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Is cartilage shield tympanoplasty better than fascia tympanoplasty

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ABSTRACT

Background: Temporalis fascia and cartilage are the most commonly used graft materials, though contradictory reports are available in literature as regards their efficacy in tympanoplasty. The aim of the study was to compare the graft uptake rates and hearing results in case of temporalis fascia and cartilage in type 1 tympanoplasty.
Methods: A total of 400 cases with large, subtotal and total perforation were considered in the study. All the selected patients were divided into two groups. Group A in which temporalis fascia graft was used and including 200 cases and cartilage graft was used in Group B patients including 200 cases. Pure tone audiometry was performed preoperatively and postoperatively at 6 months.
Results: The graft uptake rate was more than 90 percent and more than 80 percent in Group B respectively at the end of 14 week. There was no statistical difference in hearing improvement in both the groups.
Conclusions: Tragal cartilage graft can be used in cartilage tympanoplasty especially in moderate, large and subtotal perforations. The graft has better uptake rate, less graft failure and hearing improvement results were comparable to temporalis fascia graft.

Keywords: Cartilage, Temporalis fascia, Tympanoplasty

INTRODUCTION

Chronic otitis media is the chronic inflammation of mucoperiosteal lining of the middle ear cleft characterized by ear discharge, a permanent perforation of the tympanic membrane and impairment in hearing .In India including other developing countries chronic otitis media is one of the common diseases due to poor socioeconomic status ,poor nutrition, lack of health education and unhygienic habits.[1-3] It is a major cause of deafness in india.[4] Tympanoplasty is a commonly performed surgical procedure by otolaryngologists for the repair of tympanic membrane perforations.[5] Autologous graft materials like temporalis facia, cartilage, perichondirum, fat and fascia can be used as graft materials. Temporalis fascia because of its close proximity, translucency, close proximity and suppleness is most commonly used graft in primary Tympanoplasties. Failure rates are higher in larger perforations with temporalis facia as a graft material.[6,7] Displacement of graft, improperly placed graft ,autolysis , infection, hemorrhage, eustachian tube dysfunction are the known contributory factors for the failure of closure of tympanic membrane perforation.[8] Cartilage on the other hand has a constant shape, is firm than fascia and does not contain fibrous tissue so postoperative dimensions are predictable.[9] Therefore cartilage shield graft is preferred in cases with large perforations, revision surgery, tympanosclerosis, tympanic membrane, atelactesis and Eustachian tube dysfunction. Being rigid and thicker cartilage can affect the pliability of the tympanic membrane and result in inferior hearing outcome as compared to temporalis fascia graft which is thinner and moré pliable. The greatest advantage of the

cartilage graft has been thought to be its very low metabolic rate and it can resist deformation from pressure variation. The aim of the study was to compare the graft uptake rates and hearing results in case of temporalis fascia and cartilage in type 1 tympanoplasty.

METHODS

This prospective study was conducted in the department of ENT at Dr Ulhas Patil Medical College Jalgaon from October 2015 to December 2018. A total of 400 patients were selected for the study. All the patients underwent type 1 tympanoplasty. Cartilage was used in 200 patients and temporalis fascia graft in were used in 200 patients. All the selected patients had moderate/subtotal/large size perforations.

Inclusion criteria

Patients of age group between 10 to 50 years. Patients with CSOM mucosal and safe type, with intact ossicular chain and pure conductive hearing loss.

Exclusion criteria

Patients with age less than 10 years, chronic otitis media with active squamous disease, actively discharging ears. Patients having sensorineural loss and ossicular chain erosion.

Cartilage tympanoplasty was performed through endaural approach and tympanoplasty using temporalis fascia graft was performed through post aural approach because of easy availability of respective grafts. Both of these procedures were performed under local anesthesia and if required under general anesthesia. One ampule of promethazine and one ampule of pentazocin were mixed together. Half of the mixture were given 30 minutes before surgery and half were given intravenously just before the surgery in case of local anesthesia. For local infiltration adrenaline and lignocaine were used in the ratio of 1:100000. 2 ml of the solution was injected in the four quadrants of external auditory canal. Cartilage graft were harvested from tragal cartilage. Cases selected for cartilage tympanoplasty were done through the endaural approach and the cases selected for tympanoplasty using temporalis fascia were done through postauricular approach. In all the cases type 1 TP was done through underlay technique. All the patients were called for regular follow up once weekly for 1 month and fortnightly for 3 months, then after 6 months and 1 year. Hearing assessment using tunning fork tests and pure tune audiometry was done to access the auditory status after 8th week, 3 months to see if there are any changes. Figure 1 show the intra-op picture of temporalis fascia graft placed and Figure 2 show the intra operative picture of tragal cartilage graft placed.

