

## COMPARISON BETWEEN OUTCOMES OF TEMPORALIS FASCIA GRAFT TYMPANOPLASTY AND CARTILAGE TYMPANOPLASTY

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### Abstract

**Background:** This prospective study, conducted at the Department of Otorhinolaryngology, Gadag Institute of Medical Sciences, Gadag, Karnataka, India, from June 2022 to June 2023, aimed to compare the outcomes of temporalis fascia graft tympanoplasty versus cartilage tympanoplasty in patients with chronic otitis media (COM) presenting with large/subtotal perforations. **Materials and Methods:** Forty patients were included, divided into two groups - Group A (receiving temporalis fascia grafts) and Group B (receiving tragal cartilage grafts) during type-I tympanoplasty. Exclusion criteria comprised ossicular chain discontinuity, non-perforation-related conductive hearing loss, sensorineural deafness, and revision surgeries. Surgical techniques included harvesting temporalis fascia/cartilage grafts, freshening perforation margins, and elevating circumferential tympanomeatal flaps followed by placing of the flaps. Group A underwent underlay grafting of temporalis fascia whereas, in Group B, tragal cartilages were placed. Postoperative care involved aural pack removal after one week and follow-up visits at Months 1, 3, 6 post-surgery, including pure tone audiogram (PTA). Graft uptake and complications were evaluated through otomicroscopic examinations. **Result:** The graft success rate was 90% for the entire group, with 89% for the fascia group and 94% for the cartilage group. **Conclusion:** While both temporalis fascia and cartilage grafts demonstrate efficacy in tympanic membrane (TM) grafting for challenging perforations, the latter stands out as the superior autograft. This distinction is not only attributed to its enhanced graft uptake but also to its ability to yield comparable improvements in hearing outcomes.

## INTRODUCTION

Chronic otitis media (COM) poses a significant health concern, particularly when accompanied by large or subtotal perforations of the tympanic membrane. The intricate anatomy and physiology of the ear demand meticulous consideration in devising surgical interventions for the restoration of both structural and functional aspects. Tympanoplasty, a well-established surgical procedure for treating COM, has evolved over the years with a focus on graft materials. The choice of graft material is pivotal, as it directly influences the surgical outcome, long-term success, and patient quality of life.

Historically, the use of temporalis fascia (TF) as a graft material has been a conventional approach in tympanoplasty. However, advancements in surgical techniques and a growing body of evidence have propelled the exploration of alternative graft

materials. Among these alternatives, autologous cartilage grafts have gained prominence, offering distinct advantages in terms of structural integrity, resilience, and potential for improved long-term outcomes.

The rationale for comparing cartilage tympanoplasty with temporalis fascia grafts in our study stems from the need to address critical questions regarding the efficacy, success rates, and functional improvements associated with these two graft materials. Previous studies have laid the groundwork for the use of cartilage grafts,<sup>[1]</sup> emphasizing their superiority in achieving total reconstruction of the tympanic membrane. While these studies provided valuable insights, our study seeks to contribute to the existing body of knowledge by systematically reviewing and synthesizing contemporary evidence, considering a range of variables such as hearing outcomes, graft success rates, and potential biases.

The procedure of tympanoplasty, focused on the restoration of the middle ear hearing apparatus, has progressed from fundamental methods employed in the repair of the eardrum, commonly known as myringoplasty. In 1640, Banzer pioneered the endeavor to repair a perforated tympanic membrane. His approach involved utilizing a pig's bladder stretched across an ivory tube, which was carefully inserted into the ear. Subsequently, in 1853, Toynbee placed a rubber disc affixed to a silver wire over the perforation, resulting in hearing improvement.<sup>[2]</sup> The utilization of alloplastic material in the restoration of the middle ear mechanism dates back to 1952, when Wullstein employed an oval strut made of vinyl acrylic, commonly known as "palavit." This strut served as an acoustic transmitter positioned between the footplate of the stapes and the tympanic membrane.<sup>[3]</sup>

