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Review Article

A Comparative Study of Post-Operative Outcomes between Temporalis Fascia and Tragal Perichondrium Used as Graft Materials in two Different study Groups While Performing Endoscopic Type 1 Tympanoplasty in Them

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ABSTRACT
Background: Temporalis fascia and tragal perichondrium are commonly used graft materials for Type I tympanoplasty. This study compared their anatomical and functional outcomes using an endoscopic approach.
Methods: Sixty patients with inactive mucosal chronic otitis media undergoing endoscopic Type I tympanoplasty were divided into temporalis fascia (n=30) and tragal perichondrium (n=30) groups. Hearing outcomes and graft uptake were assessed over 3 months.
Results: At 3 months, mean ACT improved from 40.32±12.94 to 27.50±12.11 dB in the temporalis fascia group and from 40.15±7.12 to 27.73±8.33 dB in the tragal perichondrium group. Mean ABG improved to 17.76±10.48 and 13.55±7.26 dB, respectively, with no significant intergroup difference at 3 months (p=0.075). Graft uptake was 93.33% and 90.00%, respectively (p=1.00).
Conclusion: Both graft materials achieved high graft uptake and significant hearing improvement, with comparable short-term anatomical and functional outcomes.

Keywords: Chronic Otitis Media, Type I Tympanoplasty, Temporalis Fascia, Tragal Perichondrium, Endoscopic Tympanoplasty, Graft Uptake.

INTRODUCTION

Chronic otitis media (COM), particularly the mucosal type, is a common otological disorder and an important cause of preventable hearing impairment, especially in developing countries [1]. It is characterized by chronic inflammation of the middle ear cleft, frequently associated with tympanic membrane perforation and recurrent or persistent otorrhea. Persistent perforation compromises the protective and sound-conducting functions of the tympanic membrane, resulting in conductive hearing loss and increased susceptibility to middle ear infections [2]. Recurrent ear discharge and hearing impairment may further adversely affect communication, social interaction, educational or occupational performance, and quality of life.Tympanic membrane perforation may result from chronic infection, trauma, barotrauma, or iatrogenic injury. While many acute perforations heal spontaneously, persistent perforations frequently require surgical repair to restore membrane integrity, improve hearing, and prevent recurrent infection [3,4]. Tympanoplasty involves reconstruction of the tympanic membrane with or without ossicular chain repair [5]. Type 1 tympanoplasty, or myringoplasty, is performed when the ossicular chain is intact and functional and primarily aims to close the tympanic membrane perforation [6].The success of tympanoplasty is influenced by several factors,

including patient age, size and site of perforation, middle ear mucosal status, Eustachian tube function, surgical technique, and graft material [7]. An ideal graft should be readily available, biocompatible, easy to harvest and handle, resistant to infection and resorption, structurally stable, and capable of satisfactory acoustic transmission [8].Temporalis fascia has traditionally been one of the most commonly used graft materials for tympanoplasty because of its easy availability, favourable handling characteristics, low metabolic requirement, and structural similarity to the fibrous layer of the tympanic membrane. It provides high graft uptake rates with satisfactory hearing improvement [9]. However, postoperative thinning, shrinkage, medialization, retraction, and residual or recurrent perforation may occur, particularly in ears with poor Eustachian tube function or large perforations [10].Tragal perichondrium is an alternative graft material with good tensile strength, low metabolic requirements, favorable handling characteristics, and minimal donor-site morbidity [11]. It may provide greater structural stability while maintaining adequate flexibility for sound transmission. Previous studies have demonstrated satisfactory graft uptake and hearing outcomes comparable to those achieved with temporalis fascia [12].Advances in endoscopic ear surgery have further transformed tympanoplasty by providing high-definition, magnified, wide-angle visualization of the tympanic membrane and middle ear [13]. Transcanal endoscopic ear surgery utilizes the external auditory canal as a natural surgical corridor, avoiding extensive soft-tissue dissection and providing superior visualization of areas such as the anterior tympanic membrane and anterior meatal angle [14]. Endoscopic Type 1 tympanoplasty has demonstrated anatomical and functional outcomes comparable to conventional microscopic techniques [15].Despite these advances, the optimal graft material for endoscopic Type 1 tympanoplasty remains uncertain. Temporalis fascia is well established, whereas tragal perichondrium may provide greater mechanical stability without compromising hearing outcomes [12]. Comparative evidence regarding these graft materials remains variable [15]. Therefore, the present study was designed to compare the postoperative anatomical and functional outcomes of temporalis fascia and tragal perichondrium as graft materials in patients undergoing endoscopic Type 1 tympanoplasty.

