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Comparative Study of Cartilage Tympanoplasty and Temporalis Fascia Tympanoplasty in Young Patients

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Abstract
Background
Hearing is one of the most vital senses, and its restoration remains a primary concern for ENT surgeons.This comparative study aims to evaluate and enhance our understanding of different graft materials used in Type I tympanoplasty, focusing on graft uptake and audiological outcomes in young patients.
Materials and Methods
This study was conducted at the Department of Otorhinolaryngology, GMERS Medical College, Gandhinagar, Gujarat,India. A total of 30 patients, aged between 14 to18 years, who underwent Type I tympanoplasty, were enrolled and divided into two groups:

- *Group A (n = 10): Underwent cartilage tympanoplasty (tragal cartilage).*
- *Group B (n = 20): Underwent temporalis fascia tympanoplasty.*

Results

- *The graft uptake rate in the cartilage group was 90%.*
- *The graft uptake rate in the temporalis fascia group was 85%.*
- *Audiological improvement was found to be better in the temporalis fascia group.*

Conclusion
Cartilage tympanoplasty demonstrated a higher graft uptake rate, whereas temporalis fascia grafts yielded better audiological outcomes. Although both parameters are important, the durability of the graft material plays a more critical role. Therefore, cartilage is preferable in cases with a high risk of graft failure specially in young patients.

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I. Introduction

Tympanoplasty is a frequently performed surgical procedure in the field of otolaryngology, primarily aimed at the reconstruction of the tympanic membrane. Various grafting materials have been utilized over time, including temporalis fascia, fascia lata, periosteum, perichondrium, cartilage, and fat.

The first use of cartilage as a graft material in tympanoplasty was introduced by Salen and Jansen in 1963(1,2). Following this, the cartilage-perichondrium composite graft was first described by Goodhill in 1967(3). Temporalis fascia remains the most commonly used grafting material due to its availability and ease of harvesting. However, in younger patients, its use has shown less satisfactory outcomes, possibly due to disadvantages such as irregularly arranged elastic fibers and fibrous connective tissue and high metabolic rate(4)

Cartilage, on the other hand, provides several advantages. It demonstrates higher resistance to infection and pressure variations within the middle ear and possesses a significantly lower metabolic rate compared to the tympanic membrane(5). These properties contribute to its increasing preference, particularly in cases where temporalis fascia grafts have shown high rejection rates. This is especially relevant in pediatric patients, where

factors such as immature immune systems, Eustachian tube dysfunction, and frequent upper respiratory tract infections contribute to the lower success rate of fascia grafts(6).

This study, therefore, focuses on the outcomes of tympanoplasty using cartilage grafts in young patients, aiming to evaluate its efficacy and long-term success compared to conventional materials.

II. Material And Methods

This study was conducted at the Department of Otorhinolaryngology, GMERS Medical College, Gandhinagar, Gujarat, India, from September 2023 to March 2025.

A total of 30 patients, aged between 14 to 18 years, who underwent Type I tympanoplasty were enrolled and divided into two groups:
- Group A (10 patients) underwent cartilage tympanoplasty using tragal cartilage.
- Group B (20 patients) underwent tympanoplasty using temporalis fascia.

All patients were evaluated post-operatively using otoscopic examination and audiometric testing. Both groups received three courses of antibiotics post-operatively.

Inclusion Criteria:
- Patients with conductive hearingloss.
- Presence of moderate/large tympanic membrane perforation.
- Dry ear for more than one month.
- Intact ossicular chain confirmed intraoperatively.

Exclusion Criteria:
- Patients with sensorineural or mixed hearing loss.
- Intraoperative finding of ossicular discontinuity.
-Atticoantral disease.

All patients underwent surgery via the post-auricular approach. In Group A, tragal cartilage was harvested, while in Group B, temporalis fascia was used. Full-thickness tragal cartilage was harvested along with perichondrium from one side. The cartilage was placed over the malleus and tucked to the medial end of the bony external auditory canal (EAC), with the bare cartilage facing the middle ear and the perichondrium facing the EAC.

Pre-operative and post-operative audiometry was conducted, with follow-up assessments performed three months after surgery. Results were systematically recorded.

III. Result

The results demonstrated comparable success rates between the two grafting techniques. Although temporalis fascia showed a slightly higher success rate of 90% compared to cartilage at 85%, the difference was not substantial. Hearing improvement was evident in both groups, with significant AB gap closure observed post-operatively. These findings suggest that both graft materials are effective for Type I tympanoplasty, with cartilage offering a reliable alternative in cases where graft durability is a concern.

All the patients from both the groups were examined pre and post-operatively. A follow-up audiogram was taken 3 months after the operation.

Table 1: Age and Sex Distribution in Patients

	Group A (n=10)	Group B (n=20)	Total (30)
Age (Average) in years	17.30	16.80	
Male	4	11	15
Female	6	9	15

Table 2: Comparison of Success Rate of Cartilage and Temporalis Fascia Grafts

Type of Graft	No.	Success	Failure
Cartilage	10	9 (90%)	1 (10%)
Temporalis fascia	20	17 (85%)	3 (15%)

Total	30	26 (86.66%)	4 (13.33%)

Table 3: Comparison Between Pre- and Post-operative AB Gap and AB Gap Closure

	Cartilage Tympanoplasty		**Temporalis Fascia Tympanoplasty**	
	Pre-op	Post-op	Pre-op	Post-op
Avg. AB Gap	30.56	17.24	31.28	15.42
AB Gap Closure	13.32(43.59%)		15.86(50.7%)	

IV. Discussion

Tympanoplasty has conventionally been performed using temporalis fascia, which remains a widely accepted graft material due to its availability and structural similarity to the tympanic membrane. However, its efficacy may be compromised in certain clinical scenarios, such as Young patients, bilateral tympanic membrane perforations, nasal pathology, allergic rhinitis, and Eustachian tube dysfunction. In these situations, a more robust graft material is needed.

Endoscopic tympanoplasty has emerged as a minimally invasive technique that reduces tissue trauma and postoperative morbidity. In this context, tragal cartilage is particularly advantageous due to its ease of harvesting.

In the present study, both male and female participants were equally represented. The graft success rate was 90% for cartilage and 85% for temporalis fascia. These findings are consistent with those of Shrestha et al.(7)who reported a graft uptake rate of 92% with cartilage compared to 84% with fascia. Similarly, Chhapola et al.(8) observed a 98.36% success rate with cartilage versus 84.5% with fascia, and Ulka et al.(9) found cartilage success rates to be 91.3% compared to 88.2% for temporalis fascia.

Audiological outcomes in our study showed comparable results between the two groups. The mean air-bone gap (AB gap) closure was 43.54% in the cartilage group and 50.7% in the fascia group. While these values suggest a slight advantage for fascia in terms of hearing gain, the difference was not statistically significant. Previous literature, including work by Harkare et al.(10) supports these findings, with AB gap closure rates of 56% for cartilage and 46% for fascia at three months postoperatively.

In conclusion, both cartilage and temporalis fascia are effective graft materials for Type I tympanoplasty. However, cartilage offers superior graft stability and integration, particularly in challenging anatomical and functional cases, making it a preferred choice in select patient populations.

V. Conclusion

In young patients, the success rate of cartilage grafts is higher than that of temporalis fascia when used in tympanoplasty. Cartilage proves to be a more suitable graft material due to its elasticity, and greater resistance to resorption and retraction from negative middle ear pressure.

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