

# Comparative Study of Graft Placement between Medial and Lateral to Malleus in Tympanoplasty

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## ABSTRACT

### Introduction

Tympanoplasty is a surgical method, to eradicate middle ear infection and improve its function. In tympanoplasty graft can be placed by overlay, underlay or inter lay technique. In underlay technique the graft material can be placed either medial or lateral to the handle of malleus.

The objective of the study was to compare the outcome of the surgery when the temporalis fascia graft is placed medial or lateral to the handle of malleus, in terms of complete take up of the graft and hearing improvement after the surgery.

### Materials and Methods

A prospective and comparative hospital-based study was done in the Otorhinolaryngology (ENT) department of a tertiary referral hospital of Kolkata, from 1st January, 2021 to 30th June, 2022 (18 months). 60 patients were included in the study.

### Results

We found that association of tympanic membrane status with group was not statistically significant after 1 month of surgery ( $p = 1.0000$ ) and after 3 months of surgery ( $p = 0.6711$ ). Distribution of mean postoperative hearing gain after 3 months of surgery with group was not statistically significant ( $p = 0.3020$ ).

### Conclusion

We found both the techniques are equally effective in terms of complete graft take up and post operative hearing gain after 3 months follow up.

### Keywords

Tympanoplasty; Chronic Otitis Media; Temporalis Fascia; Medial; Lateral; Malleus

Tympanoplasty is a surgical method, to eradicate middle ear infection and improve its function.<sup>1</sup> A main part of tympanoplasty is repair of perforated tympanic membrane (TM) which results mainly from chronic otitis media (COM). Other etiologies include traumatic perforation of the tympanic membrane.<sup>2</sup>

The term tympanoplasty was introduced in 1953 by Wullstein to describe surgical techniques for reconstruction of the middle ear hearing mechanism that have been impaired or destroyed by chronic ear disease.<sup>3</sup> A year earlier, Wullstein had described an operation for repairing tympanic membrane perforations with split thickness skin grafts. Tabb and Shea first innovated positioning of grafting tissue medial to malleus and residue of TM.

Nowadays, three classic techniques are applied in tympanoplasty viz. underlay, overlay and interlay. In the underlay method, which is used more frequently, the graft is placed medial to the residue of tympanic membrane. In overlay technique after the elevation of squamous tissue, the graft is positioned lateral to annulus and fibrous layer of TM residue. The underlay technique is generally more recommended for posterior perforations. It has less risk of lateralization, and more acceptable success rate.

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Overlay technique is not only proper for all types of perforations but also saves the middle ear volume. It also has a good success rate especially in large and anterior perforations.

Among surgeons utilising the ‘underlay’ technique, some prefer to place the graft material lateral to the handle of malleus while the rest prefer to place it medial to the handle of malleus to avoid lateralization of the graft material and to ensure a proper relationship of graft material to malleus.

Chronic otitis media (COM) is characterized by inflammation of the middle ear accompanied by long-term or permanent changes in the tympanic membrane. These changes include perforation, atelectasis, retraction, tympanosclerosis and cholesteatoma. COM can be classified based on whether it involves active inflammation or is associated with a cholesteatoma.<sup>4</sup> This disorder is a major cause of acquired hearing loss, especially in developing countries, and is a major disease entity in the field of otolaryngology. Chronic active or suppurative otitis media affects 65 to 330 million people worldwide, and more than half of these patients have significant hearing impairment. Worldwide, COM is responsible for an estimated 28,000 deaths annually, and is associated with a disease burden involving more than 2 million individuals daily.<sup>5</sup>

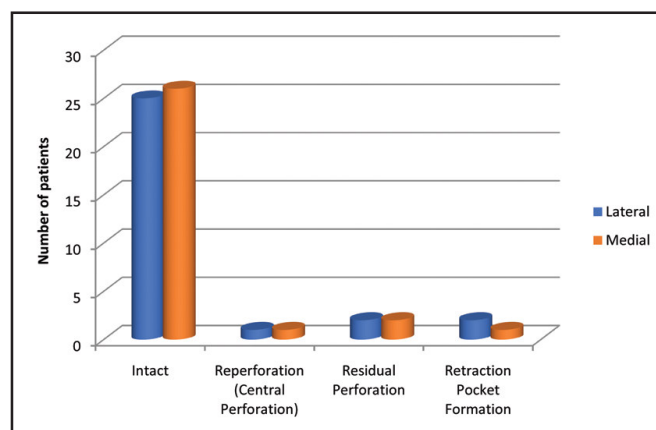
## Materials and Methods

A prospective and comparative hospital-based study was done in the Otorhinolaryngology (ENT) department of a tertiary referral hospital of Kolkata, from 1st January, 2021 to 30th June, 2022 (18 months). Clearance from institutional ethics committee and informed consent from the participants were obtained. First 2 months were utilized for preparatory phase, next 15 months for data collection and last 1 month for statistical analysis. 60 patients undergoing type-I tympanoplasty were selected by simple random sampling as and when they attended the ENT out patient department of our hospital during the study period keeping firm adherence to the inclusion and exclusion criteria. Then they were divided into two groups; 30 patients in lateral group (where graft was placed lateral to the handle of malleus) and 30 patients in

medial group (where graft was placed medial to the handle of the malleus). The patients were evaluated for hearing loss by pure tone audiometry before surgery. After surgery all patients were followed up with clinical examination by otoscopy to see the graft uptake at 1st month and 3rd month. Pure tone audiometry was done to see residual hearing loss at 1 month and 3 months respectively. All data recorded pre-operatively and post-operatively in proforma was analyzed using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5.