MATERIALS AND METHODS

This prospective comparative study was conducted in the Department of Otorhinolaryngology, Jawaharlal Nehru Medical College, Aligarh Muslim University (AMU), Aligarh. The study included 60 patients diagnosed with chronic otitis media (COM), inactive mucosal type, who underwent endoscopic Type I tympanoplasty.

Study Participants

Patients attending the ENT outpatient department or admitted to the inpatient services were evaluated for eligibility. All patients underwent detailed clinical history taking and comprehensive otological examination. Otoendoscopic examination was performed to assess the site and size of the tympanic membrane perforation and to exclude cholesteatoma, aural polyps, granulation tissue, or other middle ear pathology. Patients fulfilling the eligibility criteria and providing written informed consent were enrolled in the study.

Inclusion Criteria

Patients aged 15–65 years with inactive mucosal COM, conductive hearing loss demonstrated on pure tone audiometry (PTA), adequate cochlear reserve, and absence of significant systemic comorbidity were included.

Exclusion Criteria

Patients aged <15 or >65 years; those with active mucosal or squamous COM; mixed or sensorineural hearing loss; significant systemic illnesses such as diabetes mellitus or hypertension that could influence study outcomes; previous tympanoplasty; and patients requiring tympanoplasty procedures other than Type I tympanoplasty were excluded.

Preoperative Assessment

All participants underwent detailed preoperative otological and audiological assessment. Hearing evaluation was performed using PTA to determine air-conduction and bone-conduction thresholds. The air-bone gap (ABG) was calculated as the difference between air- and bone-conduction thresholds averaged across 500, 1000, and 2000 Hz.

Group Allocation

A total of 60 patients were allocated into two groups of 30 patients each using an alternating weekly allocation method. Patients admitted during each week were serially numbered.

During the first week, odd-numbered patients were assigned to Group A and even-numbered patients to Group B. During the subsequent week, the allocation sequence was reversed. This alternating pattern was continued throughout the recruitment period.

Group A (n=30): Endoscopic Type I tympanoplasty using temporalis fascia graft.

Group B (n=30): Endoscopic Type I tympanoplasty using tragal perichondrium graft.

Surgical Technique

All patients underwent transcanal endoscopic Type I tympanoplasty using a 0° rigid endoscope. An underlay grafting technique was used in both groups.

Temporalis Fascia Graft

In Group A, the temporalis region was infiltrated with lignocaine and adrenaline (1:100,000). A 2–3 cm supra-auricular incision was made within the hairline, and an appropriately sized temporalis fascia graft was harvested after careful dissection. Hemostasis was achieved and the incision was closed in layers.The harvested fascia was dried on a sterile metal plate or gauze, trimmed to the required dimensions, and positioned medial to the tympanic membrane remnant using the underlay technique. The middle ear and external auditory canal were supported with absorbable gelatin sponge (Gelfoam).

Tragal Perichondrium Graft

In Group B, the tragal region was infiltrated with lignocaine and adrenaline (1:100,000). An approximately 1–1.5 cm vertical incision was made over the medial aspect of the tragus. The perichondrium was carefully separated from the underlying cartilage and harvested while preserving adequate cartilaginous support. Hemostasis was achieved and the incision was closed with fine sutures.

