

## Original article

# A comparison between loose areolar tissue and temporalis fascia as graft materials for tympanoplasty

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## Abstract

**Aim:** The aim of this prospective, randomized study is to compare the graft uptake rate and hearing gain between the two graft materials: loose areolar tissue and temporalis fascia in tympanoplasty.

**Methodology:** In our tertiary centre we conducted a randomized controlled trial on 60 subjects to evaluate comparison of the surgical outcomes between loose areolar tissue and temporalis fascia. In this study evaluation of graft uptake and closure of A-B gap was evaluated over a 6 month follow up period.

**Results:** The graft uptake rate of temporalis fascia was 93.3% and mean post-operative A-B gap closure was 26.33, while that of the loose areolar tissue 90% and 22.17 respectively.

**Conclusion:** The graft uptake rate and A-B gap closure are comparable with no statistical difference between them.

**Keywords:** Myringoplasty, Temporalis fascia, loose areolar tissue

## Introduction

Chronic Otitis Media is the chronic inflammation of mucoperiosteal lining of the middle ear cleft characterized by ear discharge, a permanent central perforation of Tympanic Membrane and impairment in hearing. It is one of the most common ear diseases encountered in developing countries because of poor socioeconomic standards, poor nutrition, lack of health education and unhygienic habits [1, 2,3].

Perforation in the tympanic membrane leads to loss of hearing and recurrent ear discharge. The close anatomical proximity of the middle ear cleft to many critical structures such as the facial nerve, inner ear, meninges and intracranial spaces, makes these structures vulnerable to spread of infection from middle ear, resulting in potentially serious complication. The patient also suffers socially due to deafness and faces embarrassment due to aural discharge. To avoid the complications associated with chronic otitis media and to give a better hearing and social satisfaction, need of repair of tympanic membrane perforation arose. The term myringoplasty is reserved for the surgical rectification of tympanic membrane in which no ossicular reconstruction is involved. Myringoplasty is now an established surgery for tympanic membrane perforations, being carried out routinely by otolaryngologists [4] In the present-day scenario various graft materials have been used such as temporalis fascia, tragal perichondrium, cartilage with perichondrium, fascia lata, loose areolar connective tissue fat harvested from ear lobule. A good graft material is one which is locally available, is easily harvestable, tough and easy to handle and gives hearing similar to the normal tympanic membrane. Temporalis fascia is the most preferred grafting material. Graft displacement, improper placement, [5] autolysis, infection, haemorrhage, Eustachian tube

dysfunction are the known contributing factors for the failure of closure of perforation. Thus, consistent achievement of good hearing is still a challenge and one of the most difficult tasks of otology surgery.

This study was undertaken to compare the easily available autogenous graft materials, i.e. Temporalis fascia and Loose areolar tissue in myringoplasty. The study also compares the result of these grafts in various aspects such as the graft uptake rates and hearing improvement.

### **Materials and methods**

The study population comprised of 60 patients who attended our ENT OPD satisfying the criteria, were divided into two study groups 30 patients each. The study was conducted from May 2015 to April 2017. In one study group temporalis fascia was used as a graft material and in the other group loose areolar tissue was used. Patients between the ages of 15 to 60 years with unilateral safe perforations and pure conductive hearing loss and good Eustachian tube function were included in the study. Patients with obvious ossicular dysfunction, or external ear pathology were excluded from the study. Patients with ear discharge were initially treated conservatively and were included in the study when their ear became dry for at least 6 weeks.

A thorough clinical examination of ear, nose and throat was done with special reference to the ear. An otoscopic examination was done to note the location and size of perforation. All findings were confirmed with examination of the ear under a microscope. Hearing assessment was done with tuning fork tests and pure tone audiometry (PTA).

All patients were operated using a post-aural approach under local anaesthesia. The temporalis fascia graft or loose areolar tissue were used by underlay technique.

Antibiotics, analgesics and decongestants were given for 3 weeks. All patients were called for regular follow up for ear examination at 7<sup>th</sup> day, 3 weeks, 6 weeks, 3 months and 6 months. PTA was done after 3 months and 6 months.

