

## A Comparative Study of Island Cartilage Graft Tympanoplasty and Temporalis Fascia Graft Tympanoplasty in Chronic Suppurative Otitis Media with Subtotal Perforation

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### Abstract:

**Background:** Chronic otitis media is a common condition for which the patient present to Otorhinolaryngology, constituting about 30% of the ENT outpatient numbers. Chronic otitis media implies a permanent abnormality of pars tensa or flaccida, most likely a result of acute otitis media, negative middle ear pressure or otitis media with effusion. Being surgery the main treatment modality of treatment, tympanoplasty using various types of graft materials is essential in the management of the disease. Temporalis fascia is most commonly used graft. Various other grafts materials include cartilage, areolar tissue, ear lobule fat, and vein. Cartilage is also a popular graft which can be used in the form of palisade, perichondrium/cartilage island, butterfly and shield graft. Hence this study was conducted with the objectives to compare the surgical outcome in terms of graft acceptance between the island cartilage graft and temporalis fascia graft used in type 1 tympanoplasty, to compare the audiological outcomes and complications.

**Methods:** A cross sectional (Hospital based) study was conducted at Krishna Rajendra Hospital, Mysore attached to Mysore Medical College and Research Institute, Mysore. Patients attending the OPD with mucosal type of COM with subtotal perforation were included in the study between October 2018 to September 2019. Patients were divided into two groups alternatively and type one tympanoplasty was performed using island cartilage in one group and temporalis fascia in the other after clinical examination, examination under microscope and performing pure tone audiogram. Postoperatively they were followed up at third and eighth weeks to assess the graft uptake and audiological parameters.

**Results:** In our study the graft uptake was similar in both island cartilage and temporalis fascia group. The audiological gain in terms of AB gap closure is slightly better in the temporalis fascia group than the island cartilage.

**Conclusion:** In type 1 tympanoplasty, both temporalis fascia and island cartilage can be used for structural stability and temporalis fascia gives better audiological results.

**Keywords:** Type 1 Tympanoplasty, Temporalis Fascia, Island Cartilage, Graft Uptake, Pure Tone Audiogram, Air Bone Gap.

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### Introduction

Chronic suppurative otitis media ‘a permanent abnormality of the pars tensa or flaccida, most likely a result of earlier acute otitis media, negative middle ear pressure or otitis media with effusion’. It accounts for 30% of patients attending outpatient department of Otorhinolaryngology. The burden of the disease amounts to 65–330 million people worldwide are affected of whom 50 % suffer from hearing impairment, and approximately 28000 deaths per annum are attributed to the complications both intra cranial and extra cranial. Chronic suppurative otitis media are of two types Attico antral (squamous type) and Tubo tympanic

(mucosal type). Tubotympanic type is also called as safe type which involves the mucosal lining of the middle ear characterized by ear discharge, perforation of tympanic membrane and hearing loss. Surgical intervention for closure of perforation of tympanic membrane and restoring the hearing mechanism tympanoplasty is performed. For tympanoplasty most commonly temporalis fascia is used however many autografts are used like conchal cartilage, tragal cartilage, perichondrium, fat from lobule, subcutaneous tissue, amniotic membrane, dermal matrix, animal pericardium and scar tissue, vein so on. [1]

In the present day, Cartilage tympanoplasty is getting popular due to better cosmetic appeal and better post-operative graft uptake. Shield, palisade [2] and butterfly [3] are the most commonly used techniques in cartilage tympanoplasty. Island cartilage technique is found to reproduce better acoustic transfer and vibration characteristics when compared to shield or palisade techniques [4]. Moreover, graft integration and hearing improvement is thought to be better with a full thickness cartilage graft [5]. Hence this study was conducted with the objectives to compare the surgical outcome in terms of graft acceptance, audiological outcomes and complications between temporalis fascia and island cartilage graft in type 1 tympanoplasty in patients with subtotal perforation of tympanic membrane resulting from tubotympanic type of CSOM.

