

Outcome of Graft Uptake and Hearing Results between 'U' Flap Technique and Conventional Tympanomeatal Flap Technique for Anterior and Subtotal Tympanic Membrane Perforation

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ABSTRACT

Background: Myringoplasty done for anterior and subtotal perforation needs expertise and practice than conventional underlay myringoplasty. The objective of this study was to compare the graft uptake and postoperative hearing results between 'U' flap and conventional tympanomeatal flap technique in anterior and subtotal tympanic membrane perforation.

Methods: Sixty three patients of age fifteen years and above with chronic otitis media mucosal type with any sized anterior and subtotal perforation of tympanic membrane were randomly allocated for myringoplasty by lottery method. There were thirty one cases in 'U' flap group and thirty two cases in conventional tympanomeatal flap group. Graft uptake and hearing results were assessed after six weeks and results were compared within and between the groups.

Results: Graft uptake rate was 90.3%(28/31) in 'U' flap group and it was 87.5%(28/32) in conventional tympanomeatal flap group with no statistically significant difference ($p= 0.772$) between the two groups. The mean pre and post-operative air bone gap in 'U' flap group were $23.63\text{dB}\pm 7.77\text{dB}$; $13.26\text{dB}\pm 5.50\text{dB}$ and that in the conventional tympanomeatal flap group were $20.88\pm 9.88\text{dB}$, $9.42\text{dB}\pm 6.70\text{dB}$ respectively. There was no statistically significant difference in hearing results between the two groups ($p= 0.504$).

Conclusions: The graft uptake rate and hearing results of 'U' flap group were comparable and showed no statistically significant difference to those of conventional tympanomeatal flap group.

Keywords: Anterior perforation; myringoplasty; subtotal perforation; 'U' flap.

INTRODUCTION

Chronic otitis media (COM) mucosal type previously called tubotympanic disease is defined as permanent perforation of pars tensa and Myringoplasty is the surgical procedure that is done for closure of the perforation.

Specific technical difficulties are encountered while dealing with anterior and subtotal perforation like poor visualization and absence of remnant tympanic membrane.¹ Moreover, there is need of an experienced surgeon for these difficult cases. Thus, there is a need to modify the conventional tympanomeatal flap technique of myringoplasty for anterior and subtotal perforations and compare the results in terms of graft uptake and

hearing improvement. In the current study we have made a modification of doing a 'U' flap technique.

The aim of this study is to evaluate and compare the graft uptake and hearing results using 'U' flap and conventional tympanomeatal flap techniques in anterior and subtotal tympanic membrane perforations.

METHODS

This is a randomized-controlled, interventional study performed in patients who underwent myringoplasty from January 2014 to August 2015 in the department of ENT and Head & Neck Surgery, Ganesh Man Singh Memorial Academy of ENT and Head & Neck Studies, Tribhuvan University Teaching Hospital. Approval from

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the Institutional Review Board was taken for conducting the study.

The sample size was calculated using sample size calculator. The Inclusion criteria for this study were all gender, age fifteen years and above, anterior or subtotal perforation, revision surgery for anterior and subtotal perforation; needing myringoplasty. Posterior perforation only and wet ear were excluded. Suspected ossicular chain pathology diagnosed peroperatively were excluded for the hearing results comparison in the study. Total of seventy patients with chronic otitis media (COM) - mucosal type meeting the inclusion criteria were divided into two groups with thirty five patients in each group by lottery method. However, seven patients were lost to follow up and finally only sixty three patients were analysed for final analysis. Out of them, thirty one patients were in Group A ('U' flap) and thirty two patients were in Group B (Conventional Tympanomeatal flap).

The patients planned for myringoplasty fulfilling the above inclusion criteria were examined by the consultants in the outpatient department. They were checked for pure tone audiogram done within one month period by the senior audiologists. Informed consent was taken from the patient or the guardian.

Randomization into two groups was done prior to surgery by lottery method. All surgeries were performed under local anesthesia and were performed by multiple surgeons. The myringoplasty was done by two different methods as described below.

Various approaches like perimeatal, postauricular or endaural approach was used to access the tympanic membrane and middle ear according to surgeons' choice. Temporalis fascia graft was harvested in all the patients. The margin of the perforation was refreshed by excising small rim around the margin of the remnant tympanic membrane. The under surface of remnant tympanic membrane was made raw using endomeatal circular knife. Then the flap was elevated using two different techniques.

In group A ('U' Flap) the tympanomeatal flap was elevated after making the incision in the bony external auditory canal 5mm lateral to annulus and it was carried from 11 o'clock position to 2 o'clock position in case of right ear as in Fig. 1

In group B (conventional group) the standard flap was elevated from 12 o'clock to 6 o'clock position in case of right ear as in Fig.2

In both the groups, middle ear and ossicular status was evaluated after the tympanomeatal flap was elevated



Figure 1. Incision in the external auditory canal for 'U' flap.