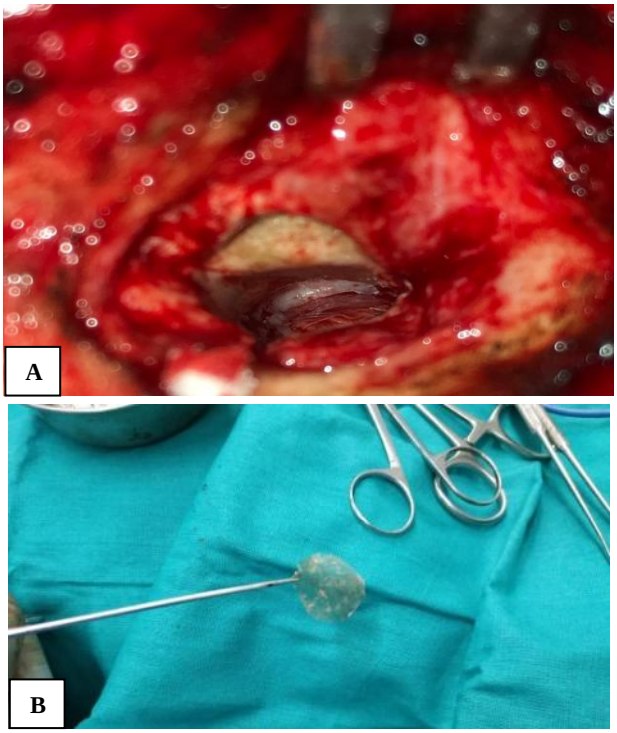

Figure 1: (A) Temporalis fascia as graft material; (B) temporalis fascia harvested.

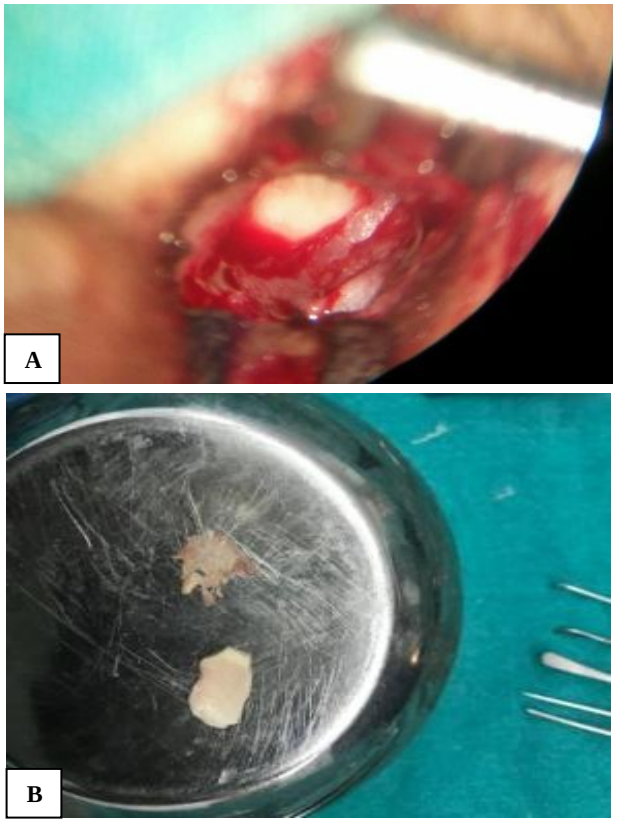

Figure 2: (A) Tragal cartilage as graft material; (B) tragal cartilage harvested.

Statistical analysis

Statistical analysis with the students t-test, chi-square test, and F-test for large sample size was used to examine these parameters with regards to graft take up and hearing outcome.

RESULTS

A total of 400 patients were selected for the study. All the patients underwent type 1 tympanoplasty. Cartilage was used in 200 patients and temporalis fascia graft in were used in 200 patients. All the selected patients had moderate/ subtotal/ large size perforations. Out of 200 patients 60 percent 120 were females and 40 percent 80 were males.

The percentage of moderate, large and subtotal perforation in both the groups was 70, 24 and 6% respectively.

In cartilage shield tympanoplasty complete graft uptake was seen in 93% of cases with partial failure in more than 7 percent of cases. Similarly, in Group B, graft uptake rate in patients in the temporalis fascia Tympanoplasty complete graft uptake was seen in more than 87 percent of cases and graft failure in 13 percent of cases. This suggests that postoperative graft uptake in cartilage shield tympanoplasty and temporalis fascia graft tympanoplasty group was insignificant.

