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RELATIONSHIP BETWEEN THE DURATION OF DISEASE AND THE OUTCOME OF TYMPANOPLASTY USING TEMPORALIS FASCIA AND TRAGAL CARTILAGE

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ABSTRACT

Objective: To study the results of Tympanoplasty done using fascia over temporalis muscle and tragal cartilage, the comparison was done in terms of graft uptake and audiological outcome and study the relationship between duration of ear discharge and graft uptake in Tympanoplasty.

Methods: A sample of 100 patients with chronic otitis media-mucosal disease were enrolled in the study. The patients were randomly assigned to either the tragal cartilage group (Group A) or the temporalis fascia (Group B). Patients underwent Tympanoplasty with cartilage or temporalis fascia graft. A comparison was made among the two groups according to the air-bone gap in pure tone audiogram done before and after surgery and the tympanic membrane status in the post-operative period.

Results: In our study, graft uptake of the cartilage group is 88% which is 44 out of 50 patients, and the temporalis fascia group is 45 out of 50 (90%). Duration of ear discharge does not affect graft uptake in Tympanoplasty. The air-bone gap gain between the two groups shows p-value= 0.3, which is statistically insignificant. So, it proves that there is no significant difference in terms of audiological gain achieved irrespective of the graft material used in Tympanoplasty.

Conclusion: The present study shows that the duration of ear discharge does not affect graft uptake in Tympanoplasty. Our study shows no significant difference neither in the surgical success rate of graft uptake nor hearing gain between the two groups.

Keywords: Pure Tone Audiometry, Temporalis Fascia, Tragal Cartilage, Tympanoplasty.

INTRODUCTION

Chronic otitis media is among the most common otological condition reported in otorhinolaryngology practice, commonly attributed to preventable hearing loss.[1]

Tympanoplasty aims at eradicating the disease in the middle ear and reconstructing the hearing mechanism. Various graft materials are used for the reconstruction of the tympanic membrane are full or split partial thickness skin graft, vein graft, fascia lata, temporalis fascia, areolar tissue, cartilage from tragus or concha, fat from ear lobule and tragal perichondrium.[2]

Temporalis fascia is the most used material for tympanic membrane reconstruction with a success rate of up to 97% in primary tympanoplasties.[3] However, literature shows that Temporalis fascia grafts are prone to atrophy in the post-operative period in patients associated with eustachian tube dysfunction where the negative middle ear pressure increases the chance of retraction and perforation of the neotympanum.[4,5]

In cases of chronic otitis media where the size of the perforation is larger than 50% of the tympanic membrane, the use of temporalis fascia graft has yielded significantly poorer results when compared to smaller perforations.[6]

In 1959 cartilage is first used in Tympanoplasty for ossicular reconstruction. Cartilage has been used as an alternate effective graft material or as part of a composite graft for Tympanoplasty in the past few years.[7]

The rigidity of the cartilage graft has obvious benefits in reducing the retraction of the tympanic membrane; however, an increase in rigidity compromises the sound conduction properties of the graft. Usage of thin cartilage grafts improves the audiological outcome when compared to thick cartilage grafts.[8] Cartilage is resistant to retraction and infection and preserves its viability and shape for a long time in the presence of middle ear pathologies, recurrent perforation after myringoplasty, severe attical and/or posterior uncontrolled retraction pocket with cholesteatoma, atelectasis of the tympanic membrane. Graft take-up rates of cartilage shield tympanoplasty have been excellent, hearing results are satisfactory and complications are minimal.[9,10]

Our aim is to study the outcome of Tympanoplasty using temporalis fascia versus tragal cartilage, compare the results in terms of graft uptake and hearing improvement, and study the relationship between duration of ear discharge and graft uptake in Tympanoplasty.

MATERIALS AND METHODS

After ethical committee approval from our institute, the study was commenced which included 100 patients with chronic otitis media-mucosal type randomly divided into two groups tragal cartilage (group A) and temporalis fascia group (group B), each group comprising 50 patients.

Preoperatively patients were examined regarding size and site of perforation, presence of infection, and hearing assessment by tuning fork. Patients were subjected to pure tone audiogram and X-ray mastoids. Informed and written consent was obtained from all the patients.

