COMPARATIVE OUTCOME OF TEMPORAL FASCIA AND TRAGAL CARTILAGE GRAFT IN TYPE 1 TYMPANOPLASTY

*Gurshinderpal Singh Shergill, **Dipak Ranjan Nayak, ***Ankur Kaur Shergill

ABSTRACT

Background: Tympanoplasty is the preferred treatment for chronic suppurative otitis media (CSOM) of tubotympanic disease. Numerous varieties of grafts are employed to repair the tympanic membrane in such cases. Our study compared the graft take up rate and conductive hearing gain after type 1 tympanoplasties using temporalis fascia and tragal cartilage grafts.

Materials and method: One hundred and twenty patients who had undergone type 1 tympanoplasty using temporal fascia and tragal cartilage were retrospectively reviewed. Eighty seven patients underwent tympanoplasty using temporal fascia graft while in 33 patients, tragal cartilage with perichondrium was employed. Graft take up was analyzed at 6 weeks post-operatively, in both the groups. Pre-operative mean of calculated averages of air bone gap was compared with postoperative mean in both groups. Conductive hearing gain was also compared.

Results and conclusion: Although conductive hearing gain was noteworthy in both, but still there was no statistically significant difference when the two groups were compared. Similarly, our study demonstrated no significant difference in graft take up rate and conductive hearing gain in both the groups. Consequently, both temporal fascia and cartilage can be used unconventionally as suitable graft materials in type 1 tympanoplasty surgeries.

Keywords: Tympanoplasty, Tragal cartilage graft, temporal fascia graft, Graft take up rate, Air bone gap closure.

INTRODUCTION

Tympanoplasty is the mainstay of treatment for chronic suppurative otitis media of tubotympanic disease. Various types of grafts are being used to repair the tympanic membrane. The most widely used graft in tympanoplasty is temporal fascia graft followed by cartilage, skin, vein graft, fat, perichondria etc[1-4]. Cartilage offers to be better graft option in graft take up rates, especially in the ears where there is Eustachian tube dysfunction, large perforations and ears with atelectasis. Meanwhile, temporal fascia graft is considered to be a better graft in terms of hearing outcome owing to its thinness and more pliable texture[5-7]. Our study compared the graft take up rate and hearing improvement in type 1 tympanoplasty cases where temporalis fascia graft and tragal cartilage graft were employed independently.

MATERIALS AND METHOD:

Patient population: All the patients who underwent type 1 tympanoplasty with underlay
method using temporal fascia graft or cartilage graft in a span of one year (2012-2013) were retrospectively chosen for the study. The patients who had undergone ossicular reconstruction, mastoid surgery along with tympanoplasty or cases where graft materials other than temporal fascia or cartilage employed were excluded from the study. The total eligible patients for the study were 120.

PROCEDURE:

Both the graft materials had been employed independently for the surgeries. In one group of patients, tragal cartilage with perichondrium was used to repair the tympanic membrane. The tragal cartilage was harvested by keeping one side perichondrium intact on the cartilage. A 2 mm slit was cut over the cartilage graft (where the perichondrium was elevated) to accommodate the handle of the malleus. Tympanomeatal flap was then raised in the usual manner. Thereafter, the cartilage graft was placed medial to annulus and the perichondrium repositioned over the cartilage and the handle of malleus. The tympanomeatal flap was then repositioned back over the cartilage graft. In the second group of cases, the temporal fascia was harvested in the same operative field and used as graft material in the underlay tympanoplasty in other group.

The perforation closure in all cases was analyzed postoperatively at 6 weeks. Hearing assessment was done by doing pre-operative and post-operative pure tone audiometry. Conductive hearing loss of individual patients was calculated (air bone gap) preoperatively and 3 months postoperatively by taking the average of air bone gap at 0.5, 1, 2, and 3 kHz pure tone frequencies. Mean of air bone gap was calculated for all the patients preoperatively and postoperatively. Preoperative mean air bone gap was compared with post-operative mean air bone gap in both graft materials. Patients with residual perforation postoperatively are not taken up for the hearing assessment.

Statistical analysis: The results were analyzed using SPSS software version 16. We compared the graft take up rate (primary outcome) and hearing improvement e.g. closure of air bone gap (secondary outcome) in both types of graft material used in tympanoplasty.

