International Journal of Otorhinolaryngology and Head and Neck Surgery
Soby RM et al. Int J Otorhinolaryngol Head Neck Surg. 2026 Apr;12(2):166-172
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937
DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20260772

Original Research Article

Outcomes of endoscopic tympanoplasty in chronic suppurative otitis media: a prospective study from a tertiary care hospital

Riya M. Soby*, Vinod A. Gite, Megha M. Panjiyar, Yash Kadao

Department of ENT and Head and Neck Surgery, Dr. R. N. Cooper and HBT Medical College, Mumbai, Maharashtra, India

Received: 11 August 2025
Revised: 11 March 2026
Accepted: 13 March 2026

***Correspondence:**
Dr. Riya M. Soby,
E-mail: rmariya5@gmail.com

ABSTRACT

Background: Chronic suppurative otitis media (CSOM) remains a significant public health issue in developing countries like India, contributing substantially to preventable hearing loss. Although microscopic tympanoplasty is widely practiced, endoscopic tympanoplasty (ET) with its minimally invasive transcanal approach, offers enhanced surgical visualization, reduced morbidity, comparable graft success rates and is particularly well-suited for high-volume tertiary centers where surgical efficiency and cost-effectiveness are critical. This study evaluates the outcomes of ET in terms of graft success, hearing improvement, and surgical efficacy.

Methods: A prospective study was conducted from August 2022 to August 2024, involving 70 patients diagnosed with tubotympanic type of CSOM. All patients underwent ET using a superiorly based tympanomeatal flap with an underlay grafting technique. Preoperative and postoperative audiological assessments were performed using pure tone audiometry at 1-month and 3-month intervals. The primary outcome measures included graft uptake rate, air-bone gap (ABG) closure, surgical duration, and postoperative complications.

Results: The study population had a male-to-female ratio of 1:2, with the majority (52%) aged between 10-30 years. The overall graft uptake success rate was 91.43% (64/70), with a statistically significant improvement in hearing outcomes. The mean preoperative ABG of 29.44 dB (95% CI: 28.10-30.78) improved to 13.60 dB at 3 months postoperatively (95% CI: 12.56-14.64 dB) at three months postoperatively ($p<0.01$). Surgical complications were minimal, and no major adverse events were noted.

Conclusions: ET demonstrates high success rates, substantial hearing improvement, and minimal complications, confirming its effectiveness in managing tubotympanic CSOM. The procedure offered the advantages of enhanced visualization provided by endoscopy facilitates precise graft placement and optimal surgical outcomes, shorter surgical time, faster postoperative recovery, and minimal complications. Its minimally invasive nature and favorable outcomes make it a reliable alternative to the microscopic approach, warranting its integration into routine clinical practice and otologic training programs for improved patient care.

Keywords: Chronic suppurative otitis media, Endoscopic tympanoplasty, Graft uptake, Air-bone gap closure, Hearing restoration, Otologic surgery, Minimally invasive techniques

INTRODUCTION

Chronic suppurative otitis media (CSOM) is a persistent and potentially disabling condition of the middle ear, characterized by long-standing tympanic membrane perforation and intermittent or continuous otorrhea. Globally, CSOM is estimated to affect 65-330 million individuals, with approximately 60% of these patients suffering from varying degrees of hearing impairment.[1] In resource-limited settings like India, delayed diagnosis

and restricted access to care make CSOM a major cause of acquired hearing loss, particularly in children and young adults, often leading to speech impairment, reduced social interaction, and poor academic performance.

Surgical intervention, most commonly tympanoplasty, remains the mainstay of treatment for tubotympanic-type CSOM. The primary goals are anatomical closure of the tympanic membrane, elimination of disease, and restoration of hearing. Traditionally, tympanoplasty has been performed using a surgical microscope, offering excellent magnification and depth perception. However, limitations such as a linear line of sight, difficulty accessing anterior perforations, and the need for postauricular incisions in certain cases can complicate the procedure and prolong recovery.[2]

In recent years, endoscopic ear surgery has gained popularity as a viable alternative to conventional microscopic approaches. ET employs a rigid endoscope inserted through the external auditory canal, providing a wide-angle, panoramic view of the tympanic membrane and middle ear spaces. This allows for superior visualization of hidden areas such as the anterior mesotympanum and sinus tympani without requiring canalplasty or external incisions.[3]

Numerous studies have demonstrated that ET offers comparable or superior outcomes to microscopic techniques in terms of graft uptake, hearing improvement, operative time, and postoperative recovery.[4] In addition to its clinical advantages, the transcanal endoscopic approach is less invasive, cosmetically favorable, and well-suited for high-volume tertiary care centers where surgical efficiency and patient turnover are key considerations.