### Material and Methods

A Cross sectional (Hospital based) study was conducted at Department of ENT, Krishna Rajendra Hospital, Mysore Medical College and Research Institute, Mysore from 1st October 2018 to 30th September 2019 (12 months). 32 patients with subtotal perforation on tympanic membrane due to chronic otitis media were selected after written informed consent.

**Inclusion Criteria:** Patients with mucosal type of COM, Subject with subtotal perforation on TM due to COM who will be willing to undergo surgery, Selected patients should have dry ears minimum for 6 weeks and Patients with age between 15 to 55years.

**Exclusion Criteria:** Patients with squamous type of COM, Patients with tympanic membrane perforation due to trauma, Tuberculosis, other granulomatous diseases, Patients of age below 15years and above 55years, Patients with bilateral chronic otitis media, ossicular defects, associated sensorineural hearing loss, external ear infections, Patients with history of previous ear surgery, Immunocompromised patients and Patients with active ear discharge were excluded from the study.

All patients underwent tympanoplasty (Post aural approach) under General anesthesia. 16 patients underwent temporalis fascia graft and 16 patients underwent island cartilage graft. Post operatively patient was given intravenous antibiotics and analgesics for two days followed by oral administration from postoperative day three. Suture removal performed between 7-10 post-operative days. Topical antibiotics drop instillation for 2 weeks post operatively. Water precaution advised for 6 weeks. Instructed to avoid nose blowing. At

the end of 3rd and 8th week postoperatively patient evaluated clinically for graft uptake by otoendoscopy. The graft uptake was evaluated by intact neo tympanic membrane without residual perforation, retraction or lateralization. Audiological evaluation by pure tone audiometry was performed comparing the pre-operative and postoperative average PTA thresholds and air bone gaps. Average PTA threshold was defined as average of the air conduction values in 500Hz, 1000Hz and 2000Hz. AB gap was defined as the difference between the air bone gap of pure tone averages of 500Hz, 1000Hz and 2000Hz.

**Statistical Methods:** Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software (IBM SPSS Statistics, Somers NY, USA). Categorical data was represented in the form of Frequencies and proportions. **Chi-square test** was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. **Normality of the continuous data**, was tested by **Kolmogorov-Smirnov test and the Shapiro-Wilk test**. **Independent t test** was used as test of significance to identify the mean difference between two quantitative variables. **Mann Whitney U test** was used for non-parametric data between two groups. **Paired t test** was used as test of significance to identify the mean difference between two quantitative variables before and after surgery. **Wilcoxon Signed Rank test** was used for non-parametric data paired data. **ANOVA (Analysis of Variance)** was the test of significance to identify the mean difference between more than two groups for quantitative data. **Post Hoc Bonferroni test** was used to determine the intergroup analysis. **Kruskall Wallis test** was used for non-parametric data between three or more groups. **p value** <0.05 was considered as statistically significant. [6,7]

### Results

In the study patient's age ranged between 15 years to 45 years with mean age of 29 years, majority i.e. 34.4% were in the age group of 21-30 years and 12.5% were in the age group more than 40 years. In Island cartilage group age ranged between 18 years to 45 years with mean age of 33 years. In temporalis fascia group it ranged between 15 years and 35 years with mean age of 26 years. In island cartilage group 68.8% were female and 31.2% male and in temporalis fascia group 50.0% were females and males respectively. In island cartilage group left sided disease noted in 62.5% and right sided disease in 37.5%. In temporalis fascia group left sided disease noted in 50.0% and on right side disease was noted in 50.0% [Table 1].

