

# Comparison of Pre and Post-Operative Hearing Results in Patients Undergone Modified Inlay Butterfly Cartilage Perichondrium Myringoplasty

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**Abstract:** *Objective:* The perichondrium cartilage graft has its advantage not only on hearing outcome but also in graft uptake rate. So, the main aims are to compare the pre and post-operative hearing results and to observe the graft uptake rate.

*Materials and methodology:* This is a prospective, longitudinal and analytical study conducted in the department of otorhinolaryngology in Kathmandu university hospital from 1st January 2011 to 1st June 2012. There were 34 patients who underwent modified inlay butterfly cartilage perichondrium myringoplasty using tragal cartilage perichondrium in  $\geq 13$  years patients and with the diagnosis of Chronic otitis media (mucosal- inactive) with central perforation of  $>50\%$  and those requiring revision surgeries for failed myringoplasties were included. The pre and post-operative PTA (pure tone audiogram) was performed and evaluated. The post-operative hearing was assessed in terms of average ABG (air bone gap) and size of ABG closure.

*Results:* Among 34 patients, the 30 (88.2%) patients had graft uptaken. Other 4 patients had residual perforation because of infection. The post operative ABG was smaller than the pre operative ABG. (36.57 $\pm$ 12.13dB and 26.41 $\pm$ 8.47dB respectively) The mean ABG closure was 10.15 $\pm$ 10.23dB. The ABG closure was smaller than 10dB in 15 (50%) patients.

*Conclusion:* There was statistically significant improvement in postoperative ABG with ABG closure within 10dB in 50% of patients. So, it is useful to perform the procedure in subtotal to total perforation with good outcome.

**Keywords:** Air bone gap, cartilage, chronic otitis media, Myringoplasty.

## INTRODUCTION

Since the perforation of tympanic membrane adversely affects the hearing and causes the recurrent infection, so there are various grafts and techniques used to repair the tympanic membrane.

The various graft materials are skin [1], vein [2], perichondrium [3, 4], temporalis fascia [5], dura [6] and cartilage [7-10]. The cartilage has been used in cases of negative prognostic factors like total or sub total perforation, anterior perforations, revision procedures, surgery in wet ear, extensive tympanosclerosis and pediatric age group [11]. The main advantages of cartilage is that it has very low metabolic rate, provide support to prevent retraction, reacts minimally to inflammatory reaction [12].

Eavey [13] was the first to repair the small tympanic membrane perforation with cartilage graft butterfly myringoplasty and Rourke T *et al.* [14] followed the similar technique to close the perforation.

We had also followed the similar technique with modification. The main aim of our study is to observe the graft uptake rate, to compare pre with post operative hearing results in terms of average ABG and ABG closure.

To the best of our knowledge, this is the first of its kind of study being performed in Nepal.

## MATERIALS AND METHODOLOGY

This is the prospective, analytical and longitudinal study performed in the department of otorhinolaryngology in Kathmandu university hospital from 1<sup>st</sup> January 2011 to 1<sup>st</sup> June 2012.

### Inclusion Criteria

- Age of  $\geq 13$  years
- Both gender.
- Chronic otitis media (mucosal- inactive) with central perforation of  $>50\%$  and those requiring revision surgeries for failed myringoplasty.

### Exclusion Criteria

- Sensorineural and mixed hearing loss.
- Post-operative graft failure.

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## Patient Pre-Operative Preparation

All the patients who were included for surgery were taken informed consent. The procedure was done in accord with the Helsinki Declaration of 1975.

The patient was given oral ciprofloxacin 500mg q 12 hourly one day prior surgery and continued till 10<sup>th</sup> post-operative day. All the surgeries were performed under local anesthesia by the same ENT (Ear, Nose and Throat) surgeon.

