sample size limits the generalizability of the findings, and larger multicenter studies are warranted to confirm these observations across broader populations. Another limitation was the singular follow-up point at 16 weeks postoperatively, which may not fully capture delayed failures or long-term audiological outcomes. A longitudinal follow-up protocol extending to six months or one year would provide a more comprehensive understanding of tympanoplasty’s durability.

Nonetheless, the study presents several strengths. All procedures were performed by experienced surgeons using a consistent surgical technique, minimizing procedural variability. The inclusion of both subjective and objective outcome measures—such as graft uptake and air-bone gap closure—adds robustness to the findings. Furthermore, the study reinforces that the presence of middle ear discharge should not be viewed as a contraindication for tympanoplasty when performed under meticulous technique and appropriate perioperative care (20). In summary, the results affirm the efficacy of tympanoplasty in mucosal COM regardless of middle ear status. With minimal complications, high graft uptake, and significant hearing improvement, tympanoplasty remains a cornerstone intervention for restoring middle ear function. Future studies should incorporate larger samples, extended follow-up periods, and stratified analyses to further refine patient selection and improve surgical outcomes.

CONCLUSION

This study concludes that tympanoplasty is an effective surgical intervention for patients with mucosal chronic otitis media, yielding favorable outcomes in terms of graft integration, hearing restoration, and minimal postoperative complications. The results reinforce the growing consensus that the presence of preoperative middle ear discharge should not delay or preclude surgical management. Emphasis on meticulous surgical technique and appropriate graft material selection emerged as key factors influencing successful outcomes. These findings support the broader application of tympanoplasty across varied clinical presentations, contributing to improved patient care and long-term functional recovery.

Author Contribution

Author	Contribution
Muhammad Saleem Afridi	Substantial Contribution to study design, analysis, acquisition of Data
	Manuscript Writing
	Has given Final Approval of the version to be published
Muhammad Aimen Ikram*	Substantial Contribution to study design, acquisition and interpretation of Data
	Critical Review and Manuscript Writing
	Has given Final Approval of the version to be published

REFERENCES

1. Gan Y, Li R, Wang B, Gan H, Hu J, Tian C, et al. [Tympanoplasty with and without mastoidectomy for the treatment of active efficacy analysis of chronic suppurative otitis media of simple type]. Lin Chuang Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2024;38(7):593-7.

2. Mohamed FS, Lokman FL, Mansoor W, Shakri NBM, Hussain RI, Abdullah A. Recurrent Cholesteatoma: Why it occurs? Int Tinnitus J. 2024;27(2):242-6.

3. Motegi M, Yamamoto Y, Akutsu T, Tada T, Kurihara S, Takahashi M, et al. Radiological and Audiological Prediction for Ossicular Fixation in Chronic Otitis Media and Tympanic Membrane Perforation. Otol Neurotol. 2022;43(1):80-9.

4. Namba HF, Plug MB, Smit AL. The Prognostic Value of Active Otitis Media on Tympanoplasty Success Rate-A Systematic Review. *Clin Otolaryngol.* 2024;49(6):699-712.
5. Wong ZY, Park YS, Mann GS. Postoperative Outcomes After Tympanoplasty for Active Versus Inactive Otitis Media Patients With Tympanic Membrane Perforation: A Systematic Review and Meta-Analysis. *Otol Neurotol.* 2023;44(7):643-50.
6. Mantsopoulos K, Thimsen V, Richter D, Müller SK, Sievert M, Iro H, et al. Myringoplasty for pediatric chronic otitis media: An uncritical closure of a natural middle ear drainage? *Am J Otolaryngol.* 2021;42(6):103122.
7. Bayoumy AB, Veugen C, van der Veen EL, Bok JM, de Ru JA, Thomeer H. Management of tympanic membrane retractions: a systematic review. *Eur Arch Otorhinolaryngol.* 2022;279(2):723-37.
8. Haci C, Bayram O, Gurbuz G, Barcan Y, Acikalin RM, Yasar H. Investigation of factors affecting pediatric type I endoscopic tympanoplasty results and success rates of surgery. *Auris Nasus Larynx.* 2023;50(6):848-53.
9. Verma N, Goyal A, Gupta N. Hearing outcomes in pediatric tympanoplasty and factors affecting surgical outcomes in the current era. *Int J Pediatr Otorhinolaryngol.* 2023;171:111634.
10. Yang B, Zhang L, Chen X. Evaluation and comparison of tympanoplasty efficacy with tympanic membrane perforation after chronic suppurative otitis media in dry ear with different microorganisms. *Am J Otolaryngol.* 2021;42(3):102900.
11. Cavaliere M, De Luca P, Scarpa A, Cuofano R, Cassandro C, Panetti M, et al. Endoscopic Tympanoplasty in the Treatment of Chronic Otitis Media. *Otol Neurotol.* 2020;41(10):1447-8.
12. Wu C, Chen X, Huang Y, Zhang M, Ye F, Wu X. Comparison of Tympanic Membrane Perforation With and Without Calcification of Anterior Malleolar Ligament Under Transcanal Endoscopic Type I Tympanoplasty. *Ear Nose Throat J.* 2021;100(6):411-6.
13. 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.
14. Yoshida S, Seki S, Sugiyama T, Kikuchi S, Yoshida N, Iino Y. Comparative study on adhesive otitis media and pars tensa cholesteatoma in children. *Auris Nasus Larynx.* 2022;49(5):790-6.
15. Brandt HH, Metternich FU, Furer R. Chronic otorrhoea, otalgia and hearing loss not responding to antibiotics and tympanoplasty surgery. *BMJ Case Rep.* 2021;14(4).
16. Bianconi L, Di Maro F, Gazzini L, De Rossi S, Sacchetto L, Carner M, et al. Authors' Reply to the Letter to the Editor: "Endoscopic Tympanoplasty in the Treatment of Chronic Otitis Media" a Comment to the Article: "The Management of Tympanic Membrane Perforation with Endoscopic Type I Tympanoplasty". *Otol Neurotol.* 2020;41(10):1448.
17. Koyama H, Kashio A, Uranaka T, Matsumoto Y, Yamasoba T. Application of Machine Learning to Predict Hearing Outcomes of Tympanoplasty. *Laryngoscope.* 2023;133(9):2371-8.
18. Balakrishnan MC, Bhatia A, Bhattacharjee N. Surgical outcome in patients undergoing tympanoplasty alone for active chronic otitis media mucosal type in hilly area. *Ann Otol Neurotol.* 2022;5(2):55-61.
19. Mahajan R, Abraham N, Nagaraj TM. A clinical study of evaluation of tympanoplasty with mastoidectomy in mucosal chronic otitis media. *Int J Otorhinolaryngol Head Neck Surg.* 2020;6:163-168.
20. Shahzadi E, Qazi ZA, Latif S, Rehman A, Ullah I, Haroon T. Comparison between efficacy of tympanoplasty with and without cortical mastoidectomy in tubo-tympanic otitis media in adults. *J Ayub Med Coll Abbottabad.* 2024;36(4):738-743.