Comparative Study of Temporalis Fascia and Tragal Cartilage Grafts Used in Myringoplasty

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ABSTRACT

Introduction

In myringoplasty, the choice of graft material is crucial for the successful outcome of surgery. The selection of ideal graft is directly related to the size and location of the perforation and also surgeon's preference. In this study, we compared the efficacy of temporalis fascia graft with tragal cartilage on hearing outcomes. To compare the hearing outcomes between temporalis fascia graft and tragal cartilage graft in myringoplasty. To compare the postoperative hearing improvement between the temporalis fascia graft group and the tragal cartilage graft group.

Materials and Methods

In this retrospective study, the records of 40 patients who underwent myringoplasty were included out of which 20 patients (group A) underwent type 1 tympanoplasty with temporalis fascia graft and 20 patients (group B) underwent type 1 tympanoplasty with tragal cartilage graft. Both groups were assessed for hearing on the day before surgery and compared with hearing assessment done 3 months following surgery.

Results

There was no statistically significant difference between the postoperative air-bone gap values of Group A and Group B ($p < 0.001$).

Conclusion

This study validates that both graft types effectively restore hearing levels.

Keywords

Tympanoplasty; Temporalis Fascia; Tragal Cartilage; Myringoplasty; Grafts

Surgical repair of tympanic membrane along with the reconstruction of ossicular chain is called as tympanoplasty. Wullstein in 1956 classified tympanoplasty, with myringoplasty being classified as a Type I tympanoplasty.[1] Various materials including autologous to allogenous and heterogenous materials are used in the repair of tympanic membrane. However there is no one ideal material used. In our study, we compared the effect of temporalis fascia graft with tragal cartilage graft on hearing outcomes.

Materials and Methods

40 patients having dry central perforation of tympanic membrane were selected for the study. These 40 patients were divided into two equal groups of 20 patients each. All of the selected patients underwent endoscopic myringoplasty using 0 degree rigid endoscope which was performed under general anaesthesia. All surgeries selected were performed by the same surgeon to prevent bias in technique. In the first group (Group A), temporalis fascia and in the second group (Group B), tragal cartilage

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was used as graft material. Pure Tone Audiogram (PTA) was taken prior to surgery and 3 months after surgery to assess the hearing levels.

Patient's age, gender, operated ear, size of tympanic membrane perforation, type of graft used, status of middle ear and graft were documented during pre-operative evaluation and post-operative follow up of all the cases. Middle Ear Risk Index (MERI) score developed by Kartush et al[2] was used to assess the middle ear status. Patients with MERI scores above five were excluded from the study. Perforations of pars tensa of tympanic membrane were classified as large, medium and small based on the size of perforations.

The Statistical analysis was performed by STATA 11.2 (College Station TX USA). Students Independent sample t-test was used to find the significant difference between the age, pre and post op PTA, improvement of dBHL with treatment groups and expressed as mean and standard deviation. Chi square test was used to measure the association between the genders, PTA levels with treatment groups and expressed as frequency and percentage. $p<0.05$ was considered as statistically significant.

Inclusion Criteria :

1. Patients with chronic otitis media (COM) – mucosal type with dry ear presenting to the outpatient department.
2. Patients with chronic otitis media – mucosal type with conductive hearing loss.

Exclusion Criteria :

1. Patients with systemic diseases and other comorbid conditions.
2. Patients with post operative residual and recurrent perforations of tympanic membrane.
3. COM patients with ossicular chain abnormalities.
4. Patients with sensorineural hearing loss.
5. Patients with secondary cholesteatoma and granulation tissue in middle ear.
6. Cases with MERI score > 5

Technique :

Under general anaesthesia, central perforation of tympanic membrane was assessed endoscopically in all cases prior to harvesting the grafts. Hopkin's rigid endoscopes (zero degree, 4mm diameter) were used in all cases. The perforation was identified and it's margins were freshened. In Group A, the grafts were obtained from the temporalis muscle fascia through a supra auricular incision. In Group B, the grafts were obtained from the anterior or posterior perichondrium along with tragal cartilage. In all cases, the tympanomeatal flap was elevated 5 mm lateral to the annulus to access the middle ear. Ossicular continuity checked and the grafts were placed using underlay technique (Figure 1 & 2).