Despite the increasing adoption of this technique worldwide, data from public sector hospitals in India remain limited. Therefore, this prospective study was undertaken to assess the anatomical and functional outcomes of ET in patients with tubotympanic CSOM at a tertiary care teaching hospital in Mumbai. The study evaluates graft uptake rates, hearing outcomes, surgical duration, and complication rates to establish its utility in real-world clinical practice.

Aim and objectives

Aim and objectives were to assess outcomes of the techniques like the graft uptake, hearing improvement, and parameters such as: intraoperative time (in min), intraoperative difficulties and complications, post-operative graft uptake, postoperative complications (wound, graft uptake) at 7 days, 1 month, and 3 months and postoperative hearing assessment with PTA at 1 month and 3 months

METHODS

Study design, setting, and duration

A prospective observational study was conducted in the Department of ENT and Head and Neck Surgery, Dr. R. N Cooper General Hospital and HBT Medical College, Mumbai, Maharashtra, India. The study duration spanned from August 2022 to August 2024.

Study population

The sample size was calculated using the formula: $n=4pq/e^2$, where p is the estimated prevalence of CSOM, q=1-p, and e is the allowable absolute error. Based on a prevalence of 4% for CSOM in India as reported by Khalique et al with p=0.04, q=0.96, and e=0.05, the minimum required sample size was calculated to be 61.4.[5] Accounting for possible dropouts or missed cases, the final sample size was rounded up to 70 patients. All participants presented with a central perforation of the tympanic membrane and had a dry ear for a minimum of six weeks before surgery. Patients were recruited consecutively based on predefined inclusion and exclusion criteria.

Inclusion criteria

Patients with age ≥10 years, diagnosis of tubotympanic CSOM, dry ear for ≥6 weeks, normal middle ear mucosa on otoscopic and endoscopic evaluation and willingness to participate and provide informed consent were included in the study.

Exclusion criteria

Patients with atticoantral disease or presence of cholesteatoma, revision tympanoplasty cases, ossicular chain discontinuity or fixation, narrow external auditory canal limiting endoscopic access, sensorineural hearing loss and uncontrolled systemic illness were excluded.

Surgical technique

All surgeries were performed by experienced otologic surgeons under local or general anesthesia, depending on patient preference and clinical suitability. A 0° rigid otoendoscope (2.7 mm) was used, connected to a high-definition camera and monitor. A transcanal approach was adopted in all cases. A superiorly based tympanomeatal flap was elevated, and the middle ear was examined for ossicular integrity and mucosal status. The harvested graft (temporalis fascia, tragal cartilage, tragal cartilage perichondrium, tragal cartilage with perichon-drium, fascia lata) was placed using the underlay technique and tympanomeatal flap reposited. Haemostasis was maintained, and the canal was packed with gelfoam (Figure 1).