**Table 1: Demographics Profile of subjects**

		Group 1 (ICG) n = 16		Group 2 (TFG) n = 16		Total n = 32		P value
		Count	%	Count	%	Count	%	
Age (years)	<20	2	12.5	5	31.3	7	21.9	0.089
	21-30	4	25.0	7	43.8	11	34.4	
	31-40	6	37.5	4	25.0	10	31.3	
	>40	4	25.0	0	0.0	4	12.5	
Gender	Female	11	68.8	8	50.0	19	59.4	0.281
	Male	5	31.3	8	50.0	13	40.6	
Laterality	Left	10	62.5	8	50.0	18	56.3	0.476
	Right	6	37.5	8	50.0	14	43.8	

**Chi-square Test**

**Graft Uptake:** In the present study Graft uptake was assessed post operatively using otoendoscopy and observed for intact neo tympanum. In the study, overall graft uptake was achieved in 28 patients (87.4%) and graft uptake failure was in 04 patients (12.6%). Both the groups had good Graft uptake in 14 patients and failure of graft was noted in 2 patients. There was no significant difference in Graft uptake between two groups at 3<sup>rd</sup> and 8<sup>th</sup> week postoperatively.

**Audiological Results:** In all patient's preoperative pure tone audiogram from 250 Hz to 8 KHz was obtained and pre-Operative average PTA thresholds and Air Bone gap average were calculated. Postoperative follow up was done at 3<sup>rd</sup>

and 8<sup>th</sup> weeks when the pure tone audiogram was performed to calculate average PTA thresholds and AB gaps. In island cartilage group, the preoperative average PTA threshold was 36.8±2.72 dB and postoperatively at 3<sup>rd</sup> week it was 19.74 ±7.98 dB and at 8<sup>th</sup> week 17.75± 8.72dB. In temporalis fascia group, the preoperative average PTA threshold was 36.70±3.16 dB and postoperatively at 3<sup>rd</sup> week it was 19.52±8.11 dB and at 8<sup>th</sup> week 17.09±8.62 dB. There was no significant difference in mean PTA between two groups at Preoperative period, post-operative 3 weeks and 8 weeks. Were as within the groups there was significant decrease in PTA compared to preoperative values at 3 weeks and at 8 weeks compared to 3 Weeks. [Table 2].

**Table 2: Average PTA thresholds comparison between two groups at Pre-op, 3 weeks and 8 weeks post op**

Average PTA threshold	Group 1		Group 2		P value b/w 2 groups <sup>#</sup>
	Mean ± SD	P value with in the group <sup>s</sup>	Mean ± SD	P value with in the group <sup>s</sup>	
Preoperative	36.8±2.72		36.70±3.16		<b>0.937</b>
Postoperative Week 3	19.74±7.98	<0.001*	19.52±8.11	<0.001*	0.939
Postoperative week 8	17.75±8.72	0.001*	17.09±8.62	0.001*	0.944

# Independent t test, \$ Paired t test

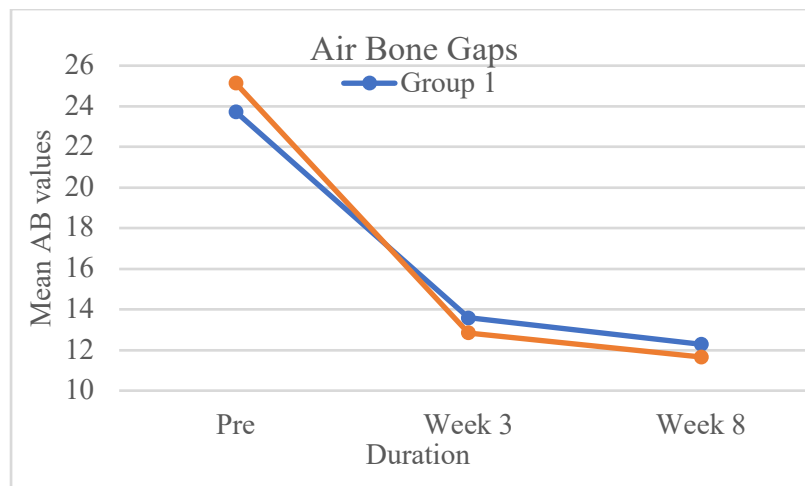
**Air Bone Gap:** In island cartilage group preoperative AB gap was 23.73±3.6, Postoperatively at 3<sup>rd</sup> week 13.58±5.3 and at 8<sup>th</sup> week 12.28±5.65dB. In temporalis fascia group preoperative AB gap was 25.14±3.7 dB. Postoperatively at 3<sup>rd</sup> week 12.85±6.9 and at 8<sup>th</sup> week 11.96±7.3dB. There was no significant