## Results

$p$  value  $\leq 0.05$  was considered statistically significant. 30 patients were there in each group. After 1 month of surgery 28 (93.3%) patients had graft in-situ and 2 (6.7%) patients had graft rejected in lateral group and 28 (93.3%) patients had graft in-situ and 2 (6.7%) patients had graft rejected in medial group. Association of tympanic membrane status after 1 month of surgery with group was not statistically significant ( $p = 1.0000$ ). After 3 months of surgery, 25 (83.3%) patients had complete take up of graft without residual perforation, retraction pocket formation or re-perforation in lateral group and 26 (86.7%) patients had complete take up of graft without residual perforation, retraction pocket formation or re-perforation in medial group. But association of tympanic membrane status after 3rd month of surgery with group was not statistically significant ( $p = 0.6711$ ).

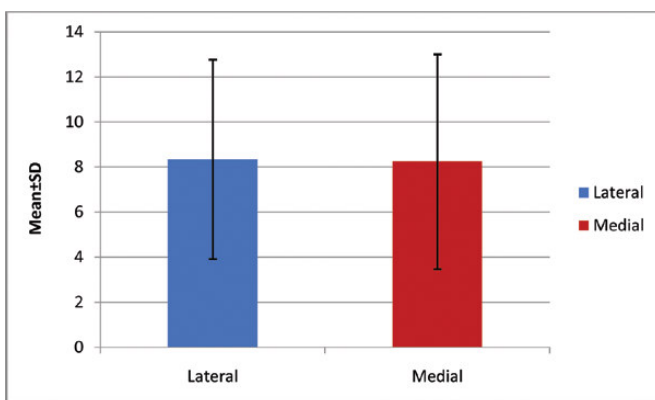


**Fig. 1. Association between tympanic membrane status after 3rd month of surgery in group**

**Table I : Distribution of mean postoperative hearing gain after 3 months of surgery (dB)**

		NUMBER	MEAN	SD	MINI-MUM	MAXI-MUM	MED-IAN	P-VALUE
Postoperative hearing gain after 3 months of surgery	Lateral	30	8.3480	4.4209	0.0000	18.3300	7.2500	0.3020
	Medial	30	8.2427	4.7653	0.0000	21.6600	8.3300	

The mean postoperative hearing gain after 3 months of surgery (mean  $\pm$  s.d.) was  $8.3480 \pm 4.4209$  in lateral group and  $8.2427 \pm 4.7653$  in medial group. Distribution of mean postoperative hearing gain after 3 months of surgery with group was not statistically significant ( $p = 0.3020$ ).

**Fig. 2. Distribution of mean postoperative hearing gain after 3 months of surgery (dB) in group**

## Discussion

In our study, out of 60 patients, most of the patients were [23 (38.3%)] 21-30 years of age. There was no statistically significant difference in age between the groups ( $p = 0.3336$ ). We found that, males [45 (75.0%)] outnumbered females [15(25.0%)] but the difference was not statistically significant ( $p = 0.0668$ ).

Yigit O et al<sup>6</sup> (2005) did a retrospective study in Turkey where 104 patients underwent tympanoplasty. Among them, graft placement was medial to the handle of malleus

in 46 patients and lateral to the handle of malleus in 58 patients. The mean follow-up period was 11 months. In the first group of patients with medial graft placement technique the success rate was 91.5%. In the second group with lateral graft placement technique the success rate was 94.9%. In the patients operated by medial graft placement technique, the air-bone gap decreased 16.55 db. This value was 16.96 db in those operated via lateral graft placement technique.

Rogha M et al<sup>7</sup> (2014) compared graft placement in tympanoplasty medial or lateral to handle of malleus. In this clinical trial which was conducted in Alzahra and Kashani hospitals, between June 2010 and February 2012, 56 patients with chronic otitis media and perforated TM were enrolled in the study in two groups. In Group A patients, the graft material was placed in such a fashion that the malleus handle projected through the graft perforation. Group B had grafting on the lateral side of the malleus. Three months after surgery both groups were examined and tested by audiometry. This study included 28 patients in Group A and 28 in Group B. Overall success rate was 94.64%; 96.42% in Group A, and 92.85% in Group B. Difference of air-bone gap before and after surgery was 16.10 ( $\pm 4.89$ ) in Group A and 15.78 ( $\pm 3.40$ ) in Group B. Difference in improvement of hearing level was not significant between two surgical methods ( $P = 0.442$ ). Both techniques (medial and lateral to malleus handle) of TM grafting are effective with success rates 96.42% and 92.85% respectively.

Our study showed that, tympanic membrane status

after 1st month of surgery was equal in proportion in both the groups and difference between the groups was not statistically significant ( $p = 1.0000$ ) and we also found that, more number of patients had complete take up of graft with intact tympanic membrane; without residual perforation, retraction pocket formation or reperforation after 3rd month of surgery in medial [26 (86.7%)] group compared to lateral [25 (83.3%)], but the difference was not statistically significant ( $p = 0.6711$ ).

In our study, the mean air-bone gap pre-op (db) was lower [22.9593  $\pm$  5.8700] in medial compared to lateral [24.0760  $\pm$  5.1838] though the difference was not statistically significant ( $p = 0.4380$ ). Distribution of mean air-bone gap (db) at 1-month post-op with group was not statistically significant ( $p = 0.8119$ ). Mean postoperative hearing gain after 3 months of surgery was lower [8.2427  $\pm$  4.7653] in medial group compared to lateral [8.3480  $\pm$  4.4209] but the difference between groups was not statistically significant ( $p = 0.3020$ ).

### Conclusion

From our study we can conclude that both the techniques, i.e., placement of temporalis fascia graft, medial and lateral to the handle of malleus are equally effective in terms of

complete graft take up without residual perforation, retraction pocket formation or reperforation and post operative hearing gain after 3 months follow up.

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