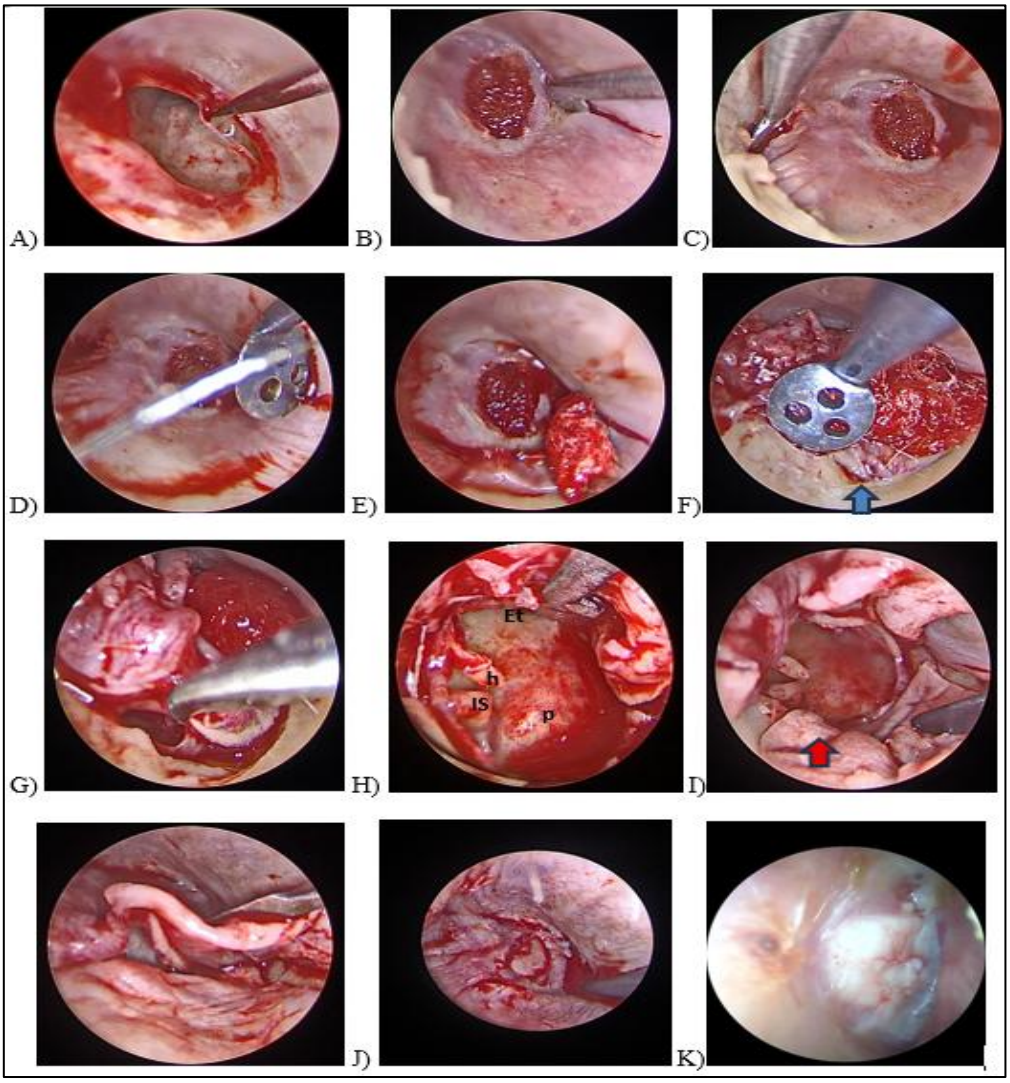

Figure 1: Steps of Endoscopic-assisted superiorly based circumferential tympanomeatal flap: A) Freshening of edges of perforation; B) incision at 6 'O' clock; C) incision at 12 'o'clock; D) joining of the two incisions circumferentially; E) tympanomeatal flap elevation; F) identifying annulus(blue arrow); G) entering middle ear; F) middle ear endoscopic view showing handle of malleus (h), IS joint (IS), Eustachian tube opening (Et), promontory (p); I) tragal cartilage with perichondrium graft placement(red arrow); J) intra-operative picture after graft placement, K) post-operative after 1 month-healed perforation.

Outcome measures

The primary outcome was anatomical success, defined as intact graft uptake at 3 months postoperatively. Secondary outcomes included functional hearing improvement, assessed using pure tone audiometry (PTA) at 1 month and 3 months postoperatively. The ABG was calculated at 500 Hz, 1000 Hz, and 2000 Hz frequencies. Surgical duration and incidence of postoperative complications were also recorded.

Statistical analysis

Data were analyzed using IBM SPSS version 26. Descriptive statistics are presented as frequencies and percentages for categorical variables, and mean±standard deviation for continuous variables. Inferential statistics included Chi-square tests for categorical associations, Student's t test or Mann-Whitney U test for continuous variables, and other appropriate tests as needed. A p value less than 0.05 was considered statistically significant, indicating a significant association or difference between groups.

RESULTS

A total of 70 patients diagnosed with chronic otitis media (COM) were included in this prospective study evaluating outcomes of ET.