The harvested perichondrium was trimmed according to the size and configuration of the tympanic membrane defect and positioned medial to the tympanic membrane remnant using the underlay technique. The middle ear and external auditory canal were supported with Gelfoam.

Postoperative Follow-up

Patients were followed at 1, 2, and 3 months after surgery. At each follow-up visit, otoscopic examination was performed to assess graft integrity, graft uptake, and middle ear status. Postoperative audiological assessment was performed using PTA and impedance audiometry. Hearing outcomes and graft uptake were recorded and compared between the two groups.

Outcome Measures

Primary Anatomical Outcome

Anatomical success was defined as complete graft uptake with an intact tympanic membrane and maintenance of a dry ear for at least 12 weeks postoperatively.

Primary Functional Outcome

Functional success was defined as achievement of a postoperative ABG of <10 dB.Changes in air-conduction threshold (ACT), bone-conduction threshold (BCT), and ABG from the preoperative to postoperative assessment were also evaluated and compared between the two groups.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS), version 25.0. Continuous variables, including age, pure tone average ACT, BCT, and ABG, were expressed as mean ± standard deviation (SD). Intergroup comparisons of continuous variables were performed using the independent-samples *t*-test, whereas preoperative and postoperative intragroup comparisons were performed using the paired *t*-test.Categorical variables were expressed as frequencies and percentages and compared between groups using the Chi-square test or Fisher's exact test, as appropriate. All statistical tests were two-sided, and a *p*-value <0.05 was considered statistically significant.

RESULTS

A total of 60 patients with chronic otitis media (COM), inactive mucosal type, were included in the study. Thirty patients underwent endoscopic Type I tympanoplasty using temporalis fascia (Group A), while 30 underwent the procedure using tragal perichondrium (Group B).The mean age of patients was 24.87 ± 5.76 years in Group A and 29.57 ± 8.24 years in Group B, with no statistically significant difference between the groups (p=0.11). Group A included 12 (40.0%) males and 18 (60.0%) females, whereas Group B included 17 (56.7%) males and 13 (43.3%) females (p=0.20). The distribution of left-, right-, and bilateral COM was also comparable between the two groups (p=0.14) (Table 1).Left-sided surgery was performed in 17 (56.7%) patients in Group A and 15 (50.0%) patients in Group B, while right-sided surgery

was performed in 13 (43.3%) and 15 (50.0%) patients, respectively. There was no significant difference in the side of surgery between the groups (p=0.80). Small tympanic membrane perforations were observed in 13 (43.3%) patients in each group. Medium-sized perforations were present in 11 (36.7%) patients in Group A and 14 (46.7%) in Group B, while large perforations were observed in 6 (20.0%) and 3 (10.0%) patients, respectively. The distribution of perforation size was comparable between the groups (p=0.51) (Table 2, Figure 1).The preoperative mean air-conduction threshold (ACT) was 40.32 ± 12.94 dB in Group A and 40.15 ± 7.12 dB in Group B (p=0.95). A progressive reduction in ACT was observed postoperatively in both groups. At 1, 2, and 3 months, mean ACT was 37.41 ± 13.08, 32.11 ± 12.57, and 27.50 ± 12.11 dB, respectively, in Group A, compared with 36.00 ± 8.16, 32.71 ± 9.03, and 27.73 ± 8.33 dB in Group B. At 3 months, ACT was comparable between the groups (p=0.93). The preoperative-to-postoperative improvement was statistically significant within both groups (p=0.001) (Table 3).The preoperative mean bone-conduction threshold (BCT) was significantly lower in Group A than in Group B (10.39 ± 6.74 vs 15.33 ± 4.97 dB; p=0.002). At 1, 2, and 3 months, mean BCT was 10.00 ± 6.59, 9.98 ± 6.64, and 9.74 ± 6.55 dB, respectively, in Group A, compared with 14.83 ± 4.89, 14.48 ± 4.55, and 14.18 ± 4.70 dB in Group B. The intergroup difference remained statistically significant at 3 months (p=0.004). Significant preoperative-to-postoperative changes were observed within both groups (p=0.001) (Table 4, Figure 2).