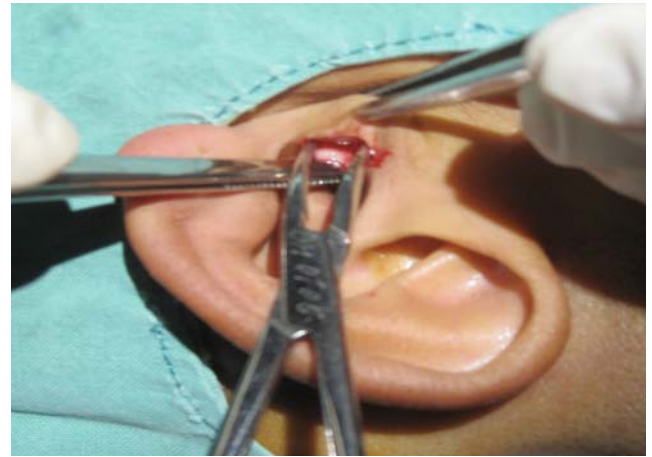
## Surgical Procedure

The patient was given 5-10 ml of 2% xylocaine with 1:1,00,000 adrenalin as per the approach selected, for four quadrant canal wall block and also on tragus. About 2 cm vertical incision was given by number 15 scalpel from incisura terminalis upto intratragal notch which was around 5mm medial to the tip of the tragus as shown in Figure 1. The single stroke skin incision was given upto tragus cartilage. The assistant held the tissue of the tip of the tragus by non tooth forceps and cleared the surgical field from blood by suction. Whereas the operating surgeon held the skin with non tooth forceps and then the canal side cartilage along with perichondrium was dissected with mosquito forceps as shown in Figure 2. Similarly, cartilage along with perichondrium from the anterior aspect of tragal cartilage was dissected and thus made free at incisura terminalis.



**Figure 1:** Incision on tragus.

The cartilage along with the perichondrium was excised with number 15 scalpel giving incision from incisura terminalis once the cartilage size of 2 cm in length and 1.5 cm in breadth was obtained. Thus, the cartilage was harvested. The skin was closed with 4/0 prolene interrupted suture.

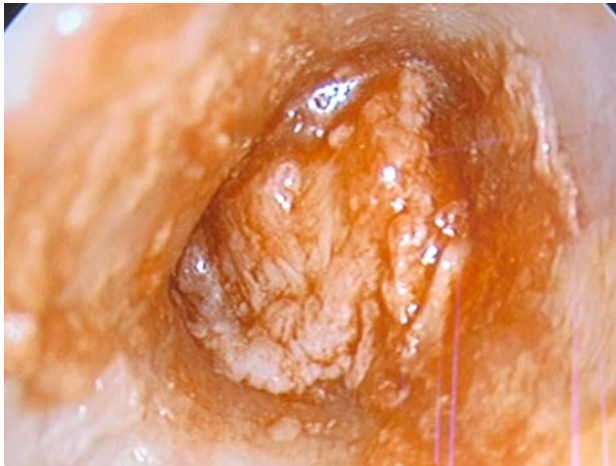


**Figure 2:** Harvesting of tragal cartilage.

Then, the graft was kept on silastic block. The perichondrium away from canal was elevated with number 15 scalpel and removed. For creating the butterfly, number 11 scalpel was used and thus created around 1.5mm groove along the circumferential border of the cartilage disc allowing the cartilage flanges to spring open like did by Rourke T *et al.* [14]. If the handle of malleus and/or the incudostapedial joint was visible then we removed the cartilage leaving only perichondrium to allow place for handle of malleus and incudostapedial joint.

The margin of the perforation was refreshed with the straight needle and also the epithelial layer of the tympanic membrane around 5mm was elevated off the fibrous layer with round knife around the perforation. Whenever the handle of malleus was visible then it was well skeletonized.

The gelatin sponge was kept in the middle ear cavity with crocodile forceps. The cartilage graft was then placed around the perforated tympanic membrane like placing a grommet by first inserting on the anterior end of perforation by mounting on the crocodile forceps. Then rest of the cartilage was placed with straight needle. The cartilage rest in such a way that medial flange lies medial to tympanic membrane whereas the lateral flange containing the cartilage along with the perichondrium lies lateral to the perforation like explained by Rourke T *et al.* [14]. The perichondrial end was then covered with rest of elevated epithelial layer of tympanic membrane as shown in Figure 3. The canal was then packed with wet gelatin sponge soaked in ciprofloxacin ear drops and followed by the ribbon pack medicated with soframycin was kept in the canal and mastoid bandage was applied.



**Figure 3:** Placement of tragal cartilage in remnant of tympanic membrane.

**Post-Operative Care and Follow Up**

The patient was prescribed tab ciprofloxacin 500mg 12 hourly for ten days. The ribbon gauge pack and stitch was removed on 7<sup>th</sup> postoperative day. The remaining gelatin sponge was suctioned on the same 7<sup>th</sup> postoperative day. Then, the patient was prescribed chloramphenicol and dexamethasone ear drops for 6 weeks. The patient was again followed up after 2 weeks, 6 weeks and then 12 weeks for the graft status (Figure 4). The hearing was assessed on 12<sup>th</sup> week if the graft uptake was there.



**Figure 4:** Post-operative graft status in 12<sup>th</sup> weeks.

**Audiological Evaluation**

For the hearing assessment, pure tone audiogram was done 7 days prior to operation and then 12 weeks after the operation. The audiological results were reported according to American Academy of Otolaryngology- Head and Neck Surgery guidelines [15]. The hearing was assessed by comparing pre with post-operative ABG and the size of the ABG closure.