Demographic profile

The age of patients ranged from 11 to 61 years, with the highest representation (32.9%) in the 21-30 years age

group (Table 1). The mean age was 31.0±12.1 years. A female preponderance was observed, with 46 females (65.7%) and 24 males (34.2%) giving a male-to-female ratio of 1:2 (Table 2). Socioeconomic classification revealed that upper-lower class was the most prevalent (38.6%), followed by lower middle class (25.7%).

Table 1: Age distribution of the patients in this study.

Age (in years)	N	Percent (%)
<11	0	0
11-20	16	22.9
21-30	23	32.9
31-40	18	25.7
41-50	8	11.4
51-60	4	5.7
61+	1	1.4
Total	70	100

Table 2: Gender distribution of the patients in this study.

Gender	N	Percentage (%)
Female	46	65.71
Male	24	34.29
Total	70	100

Table 3: Socioeconomic distribution of the patients in this study.

Socio-economic status	N	Percentage (%)
Lower class	15	21.42
Upper lower	27	38.57
Lower middle class	18	25.71
Upper middle	8	11.42
Upper class	2	2.85
Total	70	100

Clinical profile

In the study, the duration of symptoms among the participants revealed that most patients (approximately 73%) had a history of chronic symptoms persisting for 101-200 months, indicating a long-standing disease course before surgical intervention. Concerning laterality, unilateral involvement was observed in 56 patients (80%), while bilateral disease was comparatively less common. The right ear was more frequently affected among those with unilateral disease, accounting for nearly 55% of cases. Assessment of the tympanic membrane perforation size showed that moderate-sized perforations were the most prevalent, observed in 50% of patients, followed by large perforations in 28% and small perforations in 22%. Regarding the site of perforation, the anterior quadrant emerged as the most commonly affected location (39%), followed by central perforations (31%), posterior (20%), and inferior (10%). These findings reflect both the chronicity and characteristic distribution patterns of disease in the study population, which may have implications for surgical planning and prognostication.

Preoperative hearing status

The preoperative ABG ranged from 16 to 40 dB, most commonly between 31-35 dB, with a mean of 29.44 dB, indicating mild to moderate conductive hearing loss in the majority of patients.

Surgical details

All tympanoplasty procedures in the study were performed using the underlay technique via a transcanal endoscopic approach. Tragal cartilage with perichondrium (n=42) was the most commonly used graft material, followed by tragal cartilage/perichondrium alone, temporalis fascia, and fascia lata in select cases (Figure 2). Local anaesthesia with intravenous sedation was administered in the majority of patients (56 cases, 90%), while general anaesthesia was used in 14 cases (10%). The operative duration most frequently ranged between 51-60 minutes, with a mean of approximately 58 minutes.

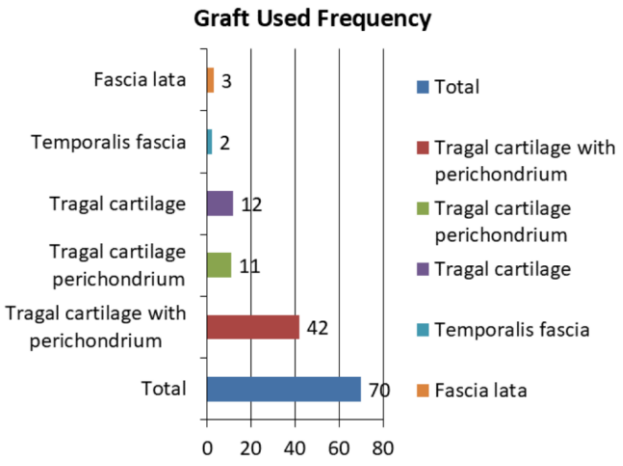

Figure 2: Type of graft material used.

Graft uptake

At the end of 3 months, successful graft uptake was achieved in 64 patients (91.43%). A statistically significant association was observed between graft material and uptake rate (p=0.003). Tragal cartilage with perichondrium demonstrated the highest success rate (97.6%), while temporalis fascia yielded the lowest (50%). These findings suggest a preferential role for tragal cartilage-based grafts in achieving optimal outcomes. No significant association was found between graft uptake and the size of perforation, site of perforation, anaesthesia type, duration of surgery, type of incision, or presence of comorbidities (Figure 3 and 4).