Table 1: Distribution of patients according to gender.

Gender	Number of patients	Percentage
Males	160	40
Females	240	60
Total	400	100

Table 2: Distribution of patients according size of perforation.

Size of perforation	Number of patients	Percentage
Moderate	140	70
Large	48	24
Subtotal	12	6
Total	200	100

Table 3: Graft uptake in Group 1 and Group 2.

Graft status	Numbers in cartilage tympanoplasty	Percentage (%)	Numbers in temporalis fascia tympanoplasty	Percentage (%)
Complete graft uptake	186	93	174	87
Residual perforation	14	7	26	13
Total	200	100	200	100

Table 4: Hearing improvement in Group 1 and Group 2.

	Group A		Group B	
Size of perforation	**Number of patients**	**Mean ABGAP (in db)**	**Number of patients**	**Mean ABGAP (in db)**
Moderate	140	18.1	140	17.3
Large	40	19.4	40	18.9
Subtotal	20	19.8	20	19.4

The mean preoperative ABGs in moderate, large, subtotal perforations were 39.7, 41.6, 45.2 in Group A compared with Group B where corresponding values 38.8, 40.1, 44.6 dB. Similarly, mean postoperative ABGs were 18.1, 19.4, 19.8 dB in group A and 17.3, 18.9, 19.4 in group B respectively. The mean improvement in ABG was >10 dB in both the groups. Hearing gain signifies use of cartilage shield or temporalis fascia graft does not affect postoperative hearing gain which was also proved statistically insignificant ($p>0.05$).

DISCUSSION

This study was designed to evaluate the graft uptake rates and hearing results in case of temporalis facia and cartilage graft in type 1 tympanoplasty using modified Ducket technique.[10] Mohamad et al, have concluded that tympanoplasty using cartilage with or without perichondrium has better morphological outcome than tympanoplasty using the temporalis fascia.[11] However there was no significant differences in hearing outcomes between the two grafts. Khan et al have shown good anatomical and functional results using sliced cartilage for tympanoplasty technique.[12] Chapola et al have mentioned that cartilage thickness of <0.5 mm seen to have similar acoustic properties as the tympanic membrane.[13] The current study shows better graft uptake rates with the use of cartilage shield method and hearing improvement comparable with temporalis fascia as a graft material. Other popular methods for cartilage tympanoplasty are the grafting procedures like Island technique, Wheel technique, Inlay butterfly technique, shield technique and palisade technique.[14,15] Cartilage is preferred over temporalis fascia especially for moderate/ large/ subtotal perforations which shows better graft uptake. A review of literature by Onal et al and

Demirpehlivan et al studies reveals previously conducted demonstrating the effectiveness of cartilage graft over the temporalis fascia for type-1 tympanoplasty.[16] In the current study, we obtained the encouraging postoperative results of tragal cartilage grafting over temporalis fascia in type-1 tympanoplasty in terms of graft uptake rates in patients with tragal cartilage which was 93 percent in contrast with the fascia which had an uptake rate of 87 at the 10th week. The mean postoperative ABG in the fascia group was 15 dB, in contrast with the cartilage tympanoplasty group in which it was found to be 11 dB. In both the groups 100 percent of patients showed significant improvement in hearing which is consistent with the previous study by Yetiser et al.[17] All these results are suggestive of that the tragal cartilage graft is a good graft material because of its stability and more resistant to negative middle ear pressure and but sufficiently elastic for good sound conduction. Furthermore, it has a constant shape, firmer than fascia and it does not contain fibrous tissue so that the postoperative dimension are predictable, and it is easily accessible, well tolerated resistant to resorption, inflammatory reactions to or rejection are rare. Cartilage is also nourished by diffusion and incorporated into the tympanic membrane, and also not involved into the additional costs. All the patients presented with significant improvement in hearing >10 dB in the postoperative period. Ozbek et al, have also claimed a better graft uptake rate and hearing outcome in cartilage Tympanoplasty compared with temporalis fascia in type 1 tympanoplasty.[18]

CONCLUSION

Tragal cartilage graft can be used in cartilage tympanoplasty especially in moderate, large and subtotal perforations. The graft has better uptake rate, less partial failure and hearing improvement results were comparable to temporalis fascia graft. From our study we came to the conclusion that both cartilage shield graft and temporalis fascia graft can be used as graft materials independently in tympanoplasty. But the results of our study suggest that cartilage shield Tympanoplasty can be considered as the first line treatment in chronic otitis media especially with moderate/large/subtotal perforations with good success rate and hearing improvement.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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