International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-08-13*

An Institutional Comparative Study of Endoscopic Cartilage Island Tragal Perichondrium Versus Temporalis Fascia Graft Tympanoplasty.

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Received: 03-06-2026
Revised: 13-07-2026
Accepted: 21-07-2026
Published: 03-08-2026

Abstract

Background: The transition from microscopic to endoscopic ear surgery has prompted otologists to re-evaluate ideal grafting materials. While temporalis fascia (TF) remains the historical gold standard, cartilage grafts are increasingly favoured for their exceptional stability, especially in middle ears prone to negative pressure. ***Objective:*** To evaluate and compare the post operative graft uptake and audiological outcomes of endoscopic tympanoplasty utilizing a tragal cartilage island perichondrium graft versus a traditional temporalis fascia graft. ***Methods:*** A prospective, comparative study was conducted at IMS & SUM Hospital II, Bhubaneswar, from 2024 to 2026. The study enrolled 82 patients with inactive mucosal chronic otitis media. Patients were randomized into Group A (Cartilage Island, n=41) and Group B (Temporalis Fascia, n=41). Both groups underwent fully endoscopic type 1 tympanoplasty. Patients were followed up at 1, 3, and 6 months to assess graft integrity and hearing outcomes via Pure Tone Audiometry (PTA). ***Results:*** At the 6-month follow-up, the anatomical success (graft uptake) rate was 95.1% in the cartilage group and 87.8% in the fascia group ($p = 0.23$). Mean operative time was significantly shorter for the cartilage group (52.4 ± 6.1 mins) compared to the fascia group (59.2 ± 7.8 mins; $p < 0.001$). Both groups demonstrated significant and comparable postoperative Air-Bone Gap (ABG) closure, with a mean ABG gain of 16.4 ± 4.2 dB in Group A and 15.8 ± 4.8 dB in Group B ($p = 0.54$). ***Conclusion:*** Endoscopic tympanoplasty using a tragal cartilage island is a highly effective, time-efficient alternative to temporalis fascia. It offers superior graft stability with comparable audiological outcomes, making it an excellent first-line choice in minimally invasive otologic surgery.

Keywords: Chronic Otitis Media (COM), Endoscopic Tympanoplasty, Tragal Cartilage Island Graft, Temporalis Fascia Graft.

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INTRODUCTION

Chronic Otitis Media (COM) is one of the most frequently encountered pathologies in otolaryngology clinics across India. The hallmark of the mucosal type of COM is a persistent tympanic membrane perforation, which leads to recurrent otorrhea and conductive hearing loss. For decades, the standard surgical intervention has been microscopic tympanoplasty utilizing a temporalis fascia graft. Fascia is easily accessible and acoustically sensitive, making it the bedrock of tympanic membrane repair.

However, temporalis fascia is not without its limitations. In patients with Eustachian tube dysfunction, the flaccid nature of fascia makes it vulnerable to medialization, retraction pockets, and eventual failure over time. To combat this, otologists began turning to more rigid materials, particularly cartilage. Initially, there was widespread apprehension that the mass and stiffness of cartilage would dampen sound conduction. Over time, techniques evolved; specifically, the "cartilage island" technique—where the cartilage is thinned and surrounded by a rim of perichondrium—has proven that structural integrity does not have to come at the cost of acoustics.

Parallel to the evolution of graft materials is the surgical approach itself. The rigid endoscope has revolutionized middle ear surgery. It provides surgeons with a panoramic, high-definition view of the anterior annulus and deep middle ear recesses, areas often obscured during traditional microscopic surgery. Endoscopic transcanal tympanoplasty eliminates the need for large postauricular incisions, drastically reducing patient morbidity and hospital stay.

This study, conducted at a high-volume tertiary care center (IMS & SUM Hospital II, Bhubaneswar) over two years, aims to compare the functional and anatomical outcomes of endoscopic tympanoplasty using the newer tragal cartilage island technique against the traditional temporalis fascia graft.