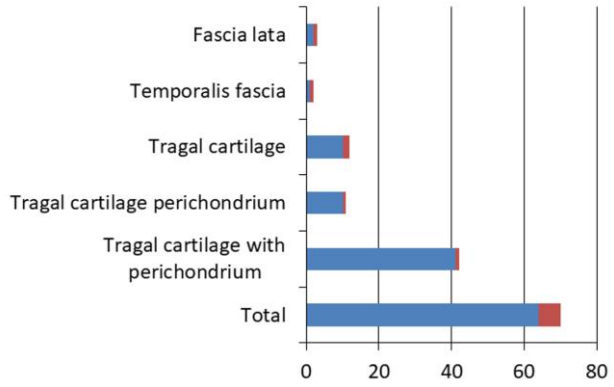

Figure 3: Graft uptake outcome by graft type post-op 3 months.

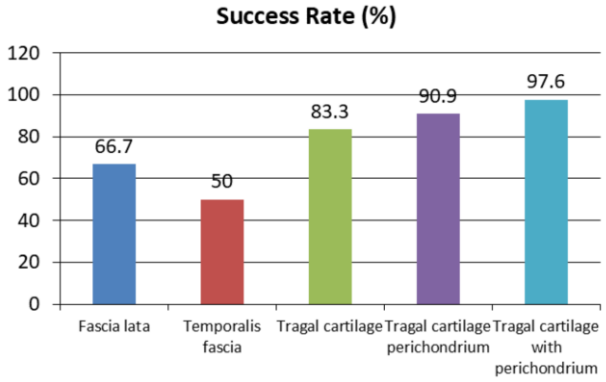

Figure 4: Graft success rate by graft type.

Hearing outcomes

Postoperative hearing assessment demonstrated a statistically significant improvement following surgery. At 3 months, the mean ABG showed an average improvement of 13.60 dB, indicating substantial functional gain. The correlation between preoperative mean ABG and 3-month postoperative mean ABG was also statistically significant (p=0.018), suggesting a consistent relationship between the initial hearing deficit and the extent of postoperative improvement. These findings highlight the effectiveness of the surgical intervention in restoring conductive hearing function in the study population.

In the subgroup analysis, graft uptake was found to have a significant influence on postoperative hearing outcomes. Patients with successful graft uptake demonstrated markedly higher hearing improvement (upto 15 dB), whereas those with graft failure experienced minimal or even negative gain, with some small perforations showing a loss of up to 10 dB. At 3 months postoperatively, moderate perforations showed the best outcomes, with most patients achieving 14-18 dB improvement and some up to 26 dB. Small perforations recorded gains of 18-24 dB in several cases, though occasional ≤10 dB improvement occurred. Large perforations showed the greatest variability, ranging from 2-10 dB in many cases to 18-21 dB in a few, indicating less consistent results. When stratified by perforation site, central perforations showed the best and most consistent improvement, with most patients achieving 14-18 dB gain and some reaching 21-24 dB. Inferior perforations also performed well, with gains up to 21 dB in several cases. Posterior perforations demonstrated moderate improvement, mostly between 14-18 dB, while anterior perforations showed the widest variability, with a substantial number achieving only ≤10 dB gain and fewer cases reaching higher values of 18-21 dB, indicating less favorable outcomes. Analysis by graft material showed that tragal cartilage with perichondrium achieved the greatest hearing improvement, commonly 14-18 dB and up to 26 dB in some cases. Tragal cartilage alone showed moderate gains (12-18 dB), while tragal cartilage perichondrium grafts recorded comparatively lower improvements (8-16 dB), indicating that combining cartilage with intact perichondrium yielded the most favorable functional outcomes.

Postoperative complications

Postoperative complications (Figure 5) were absent in 57 patients (81.4%). Minor complications included bacterial infection in 6 patients (8.6%), otomycosis in 6 patients (8.6%), and graft medialization in 1 patient (1.4%). No cases of graft lateralization, blunting of the anterior meatal angle, or sensorineural hearing loss were observed.