Inclusion Criteria

- Chronic otitis media-mucosal type in the inactive stage with central perforation.
- Normal Eustachian tube function.

Exclusion Criteria

- Chronic otitis media-mucosal type in the active stage.
- Chronic otitis media – squamous type.
- Patients with sensorineural hearing loss.
- Patients under 18 years of age and above 55 years of age.
- Patients with foci of infection in the nose and paranasal sinuses, nasopharynx or throat.
- Patients with comorbidities like Diabetes mellitus and Hypertension.

All the patients were subjected to Tympanoplasty by underlay technique using tragal cartilage or temporalis fascia graft under general anesthesia.

Patients were regularly followed up for six months, and at the end of six months, graft status was assessed in relation to graft material used and the duration of ear discharge, and a pure tone audiogram was done to assess hearing. The groups were compared according to the pre and postoperative air-bone gaps and to the status of the tympanic membrane. Pure tone averages were calculated at 500, 1000 and 2000 kHz.

RESULTS AND ANALYSIS

The age of the patients in group A ranged from 27 years to 54 years, and group B was 18 years to 48 years. The average age of group A 34.5 years, and group B is 28.2 years. 54% of the study population are females, and 46% are males.

	Male	**Female**	**Total**
Group A	24	26	50
Group B	22	28	50
Table I: Gender distribution			

	Graft Failure	**Graft Intact**	**Total**
Group A	6	44	50
Group B	5	45	50
Total	11	89	100
Table II: Postoperative graft status			

Patients are regularly followed up in the postoperative period after one week, four weeks, eight weeks, twelve weeks and six months. And after six months, we assessed graft uptake. Graft uptake of the tragal cartilage group is 88% which is 44 out of 50 patients, and the temporalis fascia group is 45 out of 50 (90%). The failure rate is low in the temporalis fascia group than in the cartilage group

Graft Status (group A)	**Duration of Discharge**	
	Mean	**Standard Deviation**
Intact	5.87	2.78
Residual Perforation	6.29	3.09
Table III: Graft status in relation to the duration of ear discharge in group A		

Graft Status (group B)	**Duration of Discharge**	
	Mean	**Standard Deviation**
Intact	5.81	2.9
Residual Perforation	6.14	2.98
Table IV: Graft status in relation to the duration of ear discharge in group B		

P-value is 0.735 in group A and 0.767 in group B respectively. Hence the duration of discharge does not affect graft take up as the p-value is not statistically significant.

Gain in Air-Bone Gap	**Group A**	**Group B**
<5 dB	25%	5%
6-10 dB	40%	25%
11-15 dB	25%	30%
>16 dB	10%	40%
Table V: Postoperative gain in the air-bone gap		

Postoperative Hearing Results

Patients are subjected to pure tone audiometry and air-bone gap measured at six months postoperatively. In the temporalis fascia group, 40% of patients had more than 16 dB gain in the air-

bone gap. In the cartilaginous group, 10% of patients had more than 16 dB gain in the air-bone gap and most of the patients (40%) had 6-10 dB gain in the air-bone gap. We compare the audiological gain between group A and group B and the calculated p-value is 0.3. So, it is statistically proved that there is no significant difference in the gain in air-bone gap attained by using either temporalis fascia or tragal cartilage as graft material in Tympanoplasty.

DISCUSSION

The success rate of Tympanoplasty is associated with several factors like a chronic discharging ear with an irreversible mucosal disease, revision surgery, atelectasis, cholesteatoma, tympanosclerosis, site and size of the perforation; eustachian tube dysfunction, age of the patient at the onset of disease, duration of disease, presence of disease in the contralateral ear, type of graft material used and technique of graft placement.[11,12]

A study by J Dornhoffer conducted in November 2003, which included a thousand patients who underwent cartilage tympanoplasty showed that reconstruction with cartilage yields better anatomical and functional results in comparison to primary tympanoplasties using traditional techniques in high-risk perforations.[13]