difference in mean Air Bone Gaps between two groups at Pre-Op, 3week and 8 weeks Post op. Were as within the groups there was significant decrease in PTA compared to preoperative values at 3 weeks and at 8 weeks compared to 3 Weeks. [Table 3 and Figure 1].

**Table 3: Air Bone Gap comparison between two groups at Pre-op, 3 weeks and 8 weeks post op**

Air Bone gap	Group 1		Group 2		P value b/w 2 groups <sup>#</sup>
	Mean ± SD	P value within the group <sup>s</sup>	Mean ± SD	P value within the group	
Preoperative	23.73±3.6		25.14±3.7		<b>0.846</b>
Postoperative Week 3	13.58±5.3	<0.001*	12.85±6.9	<0.001*	0.739
Postoperative week 8	12.28±5.65	0.001*	11.96±7.3	0.001*	0.790

# Independent t test, \$ Paired t test



**Figure 1: Air Bone Gap comparison between two groups at Pre op, 3 weeks and 8 weeks post op**

In the present study post aural wound infection was seen in 6.25% of subjects in cartilage group and 12.5% of subjects in fascia group. There was no significant difference in complications between two groups.

#### Discussion

In the present study the patients with mean age of 29 years age and between 21-30 years were affected more followed by the age between 31-40 years suggesting that the productive age group population are affected more. Gender distribution shows preponderance to the female than male patients in present study which is similar to the study done by Arvinder Singh et al. [8] Laterality distribution suggests that left side disease is more common than the right sided in present study.

In the present study overall rate of graft uptake was 87.4%, it was similar to study by Dhungana A et al, [9] they observed graft uptake of 90% in temporalis fascia group and 92.5% in cartilage perichondrium composite group. In both the groups Graft uptake was similar in the present study. Uptake of the graft depends on the disease type, surgical technique and postoperative care and follow up.

In the present study both the groups showed similar audiological improvement, more so in temporalis fascia group especially in AB gain which is about 13.17 dB between preoperative and 8<sup>th</sup> week postoperatively which was similar to the study done by Sharma N et al [10] in which the AB gain was 15.23dB in temporalis fascia and 18.13dB in cartilage group.

In a similar study done by Gerber MJ et al, [11] it was observed that there was closure of AB gap by 10dB. This is highly significant suggesting the importance of the surgical intervention in the management of COM.

Island cartilage graft also produced equally good results with AB gain of about 11.46 dB. However,

the overall results do not differ significantly, which is similar to the study done by Ruhi Aydin et al [12] in which both the groups showed similar results.

Overall, in the present study, similar structural stability was seen in both groups using temporalis fascia and island cartilage. There was significant improvement in the hearing levels in both group during the follow up period of 3<sup>rd</sup> and 8<sup>th</sup> weeks, highest improvement was seen with closure of AB gap especially with the use of temporalis fascia graft.

Whenever indicated tympanoplasty should be offered for the COM patients to give them dry ear and improved hearing. Selection of graft depending on the experience of the surgeon both temporalis fascia and cartilage grafts are recommended. Follow up period of the patients was short, hence can be potential limitation of the study. Randomized controlled trail would have been an appropriate study design. Further follow ups are required to efficiently know both the graft uptake and audiological improvements.

#### Conclusion

From the study it was concluded that Type 1 tympanoplasty offers an improved hearing results with advantages dry ear. The use of graft for the same depends on surgeon and as for our study audiological outcomes were better with temporalis fascia, although structural uptake was similar in both island cartilage and temporalis fascia grafts. No significant complications noted during our study.

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