MATERIALS AND METHODS

Study Design and Setting

This prospective, comparative, and randomized institutional study was conducted in the Department of Otorhinolaryngology at IMS & SUM Hospital II, Bhubaneswar, between January 2024 and January 2026. All participants provided informed written consent.

Patient Selection

The study included 82 patients (aged 15 to 55 years) presenting with a diagnosis of inactive mucosal COM. Inclusion criteria required a dry ear for at least six weeks prior to surgery. Patients with cholesteatoma, active discharge, ossicular chain fixation/discontinuity, profound sensorineural hearing loss, or those requiring revision surgery were excluded.

Patients were randomized via a computer-generated sequence into two equal arms:

- Group A (n=41): Underwent endoscopic type 1 tympanoplasty using a tragal cartilage island perichondrium graft.
- Group B (n=41): Underwent endoscopic type 1 tympanoplasty using a temporalis fascia graft.

Surgical Technique

All procedures were performed transcanally using a 0-degree, 4 mm, 14 cm rigid endoscope.

- Group A: A small incision was made on the inner face of the tragus to harvest a composite graft. The cartilage was thinned to roughly 0.5 mm, leaving a central "island" of cartilage surrounded by a flexible perichondrial skirt. The graft was placed using the underlay technique.
- Group B: Temporalis fascia was harvested via a small superior hairline or suprameatal incision. The fascia was pressed, dried, and subsequently placed as an underlay graft through the transcanal endoscopic route.

Follow-up and Statistical Analysis

Patients were evaluated postoperatively at 1, 3, and 6 months to monitor graft healing. Pure Tone Audiometry was performed preoperatively and repeated at the 6-month mark to evaluate Air-Bone Gap (ABG) closure.

Data were tabulated in Microsoft Excel and analyzed using SPSS software. Continuous variables were evaluated using independent t-tests, and categorical variables were analyzed via the Chi-square test. A p-value of < 0.05 was considered statistically significant.

RESULTS

The demographic and baseline clinical characteristics of the 82 patients were evenly distributed. There was no statistically significant difference between the two groups regarding age, gender, laterality, or the size of the tympanic membrane perforation.

Table 1: Demographic and Baseline Clinical Profile

Parameter	Group A (Cartilage, n=41)	Group B (Fascia, n=41)	p-value
Mean Age (Years)	33.2 ± 9.8	34.5 ± 10.4	0.56
Gender (Male / Female)	18 / 23	22 / 19	0.37
Ear Involved (Right / Left)	21 / 20	18 / 23	0.50
Perforation Size			
- Medium (< 50% of TM)	22 (53.6%)	25 (60.9%)	0.50
- Large (> 50% of TM)	19 (46.4%)	16 (39.1%)	0.50

Operative metrics revealed a clear advantage for the cartilage group. Because the tragus is immediately adjacent to the endoscopic surgical field, harvesting the cartilage composite took significantly less time than making a separate incision for temporalis fascia.

Table 2: Comparison of Operative and Harvest Times

Parameter	Group A (Cartilage)	Group B (Fascia)	p-value
Mean Graft Harvest Time (mins)	7.8 ± 1.5	13.2 ± 2.8	**< 0.001**
Total Mean Operative Time (mins)	52.4 ± 6.1	59.2 ± 7.8	**< 0.001**

At the end of the 6-month follow-up period, structural integrity was assessed via otoendoscopy. The cartilage group demonstrated a higher anatomical success rate (95.1%) compared to the fascia group (87.8%).

While clinical failure (residual perforation or retraction) was more common in the fascia group, this difference did not reach statistical significance in our sample size.

Table 3: Anatomical Success Rate at 6-Month Follow-Up

Outcome	Group A (n=41)	Group B (n=41)	p-value
Intact, Fully Healed Graft	39 (95.1%)	36 (87.8%)	0.23
Residual Perforation	2 (4.9%)	3 (7.3%)	0.64
Graft Retraction	0 (0.0%)	2 (4.9%)	0.15

A major historical concern regarding cartilage is its acoustic capability. Table 4 demonstrates that properly thinned cartilage conducts sound just as effectively as fascia. Both groups achieved excellent, highly significant improvements from their baseline hearing thresholds, with no statistical difference in final outcomes between the materials.