OBSERVATIONS AND RESULTS

A total of 120 eligible patients who underwent type 1 tympanoplasty were retrospectively selected for the study. The age of patients in the study ranged from 15 to 69 (mean age 35.7) years. The predominant population of patients were females with a male to female ratio of 0.87 (Fig.1). Out of a total of 120 cases, majority had left side CSOM, followed by bilateral tube tympanic type (39) and right side (34) CSOM cases. In our study, 71 patients had a large perforation (> 50% area of pars tensa), 36 medium perforation (25-50% area of pars tensa), 9 subtotal perforation (only annulus present) and 4 patients had small perforation (< 25% area of pars tensa) (Table 1).

Eighty seven patients underwent tympanoplasty using temporal fascia graft while 33 patients underwent tympanoplasty utilizing the tragal cartilage perichondrium composite graft. In temporal fascia group, 48 patients were females followed by 39 males. In the tragal cartilage group, there were 17 male patients and 16 female patients. The age of the patients in temporalis fascia group ranged from 15-63 (mean 34.5) years. In tragal cartilage group, age of the patients ranged from 19-69 (mean 40.27) years.

In temporal fascia group, out of 87 patients a majority 54 (62%) had large perforation followed by medium perforation cases 24 (27%), 6 (6.9%) cases had subtotal perforation and 3 (3.4%) had small perforation. In tragal cartilage group, out of 33 patients, 17 (51%) had large perforation followed by 12 (36%) cases of medium, 3 (9%) cases of subtotal and 1 (3%) case of small perforation (Table 2). On comparison of the parameters, both groups demonstrated homogenous findings.

All patients underwent type 1 tympanoplasty with underlay technique. Out of 120 cases, 102 had successful closure of the perforation postoperatively at 6 weeks.
The overall graft take up rate was 85%. In temporal fascia graft group, 74 out of 87 (85%) patients had successful closure of perforation at 6 weeks (postoperative). In tragal cartilage cases, 28 out of 33 patients had successful closure at 6 weeks postoperative. The graft take up rate was 84.9% in the latter group. It was statistically significant (p value <0.05) (Table 3).

Table 2. Clinical characteristics of patients in the temporal fascia and tragal cartilage groups

<table>
<thead>
<tr>
<th>Clinical parameters</th>
<th>Temporal fascia</th>
<th>Tragal cartilage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of patients</td>
<td>87</td>
<td>33</td>
</tr>
<tr>
<td>Gender</td>
<td>M=39; F=48</td>
<td>M=17; F=16</td>
</tr>
<tr>
<td>Age (in years)</td>
<td>Range=15-63; Mean=34.05</td>
<td>Range=19-63; Mean=40.27</td>
</tr>
<tr>
<td>Perforation size</td>
<td>Small=1 (1.4%); Medium=24 (27%); Large=54 (62%); Subtotal=5 (6.9%)</td>
<td>Small=1 (3%); Medium=12 (36%); Large=17 (51%); Subtotal=3 (9%)</td>
</tr>
</tbody>
</table>

3 months in temporal fascia graft group was 20.84dB (standard deviation ± 8.9dB) and 18.64dB (standard deviation ± 9.1dB) for tragal cartilage group.

Paired t test was applied to compare the preoperative means of air bone gap with the 3 months postoperative air bone gap in temporal fascia and in tragal cartilage graft cases. Mean air bone closure was 11.02dB (standard deviation ± 9.9dB) in temporal fascia graft group and mean air bone gap closure was 10.14dB (standard deviation ± 7.5dB) in tragal cartilage cases. These results were statistically significant (P value < 0.05). However, when the air bone closure in both groups were also compared, the values were not statistically significant (p value > 0.05) (Table 4). There was statistically significant conductive hearing gain (air bone gap closure) in both the groups. Nevertheless, on comparison between the two groups the values did not reach to a statistically significant level.

**DISCUSSION**

Chronic suppurative otitis media is a common disease entity in India especially in the population with a lower socioeconomic background. Primary goal of...
treatment for CSOM is elimination of the chronic inflammatory process. The secondary goal aims at reconstruction of sound conducting mechanism\(^8\). Tympanoplasty forms the mainstay of treatment for CSOM of tubotympanic disease. To reconstruct the tympanic membrane, several graft materials are used like temporal fascia, cartilage, tensor fascia lata and vein graft. Temporal fascia is the most widely used graft because it can be harvested from a local operative site. Temporal fascia has additional advantages over the other grafts owing to its light, mouldable structure which mimics tympanic membrane. Success rate with temporal fascia in a well aerated middle ear ranges up to 90% in different studies\(^9\). Nonetheless, success rate decreases markedly in cases with Eustachian tube dysfunction or presence of an adhesive process\(^10-12\). On the other hand, since cartilage is rigid and possesses a thick structure, it is resistant to resorption and atrophy and can be placed precisely into a perforation. Cartilage graft is preferred in cases with large perforations, revision surgery, tympanosclerosis, tympanic membrane atelectasis, and Eustachian tube dysfunctions. Being a thick and rigid structure, cartilage can affect the pliability of the tympanic membrane and result in inferior hearing outcome as compared to temporal fascia graft which is thinner and more pliable\(^5-7\).