### **Results**

In our study, maximum number(30%) of patients in the loose areolar tissue were in the age group 31-40 years, whereas in the temporalis fascia maximum number(36.6%) of patients were in the 21-30 years age group. There was no significant difference in the two groups.

In our study were 56.6% males and 43.3 % females in the loose areolar tissue group whereas the temporalis fascia group had 60 % males and 40% females. There was no significant difference in the two groups.

40% patients in the loose areolar tissue group had their left ear operated and 60% the right ear operated. In the temporalis fascia group 36.6% had their left ear operated and 63.3% had their right ear operated.

In the loose areolar tissue group, 5 patients out of 30(16.6%) had bilateral Chronic Otitis Media while 3 out of 60 (10%) in the Temporalis fascia group, had bilateral Chronic Otitis Media. There is no statistically significant difference in the two groups.

Pre-operative PTA was done for all patients. Post-operative PTA was done at 6 months postoperative period. With regards to the A-B gap closure, mean post-operative A-B gap closure was 22.17dB in the Loose areolar tissue group, with the maximum closure seen in the 11-15 dB range. It was 26.33 dB in the Temporalis fascia group with the maximum closure seen in the 6-10 dB range. Though the Temporalis

fascia group showed a higher AB gap closure, there was no statistically significant difference between the two groups with respect to AB gap closure

In our study, we obtained a graft uptake rate of the Loose areolar tissue group was 90% whereas in the Temporalis fascia group it was 93.3%. There was no statistical difference between the two groups.

Table 1: Age Distribution

Age		Loose areolar tissue		Temporalis fascia		Total	
	<20	6	20%	4	13.3%	10	16.6%
	21 -30	8	26.6%	11	36.6%	19	31.6%
	31-40	9	30%	8	26.6%	17	28.3%
	41-50	4	13.3%	5	16.6%	9	15%
	>50	3	10%	2	6.6%	5	8.3%
	Total	30		30		60	
Mean± SD		31.73±11.06		32.67±11.09			
P value	0.745						

Table 2. Gender Distribution

Gender		Loose areolar tissue		Temporalis fascia		Total	
	Male	17	56.6%	18	60%	35	58.3%
	Female	13	43.3%	12	40%	25	41.6%
	Total	30		30		60	
P value = 0.793 N.S.							

Table 3. Comparison of AB gap (pre and post operative)

	Temporalis Fascia	Loose areolar tissue
Pre-Op AB Gap (dB)	36.67	34.17
POAB 6 months	26.33	22.17

Table 4: Graft uptake at 3 months

Graft uptake at 3 months		Loose areolar tissue		Temporalis fascia		Total	
	YES	27	90%	28	93.3%	55	91.3%
	NO	3	10%	2	6.6%	5	8.3%
	TOTAL	30	100%	30	100%	60	100%
P value=0.64							

Figure 1: Bar diagram showing comparison of AB gap (Pre and post operative)