The preoperative mean air-bone gap (ABG) was 29.93 ± 11.82 dB in Group A and 24.82 ± 7.08 dB in Group B (p=0.048). A progressive reduction in ABG was observed in both groups. At 1 month, the mean ABG was 27.41 ± 11.95 dB in Group A and 21.17 ± 7.39 dB in Group B (p=0.017). At 2 months, the corresponding values were 22.13 ± 11.54 and 18.23 ± 7.92 dB (p=0.131), and at 3 months they were 17.76 ± 10.48 and 13.55 ± 7.26 dB, respectively (p=0.075). Thus, although an intergroup difference was observed at 1 month, the ABG was statistically comparable between the groups at 2 and 3 months. Both groups demonstrated significant improvement from preoperative to postoperative assessment (p=0.001) (Table 5).

Successful graft uptake was achieved in 28 of 30 patients (93.3%) in Group A and 27 of 30 patients (90.0%) in Group B. Graft failure occurred in 2 (6.7%) and 3 (10.0%) patients, respectively. There was no statistically significant difference in graft uptake between the two groups (p=1.00) (Table 6, Figure 3).

Overall, both graft materials demonstrated high graft uptake rates and significant postoperative hearing improvement. By 3 months, ACT and ABG were comparable between the groups, while no significant difference was observed in graft uptake.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Groups

Characteristic	Temporalis fascia (n=30)	Tragal perichondrium (n=30)	p-value	Statistical test
Age (years), mean ± SD	24.87 ± 5.76	29.57 ± 8.24	0.11	Independent-samples *t*-test
Male, n (%)	12 (40.0)	17 (56.7)	0.20	Chi-square test
Female, n (%)	18 (60.0)	13 (43.3)		
Left COM, n (%)	16 (53.3)	15 (50.0)	0.14	Fisher's exact test
Right COM, n (%)	10 (33.3)	15 (50.0)		
Bilateral COM, n (%)	4 (13.3)	0 (0.0)		

Table 2. Surgical Side and Tympanic Membrane Perforation Size

Variable	Temporalis fascia (n=30)	Tragal perichondrium (n=30)	p-value	Statistical test
Side of procedure			**0.80**	**Chi-square test**
Left	17 (56.7)	15 (50.0)		
Right	13 (43.3)	15 (50.0)		
Perforation size			**0.51**	**Chi-square test**

Small	13 (43.3)	13 (43.3)		
Medium	11 (36.7)	14 (46.7)		
Large	6 (20.0)	3 (10.0)		

