OUTCOME OF MYRINGOPLASTY WITH TEMPORALIS FASCIA AND PERICHONDRIAL-CARTILAGE COMPOSITE GRAFT IN HIGH RISK PERFORATIONS

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ABSTRACT

The objective of this study was to compare the graft uptake results and postoperative hearing of myringoplasty with temporalis fascia and cartilage-perichondrial composite graft in high risk perforations. Patients of age 13 years and above with diagnosis of chronic otitis media – mucosal type with high risk perforation that is >50% perforation of tympanic membrane, revision cases, absent/eroded handle of malleus, oedematous/unhealthy middle ear mucosa and marginal involvement cases were included for myringoplasty. Pure Tone Audiometry was done within 1 week before surgery. 80 cases were included for myringoplasty which were randomly allocated by lottery method with 40 cases each in temporalis fascia group and cartilage perichondrial composite graft group. Graft uptake results were assessed after 6 weeks and postoperative hearing was evaluated and compared within and between the groups. Graft uptake rate in temporalis fascia group and cartilage perichondrial composite graft group was 90% and 92.5%, respectively with no significance difference in the graft uptake rate ($p = 0.692$) between the groups. The mean pre and post-operative air bone gap in temporalis fascia group and cartilage perichondrial composite group were 30.69dB±10.19,16.36±8.37dB and 33.73±8.07dB, 20.76±9.47dB, respectively with highly significant difference in both groups ($p < 0.001$) showing improvement in the hearing after surgery in both groups. The mean air bone gain were 14.33dB and 12.97dB in temporalis fascia and cartilage perichondrial composite group respectively with no significant difference between the groups ($p=0.469$). The graft uptake rate and hearing results after cartilage perichondrial composite graft are comparable to those of temporalis fascia graft. Furthermore, the cartilage perichondrial composite graft is more rigid and thick so it is more resistant than fascia to anatomic deformation and necrosis. Therefore, we recommend the use of cartilage perichondrial composite graft for tympanic membrane reconstruction in high risk perforation without concern about affecting audiometric results.

KEYWORDS

Cartilage-perichondrium, chronic otitis media, high risk perforation, myringoplasty, pure tone audiometry, temporalis fascia

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INTRODUCTION

Myringoplasty is repair of tympanic membrane. It is one of the common surgery done in otology for the treatment of Chronic Suppurative Otitis Media-Tubotympanic Type(CSOM-TT).[1]

In 1952, Wullstein[2] and Zollner[3] first described tympanoplasty as the mainstay for tympanic membrane reconstruction. Various grafting materials have been used for reconstruction like mesenchymal tissues, including vein, fascia, perichondrium and periosteum.[4-10] Nowadays most frequently used graft material is temporalis muscle fascia.[11]

Cartilage was first used by Jansen[12] in 1958 for ossicular chain reconstruction. Then in 1963, Salen[13] and Jansen[14] used cartilage composite grafts for tympanic membrane reconstruction.

Since the first description of tympanoplasty, clinicians have encountered different complications like recurrent tympanic membrane retraction and reperforation and attempted to reduce the frequency of complications.[15] In cases like revision tympanoplasty and atelectatic ear, cartilage has been used with great success to reconstruct the tympanic membrane. Cartilage has been shown to be well tolerated by middle ear and long term survival is achieved since cartilage graft is nourished largely by diffusion. Even in the cases of severe Eustachian tube dysfunction, cartilage maintains its rigid quality and resists resorption and retraction but due to its opacity, it is difficult to visualize middle ear.[16-21]

Various techniques of cartilage tympanoplasty have been described: Inlay butterfly graft[22], Perichondrium/cartilage island graft,[16] Palisade technique[23] and Cartilage shield technique.[21]

In this study, we are trying to compare the results of Myringoplasty with Temporalis Fascia graft and Perichondrial-cartilage composite graft harvested from the tragus in high risk perforations i.e. subtotal or total perforation of TM, patient with >50% perforation of TM, revision cases, anterior margin involvement, absent/partially eroded handle of malleus, presence of pus/discharge in middle ear and epithelial ingrowth.[24-31]

MATERIALS AND METHODS

This prospective, comparative, analytical study was done in Nepal Medical College Teaching Hospital, Department of Otorhinolaryngology and Head and Neck Surgery from March 2015 to Feb 2017.

Patients aged 13 years and above diagnosed with COM mucosal type with high risk perforation willing to undergo myringoplasty in the hospital were included in the study. High risk perforation was defined as patients with subtotal or total perforation of TM, >50% perforation of TM, revision cases, anterior margin involvement, absent/partially eroded handle of malleus and presence of pus/discharge in middle ear. Patient with frank otorrhea, small perforation equal to or less than 50% and patients with sensorineural hearing loss were excluded from the study.