Tympanoplasty, a gold standard surgical technique to repair TM perforation, aims not only to close the anatomical defect in TM but also to improve the hearing ability of the patient.<sup>[4]</sup> Since the debut of tympanoplasty in the 1950s by Wullstein, utilisation of numerous graft materials for TM perforation closure such as fat,<sup>[5,6]</sup> temporal fascia,<sup>[7]</sup> perichondrium,<sup>[8]</sup> and cartilage have been documented.<sup>[9]</sup> Temporalis fascia is one of the most commonly preferred graft materials due to its ease to harvest.<sup>[10]</sup> TF is also found to shrink, undergo atrophy, and have unpredictable changes due to its poor graft stability, with potential subsequent failure. Therefore, cartilage grafts have been the usual choice for tympanic membrane reconstruction since these grafts exhibit resistance to retraction and resorption.<sup>[11]</sup>

## MATERIALS AND METHODS



**Figure 1: Pre-operative image**

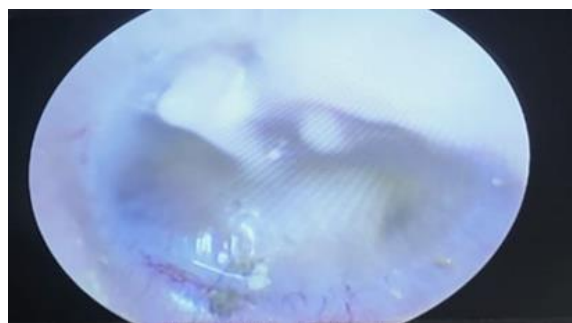


**Figure 2: Intra operative image of left tympanic membrane showing large central perforation after freshening of margins**

This prospective study enrolled 40 patients with COM and large/subtotal perforations, undergoing type-I tympanoplasty in the Department of ENT at Gadag Institute of Medical Sciences, Gadag, Karnataka, India between June 2022 and June 2023. Group A (n=20) received temporalis fascia grafts, and Group B (n=20) received tragal cartilage grafts. Exclusion criteria comprised ossicular chain discontinuity, non-perforation-related conductive hearing loss, sensorineural deafness, and revision surgeries. Surgical techniques involved local/general anesthesia, postaural/endastral approaches, and careful harvesting of grafts. Perforation margins were freshened, and tympanomeatal flaps were elevated. In Group A, underlay grafting of temporalis fascia was done and secured with gel foams. In Group B, tragal cartilages were harvested and placed snugly. Postoperatively, patients underwent PTA assessment at 1, 3, and 6 months.



**Figure 3: Intra operative image showing large central perforation after cartilage graft placement**



**Figure 4: Healed tympanic membrane at 6 months post op**

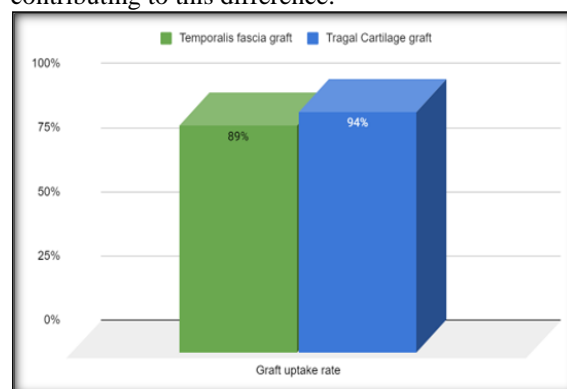
## RESULTS

The outcomes of our prospective study comparing cartilage tympanoplasty with temporalis fascia (TF) grafts in patients with chronic otitis media (COM) and large/subtotal perforations are detailed as follows. At the end of 06 months, the graft uptake rates were assessed. Group B, which underwent cartilage tympanoplasty, demonstrated an impressive 94% graft uptake. In contrast, Group A, receiving TF grafts, exhibited a slightly lower graft uptake rate at 89%. These figures underscore the robustness and reliability of cartilage grafts, positioning them as an effective choice for achieving successful tympanic membrane reconstruction, while TF grafts have also shown significant result standing the test of time.

The primary outcome measure was the improvement in hearing, specifically the air-bone gap (ABG). These findings suggest that both cartilage and TF tympanoplasty contribute significantly to the amelioration of hearing deficits associated with large or subtotal perforations.