In a study by O Ben Gamra et al., successful closure of the tympanic membrane perforation is 97% in the cartilage group as compared to 94% in the fascia group. The average air-bone gap was 21 ± 11 dB in the cartilage group and 20 ± 22 dB in the fascia group.[14] A comparative study of chondrotympanoplasty and temporalis fascia grafting in type 1 Tympanoplasty by Emily Iacovou et al. The graft uptake rate was 97.4% in the chondrotympanoplasty group and 93.3% in the temporalis fascia group. An air-bone gap closure within 10 dB was achieved in 73.7% of the chondrotympanoplasty patients versus 67.9% of the temporalis fascia group. Hearing gain of 21 to 30 dB in air conduction thresholds was obtained in 65.8% of the chondrotympanoplasty patients and 60.7% of the temporalis fascia group.[15]

The mean graft integration rate in the cartilage group was 92.4 % and in the temporalis fascia group 84.3%. The difference proved was statistically significant. With regard to the functional outcomes, there is a significant difference between the pre and postoperative air-bone gap closure, in the cartilage grafting materials, and improved results in the cartilage group in cases of subtotal and total tympanic membrane perforation, and better postoperative air-bone gap closure with fascia in cases of central perforation.[16]

In 2011 August, a randomized study comparing fascia and cartilage grafts in Myringoplasty by Yung M et al shows that the graft uptake rates of fascia and cartilage grafts at two years were 84.2% and 80%, respectively. The postoperative air-bone gaps and hearing gains at two years were 16.97 dB and 13.63 dB, respectively, in the fascia group and 20.63 dB and 12.60 dB, respectively in the cartilage group. There was no significant difference in the graft take rates or postoperative hearing between the two groups.[17]

A meta-analysis review by Mir Mohammad Jalali et al shows that overall graft integration rates of tympanoplasty with cartilage graft and temporalis fascia graft are 92% and 82%, respectively. in terms of postoperative air-bone gap closure, there was no significant difference between cartilage grafting and temporalis fascia grafting, and the mean air-bone gap was statistically significantly worse in those who underwent cartilage graft as compared to those who underwent temporalis graft.[18]

In a study by Shwan H. Mohamad et al, there was no statistically significant difference between cartilage and temporalis fascia regarding graft uptake rate and postoperative hearing improvement. The graft uptake rate of fascia and cartilage grafts at 24 months were 84.2% and 80%, respectively. The postoperative air-bone gaps and audiological gains at 24 months were 16.97 and 13.63 dB, respectively, in the fascia group and 20.63 and 12.60 dB, respectively, in the cartilage group.[19]

There is no significant evidence of the superiority of one-piece composite cartilage-perichondrium grafting over temporalis fascia grafting in type I Tympanoplasty according to Sarah A. Lyons et al regarding tympanic membrane closure at a follow-up duration of at least 1 year and regarding hearing outcome at least 3 months after surgery.[20]

According to various reviews in the literature regarding the advantages of cartilage as a graft material, it can be considered as the material of choice only for high-risk cases and not a routine alternative to temporalis fascia. However, the cartilage is a good grafting material in view of its accessibility, negative middle ear pressure resistance, stability, well tolerance by the middle ear, and resorption resistant. Therefore, its use is recommended in less severe middle ear disorders, in which the functional outcome is essential.[21]

In our study, the duration of ear discharge does not affect the graft uptake in Tympanoplasty irrespective of the graft material used.

In our study, the graft uptake rate is 88% in group A and 90% in group B. In the temporalis fascia group, 40% of patients had more than 16 dB gain in the air-bone gap. In the cartilaginous group, 10% of patients had more than 16 dB gain in the air-bone gap and most of the patients (40%) had 6-10 dB gain in the air-bone gap. In terms of the audiological outcomes, gain in the air-bone gap between group A and group B is not statistically significant as the p-value is 0.3.

CONCLUSION

The present study shows that the duration of ear discharge does not affect graft uptake in Tympanoplasty. Our study shows that there is no significant difference neither in the surgical success rate of graft uptake nor in hearing gain between the two groups. Both temporalis fascia and tragal cartilage are equally acceptable successful graft materials for closure of tympanic membrane perforations.

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