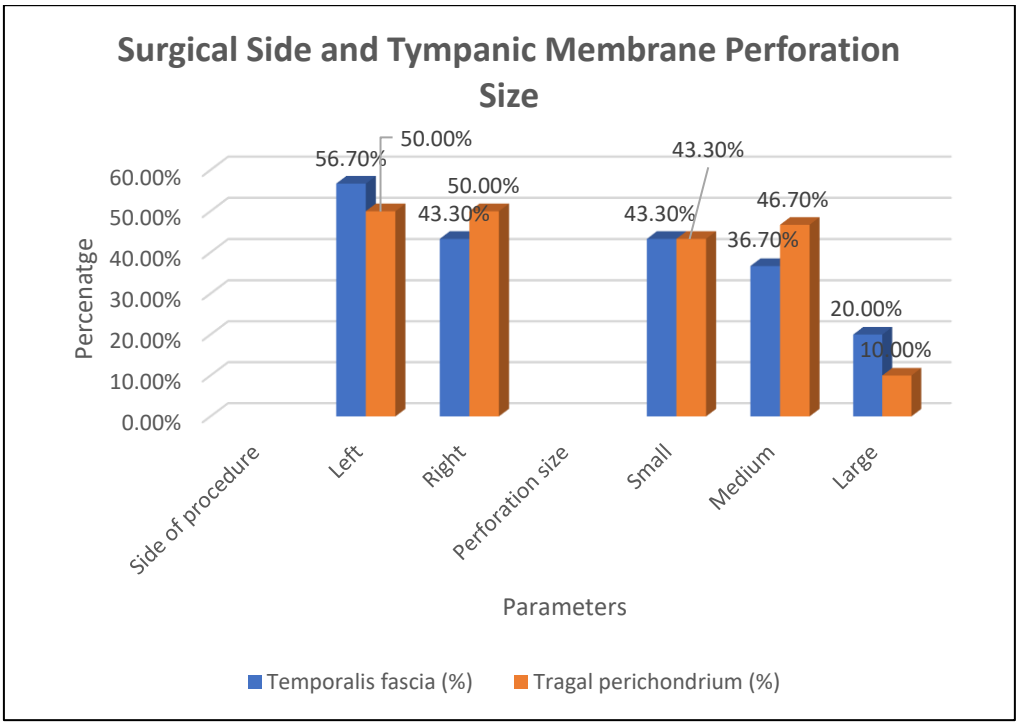


Figure 1. Surgical Side and Tympanic Membrane Perforation Size

Table 3. Comparison of Air-Conduction Threshold (ACT) Between the Study Groups

Time point	Temporalis fascia, mean ± SD (dB)	Tragal perichondrium, mean ± SD (dB)	p-value	Statistical test
Preoperative	40.32 ± 12.94	40.15 ± 7.12	0.95	Independent-samples *t*-test
1 month	37.41 ± 13.08	36.00 ± 8.16	0.62	
2 months	32.11 ± 12.57	32.71 ± 9.03	0.83	
3 months	27.50 ± 12.11	27.73 ± 8.33	0.93	
Preoperative vs postoperative	—	—	0.001 (both groups)	Paired *t*-test

Table 4. Comparison of Bone-Conduction Threshold (BCT) Between the Study Groups

Time point	Temporalis fascia, mean ± SD (dB)	Tragal perichondrium, mean ± SD (dB)	p-value	Statistical test
Preoperative	10.39 ± 6.74	15.33 ± 4.97	**0.002**	Independent-samples *t*-test
1 month	10.00 ± 6.59	14.83 ± 4.89	**0.002**	
2 months	9.98 ± 6.64	14.48 ± 4.55	**0.004**	
3 months	9.74 ± 6.55	14.18 ± 4.70	**0.004**	
Preoperative vs postoperative	—	—	0.001 (both groups)	Paired *t*-test

Table 5. Comparison of Air-Bone Gap (ABG) Between the Study Groups

Time point	Temporalis fascia, mean ± SD (dB)	Tragal perichondrium, mean ± SD (dB)	p-value	Statistical test

Preoperative	29.93 ± 11.82	24.82 ± 7.08	**0.048**	Independent-samples *t*-test
1 month	27.41 ± 11.95	21.17 ± 7.39	**0.017**	
2 months	22.13 ± 11.54	18.23 ± 7.92	0.131	
3 months	17.76 ± 10.48	13.55 ± 7.26	0.075	
Preoperative vs postoperative	—	—	0.001 (both groups)	Paired *t*-test