Figure 2. Incision in the external auditory canal for Conventional TM flap.

out of the tympanic sulcus. Gelatin sponge (Gel foam) was placed in the middle ear and graft placed medial to handle of malleus and remnant of tympanic membrane by underlay technique. Flap was repositioned and pieces of wet gelatin sponge were placed over the graft in the external auditory canal. Bismuth Iodoform Paraffin Paste (BIPP) impregnated gauze pack placed kept in the canal. The graft site was sutured and mastoid dressing was applied.

Oral Ciprofloxacin (500mg tablet twice a day) was given for seven days and wound dressing was done after 48 hours and then on alternate days. In sixth postoperative day, suture and pack were removed. Topical antibiotic and steroid ear drops (Chloramphenicol + Dexamethasone) 2-3 drops three times a day in each ear were given for two weeks.

The patients were followed at or after 6 weeks. Graft uptake result was noted and pure tone audiometry (PTA) was performed. Total graft uptake was regarded as successful graft uptake. Residual perforation of any size was reported as failure. For hearing assessment average of four frequency air bone gap and air conduction threshold was used to compare the results between two groups preoperatively as well as postoperatively.

Statistical analysis was performed using SPSS 20.0. Average age distribution was evaluated with independent *t* test. Gender of the patient, perforation size distribution, postoperative graft uptake between the two groups were analysed by Chi square test.

Preoperative and postoperative air conduction threshold and air bone gap was compared using paired *t* test.

RESULTS

Total of sixty three patients were randomized into two groups, myringoplasty by 'U' flap technique (Group A) and myringoplasty by conventional flap technique (Group B) using lottery method, with thirty one patients in Group A and thirty two patients in Group B.

The age of the patients enrolled ranged between 15 to 56 years with mean age of 27.81years (SD 10.96 years). The most common age group was 15-30 years in both the groups. The p value shows statistically significant difference while comparing the age groups between the groups.

There was male predominance in the conventional group and female predominance in the 'U' flap group though the difference was not statistically significant. The maximum number of patients had medium sized perforation. The above findings are tabulated as in Table 1.

Table 1. Demographic and operative data of patients undergoing Myringoplasty.

	'U' flap (n=31)	Conventional flap (n=32)	p-value
Age of patients(yr)	24.42	31.09	0.014
Gender distribution			
Male	14 (45.2%)	19 (59.4%)	
Female	17 (54.8%)	13 (40.6%)	0.259
Perforation Size ⁶			
Small(20%-40%)	10 (32.3%)	1 (3.1%)	
Medium (41%-60)	18 (58.1%)	18(56.3%)	
Large (61%-80%)	1 (3.2%)	12 (37.5%)	0.001
Subtotal (>80%)	2 (6.4%)	1 (3.1%)	
Surgical approach			
Permeatal	19 (61.3%)	22(68.8%)	
Others	12 (38.7%)	10 (31.2%)	0.603
Ossicular status			
Intact and mobile-Fixed/Restricted	19 (67.9%)	19 (67.9%)	
Dislocated/Ne-closed	4 (14.3%)	2 (7.1%)	
Not assessed	2 (7.1%)	0	0.274
	3 (10.7%)	7 (25%)	

Inclusion criteria : anterior(<50%) and subtotal perforations(>80%)

Postoperatively, the graft uptake in the 'U' flap group was 90.3% and 87.5% in the Conventional group and the difference was not statistically significant as shown in Table 2.

Table 2. Comparison of postoperative graft uptake between two groups.

	'U' flap (n=31)	Conventional flap (n=32)	p-value
Uptake	28(90.3%)	28(87.5%)	
Failure	3 (9.7%)	4 (12.5%)	0.772

Regarding the postoperative hearing assessment, the preoperative and postoperative AC threshold and BC threshold were compared. Both the air bone gap (AB gap) and air conduction threshold (AC threshold) showed significant improvement after surgery while comparing with in the 'U' flap group and conventional flap group. However, preoperative and postoperative hearing improvement when compared between the two groups was not statistically significant. Summary of preoperative and postoperative mean hearing between two groups are given in Table 3.

Table 3. Preoperative and postoperative mean hearing between two groups.

	'U' flap	Conventional flap	p-value
Pre Op AC Threshold	37.78 dB ±7.71dB	36.79dB ±10.54dB	0.078
Post Op AC Threshold	25 .34 dB ± 6.99 dB	23.42dB ±8.99dB	0.150
Pre Op AB Gap	23.63dB ±7.77dB	20.88dB ±9.88dB	0.448
Post Op AB Gap	13.26 dB ± 5.50dB	9.42dB ±6.76dB	0.504

DISCUSSION

This study was a randomized controlled study done in patients undergoing myringoplasty which is one of the commonest surgeries done in Otolaryngology.