A noteworthy distinction emerged in the comparison of post-operative PTA outcomes. Cartilage grafts

(Group B) outperformed standard temporalis fascia grafts (Group A) in post-operative PTA. This differentiation highlights the nuanced variations in outcomes associated with different types of cartilage grafts. Further research may be warranted to elucidate the underlying biological characteristics contributing to this difference.



**Figure 5: Comparison of graft uptake rate in Temporalis fascia graft and Tragal Cartilage graft**

**Table 1: Description of preoperative and postoperative data in the study population**

	Temporalis fascia graft	Tragal cartilage graft	All patients
Male	11	11	22
Female	9	9	18
Age (year)			
Mean	27	28	28
Range	17-32	19-40	17-40
Follow-up (month)			
Mean	22	22	22
Range	12-32	15-36	12-36
Surgical approach			
End aural	6	8	14
Post aural	14	12	26
Surgical outcomes			
Graft uptake rate	89%	94%	90%
Preoperative PTA	34.66 ± 8.66db	32.06 ± 8.4 db	30.20 ± 7.42db
Postoperative PTA	16.90 ± 5.4 db	16.80 ± 4.4 db	18.68 ± 6.88db

## DISCUSSION

Type-I tympanoplasty is a common procedure for TM reconstruction, and the choice of graft material is crucial for success. Temporalis fascia and autologous cartilage grafts have both proven effective, but cartilage is preferred, especially for large/subtotal perforations. In this study, encouraging postoperative results were obtained with cartilage grafting over temporalis fascia. The graft uptake rate in the cartilage group was 94 %, contrasting with 89% in the fascia group after 06 months post operatively.

These results collectively underscore the efficacy of both cartilage and TF tympanoplasty in achieving successful outcomes for patients with large/subtotal perforations. The differentiation between various cartilage graft types adds a layer of complexity to the decision-making process, suggesting that the choice of graft material should be tailored to individual patient needs and functional priorities.

Further statistical analyses and long-term follow-up studies are recommended to validate and extend these findings, providing a more comprehensive understanding of the nuanced outcomes associated with cartilage tympanoplasty and TF grafts in the management of COM.

## CONCLUSION

In conclusion, our study delves into the comparative effectiveness of cartilage tympanoplasty and temporalis fascia grafts, shedding light on critical aspects of surgical outcomes in chronic otitis media patients with large or subtotal perforations. The amalgamation of diverse studies offers a nuanced perspective on the performance of these graft materials, allowing for a more informed decision-making process in clinical practice.

The identified limitations, including the inclusion of various study designs, underscore the need for caution in interpreting the results and emphasize the

complexity inherent in conducting a study within the field of otology. The potential confounding bias, influenced by factors such as age, sex, and the type of cartilage used, underscores the importance of future studies adopting more standardized methodologies to reduce bias and enhance the robustness of findings.

Despite these limitations, our study reveals crucial insights. Cartilage grafts exhibit a superior success rate in tympanoplasty compared to TF grafts, aligning with historical evidence supporting the structural integrity and resilience of cartilage. Both cartilage and TF tympanoplasty demonstrate comparable improvements in hearing outcomes, showcasing the overall effectiveness of these surgical approaches in addressing COM-associated hearing deficits. These findings hold significant implications for clinical practice. Surgeons can consider the distinctive advantages of each graft material when tailoring interventions to individual patient needs. The documented success of cartilage grafts may position them as a preferred choice, particularly in cases where structural integrity and resilience are paramount.

Looking forward, the call for more comprehensive and thorough studies remains imperative. Addressing the limitations identified in this study, future research endeavors should aim for larger sample sizes, standardized methodologies, and extended follow-up periods to capture the evolving efficacy of these graft materials over time. Additionally, the exploration of the biological characteristics influencing outcomes paves the way for more targeted investigations.

In essence, our study contributes to the evolving narrative surrounding tympanoplasty, providing clinicians with evidence-based insights to guide surgical decision-making. As we navigate the dynamic landscape of otologic care, continuous research endeavors will undoubtedly refine our

understanding of optimal graft materials, fostering improved patient outcomes and enhancing the quality of life for individuals grappling with COM and associated complications.

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