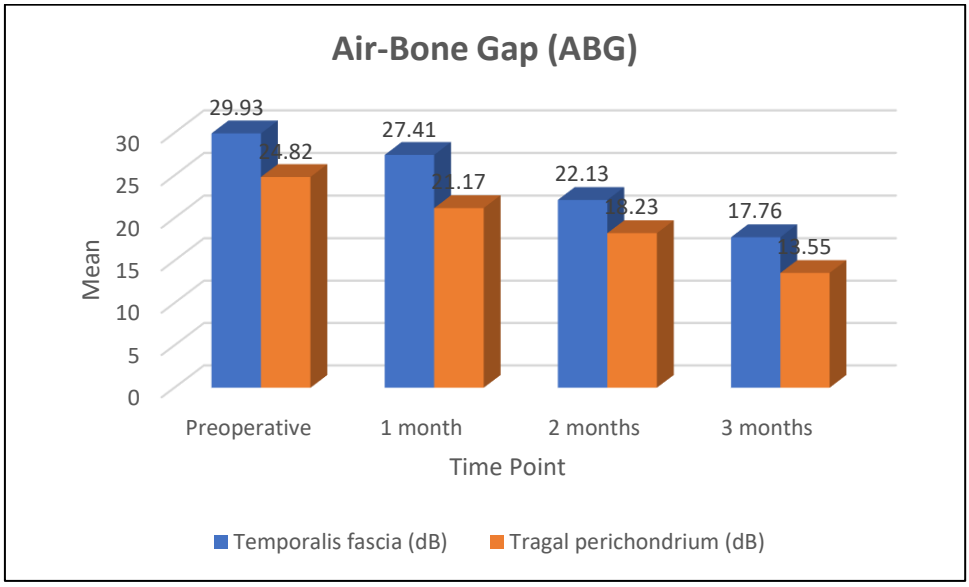


Figure 2. Comparison of Bone-Conduction Threshold (BCT) Between the Study Groups

Table 6. Comparison of Graft Uptake between the Study Groups

Graft outcome	Temporalis fascia (n=30)	Tragal perichondrium (n=30)	p-value	Statistical test
Successful graft uptake	28 (93.3%)	27 (90.0%)	**1.00**	Fisher's exact test
Graft failure	2 (6.7%)	3 (10.0%)		
Total	30 (100%)	30 (100%)		

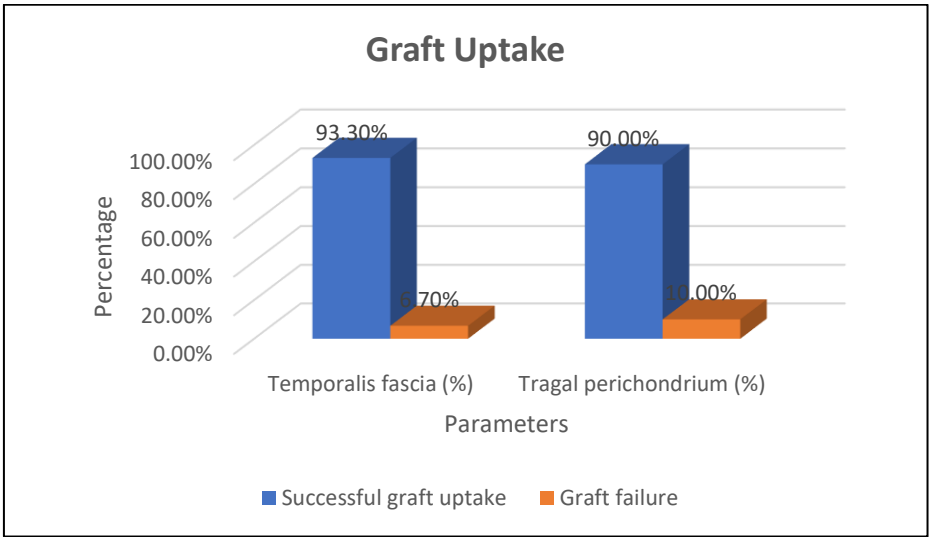


Figure 3. Comparison of Graft Uptake between the Study Groups

DISCUSSION

The present prospective comparative study evaluated the anatomical and functional outcomes of temporalis fascia and tragal perichondrium grafts in endoscopic Type I tympanoplasty among 60 patients with inactive

mucosal chronic otitis media. Both graft materials demonstrated high graft uptake and significant postoperative hearing improvement, with comparable functional outcomes at 3 months.