Randomisation was done by lottery method. Results were analysed as graft uptake rate and change between pre- and post-operative hearing. Data were analyzed using Fisher's exact test,

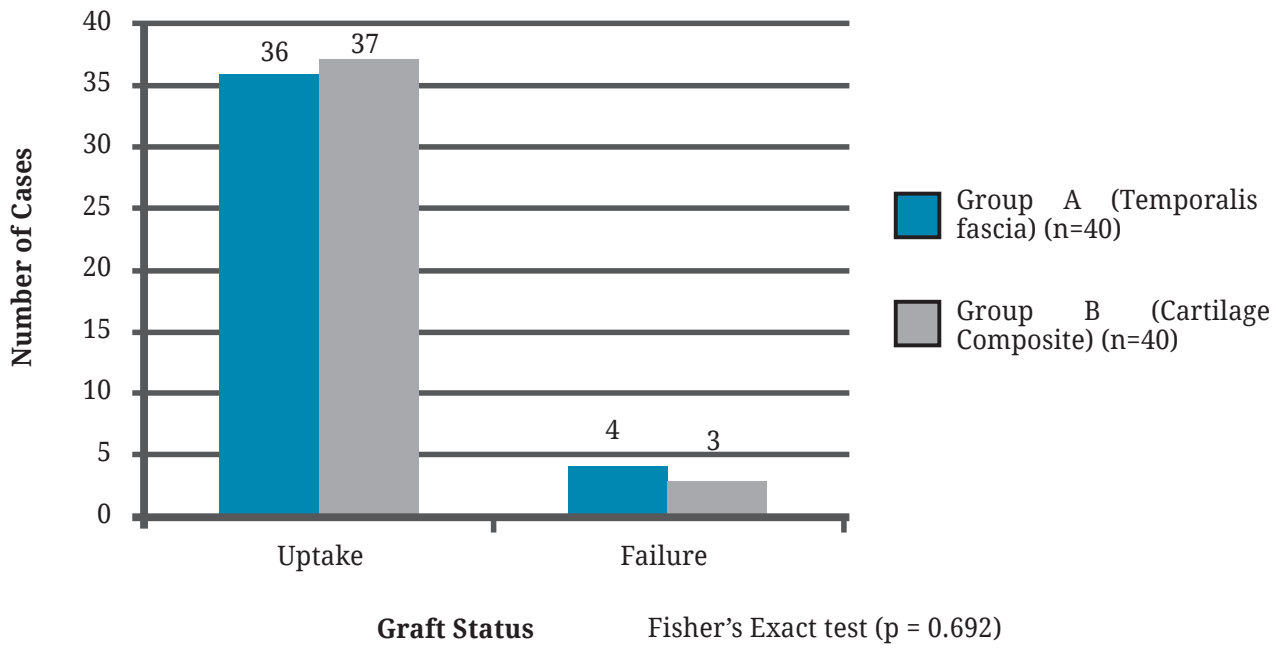

Fig. 1: Post-operative graft status in two groups

Chi square test, dependent and independent '*t*' test on a SPSS statistical package version 16.0. The level of statistical significance was set at p<0.05. Ethical approval was taken from the Institutional Review Committee (IRC) of Nepal Medical College.

RESULTS

Total number of patients enrolled for the study was 84. These patients were randomized into two groups temporalis fascia group (Group A) and perichondrial-cartilage composite graft (Group B) by lottery method, each group containing 42 patients. Out of them 4 were excluded from the study due to loss to follow up, 2 from each group with remaining 40 patients in each group.

In temporalis fascia group (Group A), there was graft uptake in 36 (90%) cases and failure in 4 (10%) cases whereas in cartilage composite group (Group B), graft uptake was observed in 37 (92.5%) cases and failure in 3 (7.5%) cases. The difference in graft uptake results between these two groups was not found to be statistically significant (p=0.692) (Fig. 1).

For the comparison of hearing results, only 36 cases with graft uptake were taken in this group A. The mean pre-operative air conduction threshold was 47.72 dB (SD=13.39) and post-operative air conduction threshold was 32.39 dB (SD=13.97). The mean pre-operative air bone gap was 30.69 dB (SD=10.19) and post-operative air bone gap was 16.36 dB (SD=8.37). Hearing improvement after surgery was found to be statistically highly significant (p<0.001). For the comparison of hearing results in this group B, only 37 cases with graft uptake were taken. The mean pre-operative air conduction threshold was 49.95 dB (SD=9.01) and post-operative air conduction threshold was 35.30 dB (SD=10.27). The mean pre-operative air bone gap was 33.73 dB (SD=8.07) and post-operative air bone gap was 20.76 dB (SD=9.47). Hearing improvement after surgery was found to be statistically highly significant (p<0.001).