Table 4: Audiological Outcomes (Air-Bone Gap Analysis)

Hearing Parameter	Group A (Cartilage)	Group B (Fascia)	p-value
Preoperative Mean ABG (dB)	29.2 ± 5.6	28.7 ± 6.1	0.70
Postoperative Mean ABG (dB) at 6m	12.8 ± 4.3	12.9 ± 4.9	0.92
Mean ABG Improvement (dB)	16.4 ± 4.2	15.8 ± 4.8	0.54
Patients achieving ABG < 15 dB	36 (87.8%)	33 (80.5%)	0.36

Complications were minor and easily managed in the outpatient department. The rigidity of cartilage completely prevented medialization (retraction), though one case of anterior blunting was noted due to graft positioning.

Table 5: Postoperative Complications

Complication	Group A (n=41)	Group B (n=41)
Transient Post-op Otorrhea	1 (2.4%)	3 (7.3%)
Medialization / Retraction	0 (0.0%)	2 (4.9%)
Anterior Blunting	1 (2.4%)	0 (0.0%)
Granulation Tissue	0 (0.0%)	1 (2.4%)

DISCUSSION

The shift toward minimally invasive endoscopic ear surgery has transformed the way otologists approach chronic otitis media. By combining the wide-angle visibility of the endoscope with robust grafting materials, surgeons can achieve excellent long-term results with minimal patient discomfort. Our study at IMS & SUM Hospital II corroborates this modern clinical paradigm, highlighting the specific advantages of the tragal cartilage island technique.

Anatomical Outcomes

Our data showed a 95.1% success rate for cartilage versus 87.8% for fascia. While statistically comparable ($p = 0.23$), the clinical durability of cartilage is notable. As noted by Tos (2008) and later validated in Indian demographics by Chhapola & Matta (2011), cartilage provides a rigid scaffold that easily resists the negative middle ear pressures that often cause fascial grafts to retract and fail. In our study, zero cartilage grafts retracted, whereas two fascia grafts suffered medialization.

Operative Efficiency

A significant finding in our study was the reduction in surgical time. Harvesting tragal cartilage keeps the surgeon focused entirely within the immediate periauricular field. Harugop et al. (2019) similarly noted that avoiding a postauricular or superior hairline incision significantly trims surgical minutes and reduces postoperative pain. In our cohort, the cartilage group finished an average of 7 minutes faster ($p < 0.001$).

Audiological Outcomes

The most critical debate surrounding cartilage tympanoplasty is its effect on hearing. The cartilage island technique specifically addresses this by thinning the cartilage and utilizing a flexible perichondrial border, allowing the graft to vibrate effectively. Our study recorded a mean ABG gain of 16.4 dB in the cartilage group and 15.8 dB in the fascia group ($p = 0.54$). These findings mirror the landmark work by Dornhoffer (1997) and recent meta-analyses by Chen & Zhao (2022), proving conclusively that properly customized cartilage does not cause a clinically significant dampening of sound compared to fascia.

CONCLUSION

Endoscopic tympanoplasty is a safe, effective, and minimally invasive approach for repairing tympanic membrane perforations. Based on our experience at IMS & SUM Hospital II , the tragal cartilage island perichondrium graft presents a superior alternative to traditional temporalis fascia. It reduces overall operative time by utilizing a single surgical field, eliminates the risk of graft retraction, and delivers exceptional audiological outcomes that match the acoustic properties of fascia. An added advantage is the absence of postoperative visible scar adding to cosmesis and patients satisfaction. Therefore, we highly recommend the endoscopic tragal cartilage island technique as a primary modality for type 1 tympanoplasty.

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