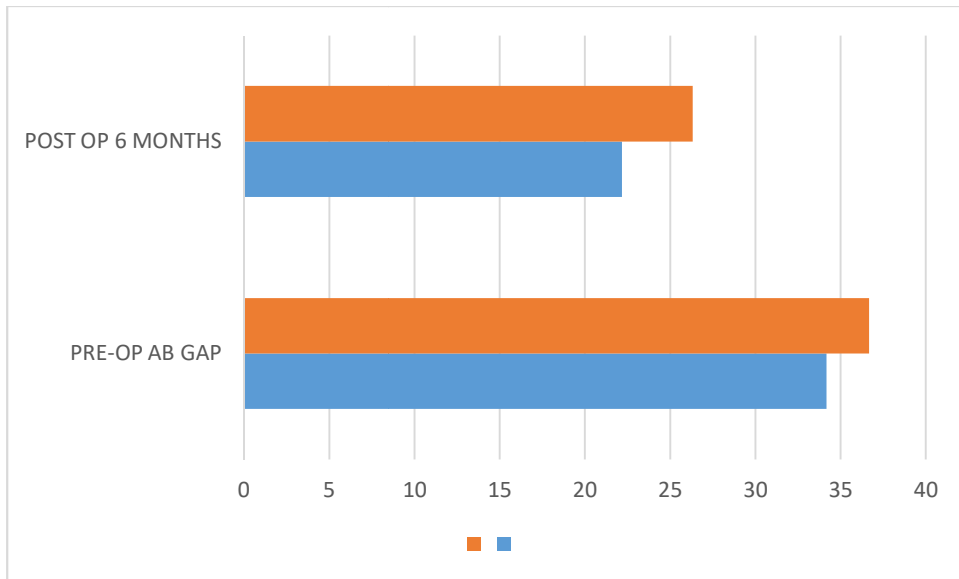
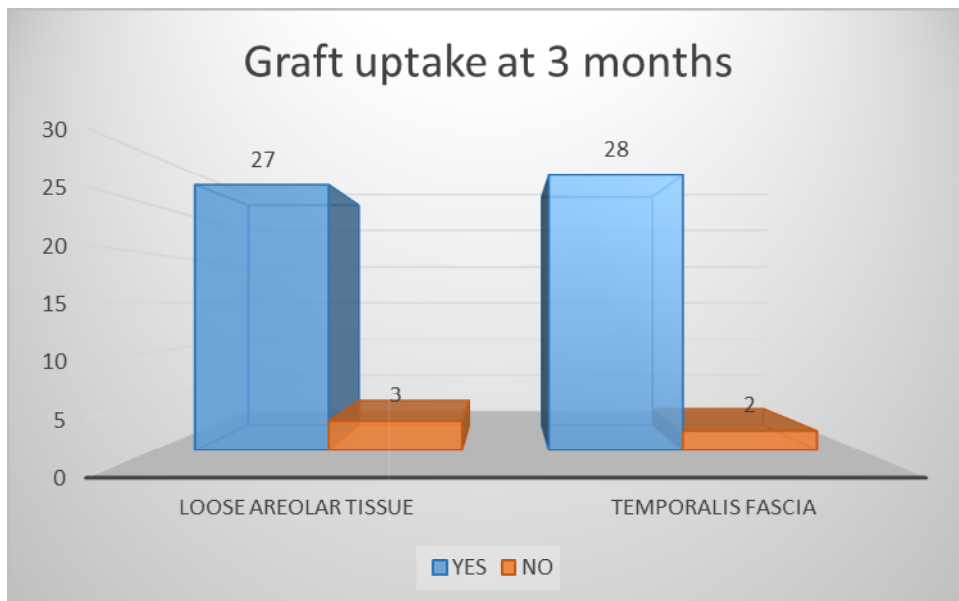


Figure 2: Bar diagram showing graft uptake at 3 months



### Discussion

Tympanoplasty is the main surgical treatment for tubotympanic disease. The ideal tympanoplasty restores sound protection for the round window by constructing a closed, air containing middle ear against the round window membrane and restores sound pressure transformation for the oval window by connecting a large tympanic membrane or substitute membrane with the stapes footplate via either an intact or a reconstructed ossicular chain<sup>[5]</sup>

In our study maximum number of patients in both the groups were in the age group 20-30 years followed by 31-40 years. B. J Singh et al (2009) in their comparative study using graft materials in myringoplasty observed that 34.55% patients were in the age group 21-30 years this was followed by 28.18% patients in

the 31-40 years age group<sup>[6]</sup>. This is similar to the observations in our study. In our study out of the 60 patients 58.3% males and 41.6% females. There were 56.6% males and 43.3 % females in the Loose areolar tissue group whereas the Temporalis fascia group had 60 % males and 40% females.

BJ Singh et al (2009) in their comparative study using different graft materials in myringoplasty had 42.7% males and 57.27 females. Asok Saha et al 2005 in the study of evaluation of improvement of hearing in type I tympanoplasty and its influencing factors had 60% male patients and 40% female patients<sup>[2]</sup> The above findings are consistent with our study.