**Statistical Analysis**

All the data were collected and analyzed using the SPSS (Statistical Package for the Social Sciences) 16.0 software. Since the values were distributed normally with 95% confidence interval, so the p value was calculated using the student “t” test and p value of <0.05 was taken as significant.

**RESULTS**

The total number of patients enrolled for the surgery was 34. Among them only 30 patients were included. Four patients were excluded because of residual perforation caused by infection. So, the graft uptake rate was 88.2%.

There were total 15(50%) patients within 25 years with mean age of 25.53+/- 10.24 as shown in Table 1.

**Table 1: Age Distribution (n=30)**

		Frequency	Percent	Valid Percent
Valid	13-25 years	15	50.0	50.0
	26-40 years	14	46.7	46.7
	>55years	1	3.3	3.3
	Total	30	100.0	100.0

The sex distribution is shown in Table 2.

**Table 2: Sex Distribution (n=30)**

		Frequency	Percent	Valid Percent
Valid	male	18	60.0	60.0
	female	12	40.0	40.0
	Total	30	100.0	100.0

The Table 3 showed pre and post-operative ABG.

**Table 3: Comparison of Pre and Post-Operative ABG (n=30)**

	Mean	N	Std. Deviation	Std. Error Mean	P value
Pre-operative average ABG	36.5750	30	12.13344	2.21525	0.000
Post-operative average ABG	26.4167	30	8.47622	1.54754	

\*Mean of 0.5,1,2 &3 KHz (p=.000).

The Table 4 showed the post-operative ABG closure.

**Table 4: Post-Operative ABG Closure (n=30)**

N	Valid	30
	Missing	0
Mean		10.1583
Std. Deviation		10.23843
Range		44.00
Minimum		-15.25
Maximum		28.75

The Table 5 showed the size of ABG closure.

**Table 5: Size of ABG Closure (n=30)**

ABG Closure	No. of patients (%)
<10dB	15(50%)
11-20dB	9(30%)
21-30dB	6(20%)
Total	30(100%)

## DISCUSSION

The use of cartilage graft in tympanoplasty was in same time as temporalis fascia [7, 16-18]. Clinical and experimental study showed that the cartilage is well tolerated with minimal resorption time and survives for a long with good hearing outcome [16, 19-22]. So, there were different methods of cartilage tympanoplasty popular for the grafting procedure like island technique, wheel technique, inlay butterfly technique, shield technique and palisade technique [23, 24].

This butterfly cartilage technique was 1<sup>st</sup> describe by Eavey [13] for small to medium perforation. Likewise, Ghanem *et al.* [25] and Rourke T *et al.* [14] modified technique to repair large perforation. We did the same technique but with the modification keeping one side of perichondrium intact. The study showed that cartilage with perichondrium on one or both sides had better viability (better metabolism and strong enzymatic reaction) than naked cartilage [26].

The main advantage of cartilage butterfly graft myringoplasty was more comfortable technique as no need to raise the tympanomeatal flap, the locking of

butterfly edge maintained the graft position without support from the middle or external ear canal and the oozing was practically non existent [26].

The graft uptake rate in our study was 88.2% which is comparable to other study performed by Rourke T *et al.* [14] (94%), Ghanem MA *et al.* [25] (92%), Couloignier V *et al.* [8] (71%) and Mauri M *et al.* [26] (85%) graft uptake rate. But differ from the study performed by Eavey RD [13] which showed uptake rate of 100%. Such an accurate results could be because of small number of cases and also used in small perforations.

Our study showed statistically significant reduction in post-operative ABG from 36.57dB to 26.41dB which is comparable to the study performed by Rourke T *et al.* [14] whereas differ from other study as they showed no improvement in hearing threshold but stable in hearing threshold [8, 13, 25, 26]. In our study we made a modification in such a way that only perichondrium lies at the handle of malleus and at incudo-stapedial joint whenever visible, this could be the reason for good hearing because of better conduction of sound.

Our study showed that in 3 cases (10%), post-operative ABG was worst than pre-operative ABG whereas the ABG closure <10dB in 50% cases. Our findings are similar to study performed by Rourke T *et al.* [14].

The main limitation of our study was the sample size and the follow up. The result will be better if we do in large sample size and with the long term follow up.

## CONCLUSION

There was graft uptake rate of 88.2% in modified inlay butterfly cartilage perichondrium myringoplasty. There was also statistically significant improvement in post-operative ABG as compared to pre-operative ABG. The ABG closure was within 10dB in 50% of patients. So, it is useful to perform the procedure in subtotal to even total perforation with good outcome.

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