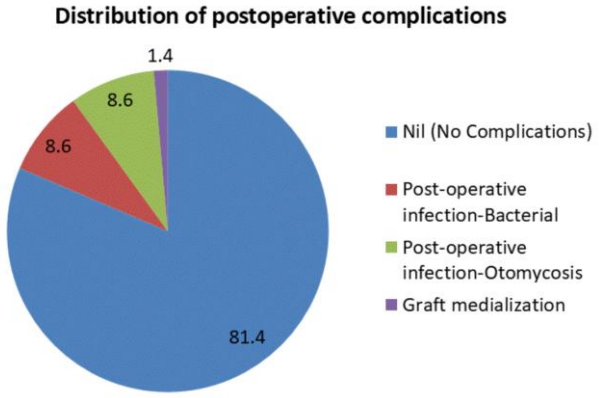

Figure 5: Distribution of post-operative complications.

DISCUSSION

This prospective study underscores the utility and effectiveness of ET in the management of tubotympanic CSOM within a high-volume tertiary care center in India. With a graft uptake rate of 91.43% and a mean ABG improvement to 13.60 dB at 3 months post-surgery, our findings demonstrate that ET offers excellent anatomical and functional outcomes, even in resource-limited public healthcare settings. These results are consistent with existing literature; for instance, Shoeb et al reported a graft success rate of 93.33% and a mean ABG

improvement of 17.4±4.99 dB, reinforcing the reliability and effectiveness of ET in routine clinical practice.[6]

The adoption of ET in government hospitals offers substantial benefits. First, the transcanal, minimally invasive approach eliminates the need for postauricular incisions, reducing surgical trauma, scarring, and patient discomfort. This also contributes to shorter operative times, less blood loss, and faster recovery, which is critical in centers dealing with large patient volumes and limited operating room availability.[4,6]

ET provides superior visualization of the middle ear compared to the microscope, especially for anterior perforations and hidden areas like the sinus tympani and hypotympanum. This enhanced visibility likely contributed to the high graft uptake rates in our study. Tarabichi and Kuo et al have demonstrated that such panoramic visualization improves graft placement accuracy, which is essential when anatomical constraints or poor access make conventional techniques difficult.[3,7]

Furthermore, ET is cost-effective. Unlike surgical microscopes that require significant capital investment and maintenance, rigid endoscopes are more affordable and portable, making them ideal for public hospitals in low-resource settings also. In addition, the feasibility of performing ET under local anesthesia, as done in 90% of our cases, makes it even more suitable for day-care surgery, reducing the burden on in-patient beds and anesthesia teams.

Moreover, Pap et al emphasized the superior cosmetic outcomes and improved postoperative quality of life associated with ET, particularly due to the absence of postauricular incisions and reduced patient discomfort. These findings resonate with our clinical observations, where the majority of patients experienced minimal postoperative morbidity and early return to routine activities. Thus, ET emerges as a highly suitable surgical modality in public healthcare settings where surgical efficiency, cost-effectiveness, and patient-centred outcomes are paramount.[8]

Challenges and limitations

Despite these advantages, ET is not without limitations.

One-handed technique and learning curve

ET demands one-handed instrument handling, requiring precise hand-eye coordination. Initially challenging, especially during bleeding or dissection, studies show that surgeons adapt quickly with experience, achieving shorter operative times and better outcomes.[9]

Intraoperative challenges

Fogging, bleeding, and reduced depth perception can hinder surgical efficiency during ET, especially in cases with edematous mucosa or narrow external auditory canal. These anatomical limitations restrict visibility and instrument mobility, justifying their exclusion in our study and aligning with literature advocating careful case selection for better outcomes.

Suitability for complex pathologies

ET may be less suited for certain complex middle ear pathologies. Cases involving extensive cholesteatoma, ossicular chain discontinuity, or facial recess access may require enhanced instrumentation and visualization, for which a microscopic or combined approach may offer superior ergonomics and operative control.