In our study we achieved an AB gap closure of 22.17 dB in the loose areolar tissue group with the maximum closure at 43.3% seen in the 11-15 dB range AB closure. In the temporalis fascia group the mean AB gap closure was 26.33 dB with the maximum number(43.3%) of patients achieving of closure in the range 6-10 dB. 23.3 % patients in the both the Loose areolar and Temporalis fascia group achieved an AB gap closure upto 5 dB. In our study, in the loose areolar tissue we achieved a AB gap closure less than 20 dB in 70% patients. While only 26.6% patients recorded of less than 20 dB in the Temporalis fascia group. This difference in the AB gap closure between the two groups is statistically significant (p value =0.394). The hearing improvement was significantly better in Loose areolar tissue in our study.

BJ singh et al achieved an AB gap closure of 11-20 dB in 63% patients in the Temporalis fascia group and 60% in the Loose areolar tissue group. They reported AB gap closure of 21-30 dB in 24% patients in the temporalis fascia group and in 20% patients in the loose areolar tissue.<sup>[6]</sup> The above findings are consistent with our study.

In our study the overall graft uptake rate was 91.3%. In the Loose areolar tissue group the graft uptake rate was 90% while in the Temporalis fascia group it was 93.3%. There was no statistical significance in the graft uptake rate in the two groups

BJ singh et al in their study obtained a graft uptake rate of 80% in the Loose areolar tissue group and 95% in the Temporalis fascia group. These results are consistent with our study.

Similarly Eisenbeis and Herrmann et al (2004) in their study Areolar Connective tissue grafts in pediatric tympanoplasty obtained a success rate of 90% in Loose areolar tissue group and 91% in Temporalis fascia group. They stated that the patients undergoing multiple procedures often require more grafting material than the ipsilateral temporalis fascia can provide. In addition to lack of material because of prior harvest of temporalis fascia , subsequent attempts to obtain additional graft are often limited because of scarring in the donor site. Although the contralateral side is available, harvesting an alternate material located in the operative field would be preferred. Areolar tissue which is present immediately superficial to the temporalis fascia is an excellent grafting material. They also stated that tempoarlis fascia is the current gold standard for graft materials for tympanoplasty in both adults and children. The biochemical properties afforded by its acellular matrix enable it to provide an excellent substrate for epithelial migration. This is complemented by ample numbers of fibroblasts and cellular components necessary for proper handling.<sup>[7]</sup>

Cueva Ra(1999) in his study, Areolar temporalis fascia : a reliable graft for tympanoplasty. achieved a graft success rate of 98.54% with loose areolar tissue as graft material.<sup>[8]</sup>

Glasscock ME (1973) reported a success rates of 96% and 91% in the underlay and overlay tympanoplasty respectively, using the loose areolar connective tissue. He also noted that the harvest of

this layer was relatively bloodless and technically easy to perform. In addition to its convenient location in the operative field ample material was available for repair of extensive perforations. [9]

As regards the uptake of the graft ,it is completed in most of the cases by 6 weeks and in all of them at the end of 3 months. In the Temporalis fascia group, at 6 weeks the graft was taken up in 90% of the patients and at 3 months 93.3% of the patients . Residual perforation was seen in 7.6% patients.

In the Loose areolar tissue group , at 6 weeks the graft was taken up in 90% of the patients and at 3 months 90% of the patients. Residual perforation was seen in 10 % of the patients. There is statistically no significant difference between the graft uptake at 6 weeks and 3 months in both the study groups.

### **Conclusion**

In our study conducted on 60 patients with 30 patients each belonging to the Loose areolar tissue group and the Temporalis fascia group, underwent myringoplasty under local anesthesia . the graft uptake rate was 91.3%; the loose areolar tissue uptake rate of 90 % and the Temporalis fascia group was 93.3 % . The AB gap closure of less than 20 dB was seen in 70% of Loose areolar tissue group while only 26.6% patients in the Temporalis fascia group. The hearing improvement was significantly better in the loose areolar tissue in our study though the graft uptake rates in the both the groups were statistically similar.

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