Fig. 1. Preoperative otoendoscopic image showing anterior perforation of left ear

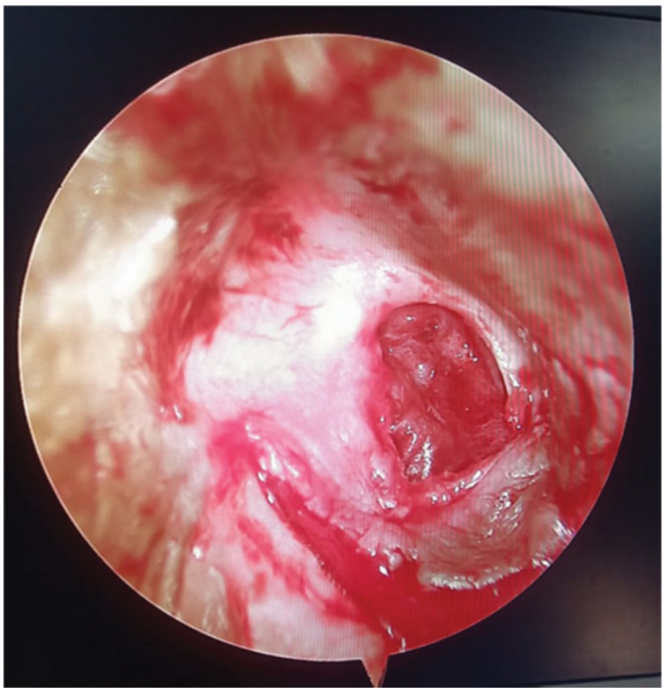

Fig. 2. Intra operative image showing underlay graft

Results

In total, 40 patients were enrolled in this study of which, 16 were males and 24 females. The age of the patients ranged from 18 to 55 years. In our study, Group A had mean age of 37 ± 8.58 years, and Group B had 35.65 ± 10.57 years, with no significant difference (p = 0.660) (Table I). In gender distribution, Group A had an equal split between males and females (10 each), while Group B had more females (14) than males (6), but this difference was not significant (p = 0.197). Based on the number of quadrants involved, the size of the perforations were classified into large (3 or more quadrants), medium (2 quadrants) and small (1 quadrant). Group A comprised of 2 small (10%), 6 medium (30%), 12 large (60%) sized perforations whereas Group B comprised of 1 small (5%), 7 medium (35%) and 12 large (60%). The p-value for the size distribution between groups was 0.815, indicating no significant difference (Table II).

Table I: Age Characteristics

	GROUP A TEMPORALIS FASCIA	GROUP B TRAGAL CARTILAGE	P-VALUE
AGE	37 ± 8.58	35.65 ± 10.57	0.660
RANGE	18-48	35.65 ± 10.57	

Table II: Types of Perforation

TYPE OF PERFORATION	GROUP A TEMPORALIS FASCIA	GROUP B TRAGAL CARTILAGE	TOTAL	P- VALUE
SMALL	2 (10%)	1 (5%)	4	0.815
MEDIUM	6 (30%)	7 (35%)	13	
LARGE	12 (60%)	12 (60%)	24	
TOTAL	20	30	40	

Table III : Comparison of PTA levels between the two groups pre and postoperatively

	GROUP A TEMPORALIS FASCIA (DBHL)	GROUP B TRAGAL CARTILAGE (DBHL)	P - VALUE
PRE OP PTA	47.47 ± 9.95	46.97 ± 8.75 dB	0.865
POST OP PTA	28.94 ± 9.25 dB	26.8 ± 9.89 dB	0.483
PVALUE	< 0.001	<0.001	

It was inferred that there were no statistically significant differences in the distributions of age, gender, groups and the sizes of perforation (all p-values > 0.05).

The mean preoperative air-bone gap in Group A was 47.47 ± 9.95 dB, and mean postoperative air-bone gap was 28.94 ± 9.25 dB. Mean preoperative air-bone gap in Group B was 46.97 ± 8.75 dB, and mean postoperative air-bone gap was 26.8 ± 9.89 dB. There was no statistically significant difference between Group A and Group B in preoperative air-bone gap values ($p = 0.608$). There was no statistically significant difference between the postoperative air-bone gap values of Group A and Group B ($p < 0.001$) (Table III).