Chronic suppurative otitis media is more commonly reported in females than males. Our study also indicated a female predilection with male to female ratio of 0.88. Chronic suppurative otitis media affects all age groups ranging from childhood to elderly people. A wide age range was also observed in our study with 15-63 years range in temporal fascia graft cases and 19-69 years in the cartilage graft group.

There are very few reported studies in literature to compare the outcome of myringoplasty using temporal fascia and cartilage. Most of these studies conducted in the past were retrospective. Literature depicts 3 randomized clinical trials which compared the outcome of cartilage myringoplasty to temporalis fascia myringoplasty. Mauri et al compared results of inlay cartilage butterfly grafts and underlay temporal fascia grafts. They investigated the graft take up rates and hearing outcomes at 1 month and 2 months respectively. They included only those perforations where the size of perforation was less than 50% of the size of the tympanic membrane. They did not detect any significant difference in either the graft take rates or hearing improvement\(^13\). Cabra et al examined the patients with perforation size more than 25 % of tympanic membrane to compare the cartilage palisade graft with the temporal fascia graft. They found higher morphological (absence of retraction, atrophy, lateralization, anterior blunting, and otorrhea) success rates in cartilage (82.3%) than fascia (64.4%) but with no significant difference in hearing improvement\(^14\). Young et al conducted a clinical trial to compare the cartilage and fascia graft. They considered tympanic perforations involving more than 50% of the tympanic membrane\(^15\). This study showed no statistical significance difference between perforation closure and hearing improvement in both types of graft materials. In the present study, we took all the sizes of perforations ranging from small to medium to large.
Onal et al in their study demonstrated a better outcome with cartilage graft in both perforation closure rate and hearing improvement rate\[16\]. Demirpehlivan et al compared the outcome of cartilage with perichondrial graft, cartilage graft and fascia graft. They presented higher graft take up rates in perichondrium cartilage (97.6%) compared to cartilage only (78.95%) and fascia (80.6%). No difference in hearing improvement was noted among the 3 groups\[17\]. Few other retrospective studies have established a better graft take up rate with cartilage graft when compared to fascia graft with follow up period ranging from 6 to 24 months. However, no difference was noted in the hearing improvement in both types of graft materials\[18-20\]. Al lackany and Sarkis investigated the graft take-up rates and hearing improvement utilizing cartilage, perichondrium, composite graft, perichondrial graft and fascia graft in central, subtotal and total perforations. A better graft take up rate was established in cartilage perichondrium composite graft (92.3%) when compared to perichondrium (88%) and fascia graft (80%), nevertheless a statistically significant value was achieved only for total perforation cases. Also a better air bone gap closure was proven with composite graft by Yetiser S et al\[21\]. Cartilage perichondrial graft gave better result in comparison to fascia graft in subtotal and total perforations while air bone closure was superior in fascia graft in central perforations. Kadir Özdamar et al also studied the hearing improvement (air bone gap closure) in cartilage tympanoplasty group and temporal muscle fascia group. They also compared the middle ear pressure, air volume and compliance of tympanic membrane in both groups. They concluded that no statistical differences were observed in air volume, pressure or compliance values at any frequency in audiometry and tympanometry in the cartilage and fascia groups\[22\]. In our study, the graft take up rate in cartilage perichondria composite graft and temporalis fascia graft was 84.85% and 85% (statistically significant) respectively. Hearing improvement (air one gap closure) was also significant in both the groups.

**CONCLUSION:**

Our study attempted to recognize better graft options in tympanoplasty surgeries. Various parameters such as healing, hearing improvement and graft take up rates were comprehensively studied in a large population group. Although the healing rate of tympanic membrane was similar in both temporal fascia and cartilage groups, there was no statistically significant difference in the hearing improvement in both types of graft materials. Consequently, both cartilage and temporal fascia can be utilized as graft materials independently with good success rates in tympanoplasty surgeries.

**DISCLOSURES**

a) Competing interests/Interests of Conflict - None
b) Sponsorships – None
c) Funding - None
d) Written consent of patient- taken
e) Animal rights- Not applicable

**HOW TO CITE THIS ARTICLE**


**REFERENCES:**