The mean age was 24.87 ± 5.76 years in the temporalis fascia group and 29.57 ± 8.24 years in the tragal perichondrium group (p=0.11). Similar demographic comparability was reported by Prinja et al. [16], Dhoke et al. [17], and Jacob et al. [18]. Sex distribution was also comparable (p=0.20). Prinja et al. [16] observed male predominance, whereas Dhoke et al. [17] and Jacob et al. [18] reported female predominance.

The distribution of laterality was comparable between the groups (p=0.14). Prinja et al. [16] reported equal right- and left-ear involvement, while Dhoke et al. [17] reported variable laterality between groups. Molinari et al. [19] similarly observed equal right- and left-ear involvement. The side of surgery was also comparable (p=0.80), consistent with Prinja et al. [16], Dhoke et al. [17], and Jacob et al. [18].

A significant postoperative improvement in hearing was observed in both groups. Mean ACT improved from 40.32 ± 12.94 to 27.50 ± 12.11 dB in the temporalis fascia group and from 40.15 ± 7.12 to 27.73 ± 8.33 dB in the tragal perichondrium group (p=0.001 within both groups). Prinja et al. [16] similarly demonstrated significant improvement in PTA with comparable final hearing outcomes. Dhoke et al. [17] and Jacob et al. [18] also reported significant hearing improvement with both graft materials, while Molinari et al. [19] reported improvement in PTA-AC from 26.43 ± 10.2 to 17.91 ± 12.4 dB following endoscopic tympanoplasty. Mean BCT improved from 10.39 ± 6.74 to 9.74 ± 6.55 dB in the temporalis fascia group and from 15.33 ± 4.97 to 14.18 ± 4.70 dB in the tragal perichondrium group. The baseline BCT differed significantly between groups (p=0.002), and therefore subsequent intergroup differences should be interpreted in the context of this baseline imbalance. Molinari et al. [19], Jacob et al. [18], and Prinja et al. [16] similarly demonstrated preservation of bone-conduction hearing without significant postoperative cochlear deterioration. The mean ABG decreased from 29.93 ± 11.82 to 17.76 ± 10.48 dB in the temporalis fascia group and from 24.82 ± 7.08 to 13.55 ± 7.26 dB in the tragal perichondrium group. Although a significant intergroup difference was observed at 1 month (p=0.017), differences at 2 months (p=0.131) and 3 months (p=0.075) were not significant. Prinja et al. [16] reported postoperative ABG <10 dB in 77% and 83% of patients receiving temporalis fascia and tragal perichondrium, respectively. Dhoke et al. [17], Jacob et al. [18], Lou et al. [20], and Molinari et al. [19] also reported significant ABG improvement with comparable functional outcomes between graft materials. Perforation size was comparable between groups (p=0.51), with small perforations being most common (43.33% in each group). Dhoke et al. [17] similarly found no significant difference in perforation size between graft groups, while Molinari et al. [19] reported both central and marginal perforations among patients undergoing endoscopic tympanoplasty. Successful graft uptake was achieved in 93.33% of the temporalis fascia group and 90.00% of the tragal perichondrium group (p=1.00). Prinja et al. [16] reported corresponding rates of 87% and 90%, Dhoke et al. [17] reported 84.44% and 91.11%, and Jacob et al. [18] reported 92.3% and 96.2%. Molinari et al. [19] observed anatomical success in 89.1%, while Lou et al. [20] reported graft success of 81.1% with temporalis fascia and 92.1% with perichondrium. These findings support the high and comparable anatomical success of both graft materials.

CONCLUSION

Both temporalis fascia and tragal perichondrium provided high graft uptake rates and significant hearing improvement following endoscopic Type I tympanoplasty. At 3 months, ACT, ABG, and graft uptake outcomes were comparable between the groups. Thus, both graft materials are effective options for tympanic membrane reconstruction.

Limitations

The study was limited by its small sample size, single-center design, and short follow-up period of 3 months. The non-random allocation method and baseline differences in BCT and ABG may also limit interpretation of comparative outcomes.

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