In conclusion, it was inferred that there were no significant differences between the temporal (Group A) and tragal (Group B) groups in terms of demographic data, tympanic membrane size, or audiometric outcomes. Both surgical techniques appear to yield similar results.

Discussion

Our study was done to compare temporalis fascia with tragal cartilage graft to assess which grafting material yielded better post operative hearing levels. The results suggest that both graft types are similarly effective in improving hearing outcomes and achieving successful tympanic membrane closure. There were no statistically significant differences observed across various metrics, including pre and post-operative pure tone audiometry (PTA) and tympanic membrane size distribution.

Demographic characteristics, such as age and gender were evenly distributed across the two groups. The lack of significant difference between age and gender implies that demographic factors were unlikely to affect the comparison of surgical outcomes. Similar gender distributions further reduce potential biases thereby supporting the robustness of the results. Research suggests that demographic factors like age and gender do not significantly impact myringoplasty success, allowing the study's focus to remain on the intrinsic qualities of each graft type. This aligns with prior research, which indicates that age and gender generally have limited influence on myringoplasty success when comparing graft materials.[3,4,5]

Pre and post-operative PTA results showed that both temporalis fascia (Group A) and tragal cartilage grafts (Group B) resulted in notable improvements in auditory thresholds. However, neither graft type demonstrated a statistically superior improvement. Temporalis fascia has been traditionally favoured due to its thin, pliable nature, which more closely resembles the tympanic membrane, theoretically allowing for better sound transmission. However, tragal cartilage has gained attention for its durability and resistance to retraction, eminently in cases of eustachian tube dysfunction or revision surgeries.

The lack of disparity between the two groups studied are consistent with findings from other comparative studies where there were no significant difference in hearing threshold between temporalis fascia and tragal cartilage grafts. A study by Yu et al.[6] found comparable hearing improvements using either graft material, attributing their efficacy to surgical skill and patient-specific factors rather than inherent differences between the graft types.

Both grafting techniques achieved high rates of tympanic membrane closure, with comparable outcomes in both small and large perforations. The study results

showed no significant variation between groups in the distribution of small, medium, and large tympanic membrane sizes postoperatively. This aligns with existing literature suggesting that cartilage grafts are particularly beneficial for large or subtotal perforations due to their robust structural support, while temporalis fascia may be effective for smaller perforations given its favourable elasticity and integration with surrounding tissue.[7,8]

In a study by Indorewala et al., [9] it was proven that the added thickness and rigidity of cartilage helps in preventing retraction pockets, specifically in cases with eustachian tube dysfunction. Although cartilage grafts were more stable in structure, it did not seem to affect postoperative hearing levels significantly. Our study's results support the notion that cartilage is as effective as fascia for auditory outcomes, consistent with other research indicating no substantial differences in PTA scores between the two materials.

Given the equivalent outcomes, temporalis fascia and tragal cartilage grafts remain viable options for myringoplasty. It is pertinent to consider factors such as the patient's anatomical and clinical profile when choosing the graft material. Patients with normal middle ear pressures or small perforations can be selected for temporalis fascia due to its thinness and acoustic properties. In terms of durability, tragal cartilage can be opted for patients with high risks of retraction or eustachian tube dysfunction.

Surgical skills can also impact myringoplasty outcomes due to the surgeon's expertise and familiarity with each graft material. It is proven in some studies wherein the experience of the surgeon with specific graft types has accounted for variability in success rates. This warrants for procedural standardization across clinical settings.[10]

Conclusion

Our study supports both temporalis fascia and tragal cartilage grafts in myringoplasty, with each material offering unique advantages suited to particular clinical scenarios. Temporalis fascia provides acoustic benefits and ease of integration, making it ideal for smaller perforations. Tragal cartilage offers superior durability which is beneficial in cases with Eustachian tube dysfunction. These findings reaffirm the versatility of myringoplasty graft options, emphasizing the need for individualized graft selection based on patient-specific factors and surgical context.

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