Graft material selection

An important determinant of success in tympanoplasty is the choice of graft material. In our study, the use of tragal cartilage with perichondrium resulted in a 97.6% graft uptake rate. Cartilage grafts have proven to be resilient against resorption, shrinkage, and retraction-particularly in high-risk cases with Eustachian tube dysfunction or sclerotic middle ear.[10] When adequately thinned, cartilage provides not only structural stability but also acceptable auditory outcomes, as corroborated by multiple clinical trials and meta-analyses.[11]

Implications for practice in India

In Indian tertiary care centers, especially government-run institutions, the burden of CSOM is immense. ET allows surgeons to handle a higher case load with minimal postoperative hospitalization, aligning with national goals of cost-effective, accessible healthcare. Moreover, the integration of endoscopic ear surgery into postgraduate training programs can bridge skill gaps and improve surgical outcomes across the public health system.

Limitations

The study carries certain limitations that should be considered while interpreting the results. The relatively small sample size may affect the statistical strength and limit the generalizability of the findings. A short follow-up period of three months restricts the assessment of long-term graft integrity and hearing outcomes. As a single-center study, the results may be influenced by specific institutional protocols and surgeon preferences. The absence of a control group undergoing microscopic tympanoplasty limits the ability to compare the two techniques objectively. Furthermore, selection bias may have occurred, as only patients opting for endoscopic surgery were included, potentially excluding more complex cases. The influence of the surgeon's learning curve in endoscopic techniques could also have impacted the early outcomes. Lastly, while pure tone audiometry was used for hearing evaluation, subjective variations in test responses may have introduced minor inconsistencies.

CONCLUSION

This study reinforces ET as a transformative approach in the surgical management of chronic otitis media, combining precision with minimal invasiveness. The high graft success rate, significant hearing restoration, and reduced operative morbidity underscore its clinical efficacy.

Recommendations

Given the scalability, cost-effectiveness, and adaptability of ET, it is particularly suited for widespread implementation in Indian healthcare systems. With growing surgical experience and integration into residency training, endoscopic ear surgery stands poised to become the new standard in otologic care.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee HBTMC/IEC/082-22/0/DT

REFERENCES

1. World Health Organization (2004). Chronic suppurative otitis media: burden of illness and management options. World Health Organization. https://iris.who.int/handle/10665/42941. Accessed on 3 December 2025.
2. Merchant SN, McKenna MJ, Rosowski JJ. Current status and future challenges of tympanoplasty. Eur Arch Otorhinolaryngol. 1998;255(5):221-8.
3. Tarabichi M. Endoscopic management of acquired cholesteatoma. Am J Otol. 1997;18(5):544-9.
4. Kuo CH, Wu HM. Comparison of endoscopic and microscopic tympanoplasty. Eur Arch Otorhinolaryngol. 2017;274(7):2727-32.
5. Khalique N, Ahmad Z, Chandra K, Zubair MY, Md Anas. Clinico-epidemiological study of safe and unsafe chronic suppurative otitis media. Indian Journal of Community Health. 2022;34(1):106-10.
6. Shoeb M, Gite V, Bhargava S, Mhashal S. Comparison of surgical outcomes of tympanoplasty assisted by conventional microscopic method and endoscopic method. Int J Otorhinolaryngol Head Neck Surg 2016;2:184-8.
7. Marchioni D, Molteni G, Presutti L. Endoscopic anatomy of the middle ear. Indian J Otolaryngol Head Neck Surg. 2011;63(2):101-13.
8. Pap I, Kovács M, Bölcsföldi B. Quality-of-life outcomes with endoscopic and microscopic type I tympanoplasty-a prospective cohort study. Eur Arch Otorhinolaryngol. 2023;280:4401-8.
9. Doğan S, Bayraktar C. Endoscopic tympanoplasty: learning curve for a surgeon already trained in microscopic tympanoplasty. Eur Arch Otorhinolaryngol. 2017;274(4):1853-8.
10. Gerber MJ, Mason JC, Lambert PR. Hearing results after primary cartilage tympanoplasty. Laryngoscope. 2000;110(12):1994-9.
11. Mohamad SH, Khan I, Hussain SS. Is cartilage tympanoplasty more effective than fascia tympanoplasty? A systematic review. Otol Neurotol. 2012;33(5):699-705.

Cite this article as: Soby RM, Gite VA, Panjiyar MM, Kadao Y. Outcomes of endoscopic tympanoplasty in chronic suppurative otitis media: a prospective study from a tertiary care hospital. Int J Otorhinolaryngol Head Neck Surg 2026;12:166-72.