The present study showed the commonest age group was in 15-30 years of age which are highly active group and seek early health care. The male and female have similar distribution and show no predominance in our study. Various other studies done by Hung et al,² Famarzi et al³ and Alzoubi et al⁴ for anterior perforation showed female preponderance. However, other study done Seidman⁵ showed male preponderance. In our study, we have classified the perforation size as small, medium, large and subtotal. This is as per Das et al as mentioned in his study where >80% perforation was taken as subtotal perforation.⁶

Graft uptake rate of myringoplasty in our study using the conventional flap was 87.5% which is comparable with most of the studies done by various authors. Study done in this institute by Rayamajhi et al, in 104 patients showed graft uptake rate of 90%.⁷ In a study done in 50 patients by Parida et al 2014 had graft uptake rate of 80 %, which showed poor graft uptake than ours.⁸ Mokhtarinejad et al, 2012 had 100% (25 out of 25) success rate in conventional tympanomeatal flap surgery done for anterior perforation which showed better success rate than our study though the sample size was low.⁹ Peng et al, 2014 in their study showed better result with 96% graft uptake (24 out of 25).¹⁰ They had used tragal cartilage as a graft material in most of the patients and was done by postaural approach. But control group was lacking in their study.

Graft uptake rate of myringoplasty in our study using 'U' flap was 90.3%. Mokhtarinejad et al⁹, 2012 has described a surgical technique similar to ours for anterior perforation in which the flap was elevated but the graft was placed medial to the TM remnant and lateral to the malleus. They had two groups with success rate of 97%(37 out of 38) in study group where as success rate 100%(25 out of 25) in control group. They had longer follow up too. The success rate of graft uptake was better than our study with the sample size of 25. Lee et al,¹¹ in 2010 used the surgical techniques in which meatal incision was made from 2 o'clock to 10 o'clock position in case of the right ear, which is similar to our study but graft was placed by overlay technique. They had the success rate of 98.8 %(424 out of 429) with average follow up period of 15.2 months. The success rate of their study was better than our study and sample size was also quite large but they lacked a control group. Hung et al,² in 2004 found success rate of 93.3% (98 out of 105) while performing myringoplasty by anterior superior anchoring technique for anterior perforations. Seidman⁵ in 2008 had success rate of 88% (40 out of 45) for anterior perforation using anterior transcanal approach. Hay et al¹² had success rate of 91% (105 out of 116) when performing anterior interlay myringoplasty with average follow up period of 12.2 months. Their studies had slightly better result and higher sample size.

In our study, there is no significant difference in graft uptake between the 'U' flap and Conventional flap groups ($p = 0.72$). Several authors have described various techniques for the closer of anterior tympanic perforation but there are few studies which have compared their techniques with the conventional flap techniques. A study done by Mokhtarinejad et al, 2012 had comparable group which showed that there was no statistically significant difference in graft uptake

rate between conventional flap and circumferential subannular technique groups.⁹

Regarding the assessment of the hearing improvement, it was done in cases with the successful graft uptake cases only. Thus, the hearing assessment was done in 28 cases in both the groups. For homogeneity, only those with normal ossicular chain were taken for the hearing evaluation in our study. In 'U' flap group, ossicular chains were not assessed in three cases, two cases had fixed, two cases had restricted ossicular chain mobility one case each had dislocated chain and one had necrosed ossicles and thus were excluded leaving only 19 patients for final analysis. In the conventional flap group, there were two cases with fixed ossicular chain and seven cases of not assessed ossicular chain were excluded leaving 19 cases in conventional group for final analysis.

The difference between the pre and postoperative hearing improvement in both group was statistically highly significant with $p < 0.001$. This improvement in hearing is comparable with most of the studies. Study done by Shrestha et al¹³ in 2006 found that hearing gain more than 15dB in 70% following myringoplasty by Conventional techniques. Similarly, Rayamajhi et al⁷ found that 71.2 % had subjective postoperative hearing improvement after conventional myringoplasty. Another study done by Mokhtarinejad et al found preoperative and postoperative ABG of 23.4dB and 9.3 dB respectively and showed better results than ours.⁹ Similar kind of surgery performed by Peng and Lalwani found preoperative and postoperative ABG of 23.5dB and 15.7 dB respectively and is similar to our result.¹⁰ Lee et al 2010 found also found significant improvement in hearing after surgery with preoperative and postoperative ABG of 23.5dB and 8.4 dB respectively.¹¹ Similarly, Mokhtarinejad et al⁹ found preoperative and postoperative ABG of 25.6dB and 8.11 dB respectively. Both studies showed better results than ours.

When compared between our two groups, the difference was not significant statistically ($p > 0.05$). Mokhtarinejad et al¹² have comparable group which showed that there was no statistically significant difference in postoperative hearing between their two groups. Other studies to compare two variant groups are not available.

The follow up period in our study ranged from minimum of 6 weeks to maximum of 16 weeks Mokhtarinejad et al had average follow period of 1.6 years in conventional flap group and 2.4 years in circumferential subannular group for anterior perforation.⁹ Similarly, Peng and Lalwani et al,¹³ had follow up period of 3.4 ± 1.7 years. Short term follow period is one of the limitations of this study. Our study is the first study of its kind in Nepal but

still a longer duration of study with at least 1 year follow up, single surgeon, larger and proportionate sample size would provide us better and more consistent results.

CONCLUSIONS

Anterior perforation or Subtotal perforation of tympanic membrane is difficult to manage as it is associated with high failure rate. Among the various modifications done to overcome this difficulty U flap method is one which we have incorporated in the present study. Our study showed no statistically significant difference in the graft uptake and hearing improvement between the conventional and U flap myringoplasty group.

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