The mean pre-operative Pure Tone Audiogram –Air Conduction (PTA-AC) threshold was found to be 47.72 dB and 49.95 dB, post-operative PTA-AC threshold was 32.39 dB and 35.30 db, pre-operative Pure Tone Audiogram–Air Bone (PTA-AB) Gap was 30.69 db and 33.73 dB, post-operative PTA-AB Gap was 16.36 dB and 20.76 dB and mean Air Bone (AB) gain was 14.33 dB and 12.97 dB in fascia group (group A) and cartilage group (group B) respectively. Applying independent T-test, the difference in means between the groups in each category was found to be not significant statistically (Table-1).

DISCUSSION

Myringoplasty is a commonly done surgical procedure. In our study, out of 80 cases 38 were male and 42 were female. In our study, graft uptake rate was 90.0% in temporalis fascia group and 92.5% in perichondrial cartilage group which is similar to Yung *et al*[24] who found the graft uptake rates of fascia and cartilage grafts at 24 months were 84.2% and 80%, respectively.

Table-1: Comparison of pre- and post-operative hearing between two groups

Mean	Group A (Temporalis fascia)	Group B (Cartilage composite)	P value
Pre-operative PTA-AC threshold (dB)	47.72	49.95	0.407
Post-operative PTA-AC threshold (dB)	32.39	35.30	0.313
Pre-operative PTA-AB Gap (dB)	30.69	33.73	0.162
Post-operative PTA-AB Gap (dB)	16.36	20.76	0.064
ABG gain (dB)	14.33	12.97	0.469

Yung *et al*[24] found postoperative air-bone gaps and hearing gains at 24 months 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 uptake rates or postoperative hearing between the two groups. This is similar to our study, which was 16.36 dB and 14.33 dB in the fascia group and 20.76 dB and 12.97 dB respectively in cartilage group.

Haitham *et al*[25] included 40 patients, 23 males and 17 females. The average age of patients is 28.4 years with a range from 13-55 years. Surgical success rates for the temporalis fascia and cartilage groups are 77.78% and 95.45%, respectively. There is 19.4 dB improvement in mean hearing threshold in fascia group, compared to 15.2 dB improvement in cartilage group, giving an average of 17 dB improvement in mean hearing threshold of the total series. The finding of this study is comparable to our study but the number of cases are more in our study.

Gerber *et al*[26] demonstrated that hearing results after cartilage tympanoplasty are comparable to those after temporalis fascia tympanoplasty. Therefore, when indicated, a cartilage–perichondrium graft can be used for prevention of disease recurrence or progression without fear of impairing hearing. Gamra *et al*[27] achieved successful closure of the tympanic membrane perforation in 97% of the cartilage group as compared to 94% of the fascia group. The average Air Conduction Gain (ACG) was 21 ± 11 dB in cartilage group and 20 ± 22 dB in fascia group. With an average follow-up of 2 years, residual

perforation was observed in 2.2% in cartilage group. Reperforation of fascia graft and retraction were noted in 2.1 and 1%, respectively. Dornhoffer *et al*[28] reports 96 patients who failed at least 1 temporalis fascia graft tympanoplasty, of which 29 of them also underwent ossicular chain reconstruction. TM closure was achieved in about 95% of patients. There was a significant improvement in pure tone audiogram (PTA) from 24.6 to 12.2 dB.

Khullar *et al*[29] found tympanoplasty type I using temporal fascia was successful in 17 (74%) ears while tympanoplasty using composite cartilage graft was successful in 20 (91%) ears. Composite graft procedure gave better functional improvement, helped in reconstruction of canal wall and was useful in elimination of retraction pockets. Therefore composite cartilage tympanoplasty offers possibility of a rigorous tympanic membrane reconstruction.

Akihiro *et al*[30] suggest that use of perichondrium with cartilage composite graft is advantageous for second operation or perforation of the eardrum. Couto *et al*[31] found the tragus cartilage inlay myringoplasty with cartilage resembling butterfly wings has a high rate of success to close tympanic membrane perforations with 5 mm diameter at the most in cases of chronic otitis media with healthy middle ear and gives more patient comfort with less morbidity.

All these above findings show the hearing results are comparable between the cartilage composite graft and temporalis fascia graft. This removes the doubt that cartilage, because of its rigidity and mass, greatly affects post-operative hearing results.

Our study addresses only short-term graft uptake and audiologic results which may change with time. Although evidence suggests that the post-operative hearing actually improves with time in cases of cartilage myringoplasty,[22] a longitudinal follow-up of this patient group is anticipated in order to elucidate the long-term viability of this technique.

The graft uptake rate and hearing results after cartilage perichondrial composite graft are comparable to those of temporalis fascia graft. Furthermore, the cartilage perichondrial composite graft is more rigid and thick so it is more resistant than fascia to anatomic deformation and necrosis. Therefore, we recommend the use of cartilage perichondrial composite graft for tympanic membrane reconstruction in high risk perforation without concern about affecting audiometric results.

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