

## Original Research Article

# Comparative study between result of temporalis muscle fascia and tragal cartilage perichondrium as a graft material in type 1 tympanoplasty

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## ABSTRACT

**Background:** Leading cause of deafness in India is chronic suppurative otitis media. Most common cause of TM perforation is chronic suppurative otitis media. With this background this study was to compare hearing results, as well as graft takes for commonly preferred reconstruction techniques of the TM (i.e., temporalis fascia vs. cartilage) in tympanoplasty.

**Methods:** The present study consists of 60 cases of C.S.O.M (TTD) which was divided into two groups with 30 cases in each group. In first group type I tympanoplasty was done by Temporalis fascia technique. In second group type I tympanoplasty done by tragal cartilage with perichondrium technique. History and otoscopic examination along with pure tone audiometry was performed preoperatively. Postoperative hearing results and graft uptake were compared between two groups, all surgeries were performed through the post aural approach.

**Results:** Graft uptake results are better with tragal cartilage with perichondrium technique. Hearing improved significantly in both groups. Though this was slightly better in TFT, but not significant statistically.

**Conclusions:** Graft uptake rates are better with the tragal cartilage with perichondrium technique in comparison of TFT and hearing results are almost equivalent with both techniques.

**Keywords:** Temporal fascia, Tragal perichondrium, Tympanoplasty

## INTRODUCTION

The tympanic membrane (TM) is a thin semi translucent membrane, pearly white in colour, lying obliquely in the medial end of the external auditory canal. It separates the outer ear from the middle ear. Tympanic membrane consists of three layers except in the upper part (pars faccida). Outer epithelial layer, middle fibrous layer and inner mucosal layer. Tympanic membrane perforation is a hole in the tympanic membrane. Most common cause of TM perforation is chronic suppurative otitis media. Other

causes include acute otitis media with TM rupture, trauma, or surgical interventions like the placement of a grommet for suppurative otitis media. In addition to hearing loss, TM perforations can lead to ear infection which causes recurrent ear discharge.

The aim of tympanoplasty is to reconstruct the tympanic membrane and the sound conducting mechanism. In 1955, Zoellner and Wullstein used different types of graft for tympanoplasty: Temporalis fascia, skin, fascia lata, vein, perichondrium, dura mater.<sup>1-5</sup> Temporalis fascia

remains the most commonly used material for tympanic membrane reconstruction with a success rate of 93-97% in primary tympanoplasties.<sup>6</sup> In other situations, such as recurrent perforation following tympanoplasty, severe attic and/or posterior uncontrolled retraction pockets with cholesteatoma formation, atelectasis of the tympanic membrane, fascia and perichondrium have been shown to undergo atrophy and subsequent failure, regardless of the placement technique used.<sup>7</sup>

In these cases, many surgeons have used tragal perichondrium as a grafting material on account of its increased stability and resistance to negative middle ear pressure, even in cases with chronic Eustachian tube dysfunction.<sup>8</sup> It has been shown, both in experimental and clinical studies, that tragal perichondrium is well tolerated by the middle ear and shows long-term survival.<sup>9,10</sup>

The aim of this study was to compare hearing results, as well as graft takes for commonly preferred reconstruction techniques of the TM (i.e., temporalis fascia vs. cartilage) in tympanoplasty.

## METHODS

This study was carried out in the Department of ENT and Head and Neck Surgery, UPUMS, Saifai, Etawah, UP, India from October 2016 to October 2017. Detailed history and examination were carried out the patients having pure conductive hearing loss were posted for type 1 tympanoplasty. Two groups of 30 each were made – Temporalis fascia technique (Group A) and tragal perichondrium technique (Group B). Detailed history and examination were carried out the patients having pure conductive hearing loss were posted for type 1 tympanoplasty.

### Inclusion criteria

Inclusion criteria were patient suffering from CSOM (TTD); ear dry for at least 21 days with a large central perforation; patient having pure conductive hearing loss; who give consent for surgery.

### Exclusion criteria

Exclusion criteria were history of previous ear surgery; mixed hearing loss; having any middle ear pathology apart from central perforation were excluded; who not give consent for surgery.

### Surgical procedure

In both group tympanoplasty was done by post-aural approach by the same surgeon under local anaesthesia. Xylocaine sensitivity was performed in all patients before surgery. 2% xylocaine with adrenaline (1:200,000) was used as the local anesthetic agent and 4% xylocaine with adrenaline used as topical anesthetic agent.

In patients where the Temporalis fascia was used as a grafting material, the graft was taken from the ipsilateral temporalis muscle. In group B patients tragal cartilage with posterior layer of perichondrium was taken. Anterior layer of perichondrium was not included in graft. The tragal cartilage was thinned to 0.5 mm and the perichondrium was spread out laterally, after exposing the middle ear and checking the ossicular integrity and mobility, the perforation was closed using the graft material. Gel foam was placed over it followed by aural pack, and the closure of the wound was done in two layers followed by mastoid dressing.

Postoperatively patients were given I.V antibiotics in the form of Amoxyclav 1.2 gm B.D for two days. Then Tab. Amoxyclav 625 mg (amoxicillin – 500 mg and clavulanic acid 125 mg) thrice a day along with Levo-cetirizine and Ibugesic plus for five days. Suture and pack were removed on 7th postoperative day.

## RESULTS

Graft success rate was compared with the graft material used in tympanoplasty. Successful graft uptake in 26 ears with temporal fascia graft and 28 ears with tragal cartilage with perichondrium.

The age range of patient were from 20 to 45 years old. In this study 58% patients were males and 42% were female. Rinne's test was negative in all preoperative patients. Postoperatively tuning fork test was performed at 8th and 12th week in both groups. About 80% of patients show Rinne's positive at the 12th week in TFT group and 70% in TCP group.

Pure tone audiometry at 8th and 12th week postoperatively showed significant improvement in both study groups. In comparison to tragal cartilage perichondrium, tympanoplasty with temporalis fascia had better mean air conduction values though statistically insignificant.

**Table 1: Pure tone audiometry (dB) results with temporal fascia and cartilage palisadetympoplasty.**

	Preoperative	Postoperative (8th week)	Postoperative (12th week)
<b>TFT group</b>	44.44±8.66	29.76±8.28	24.48±6.13
<b>TCT Group</b>	43.24±12.15	31.8±10.55	27.16±10.54

**Table 2: Graft success rates with temporal fascia and Cartilage palisadetympoplasty.**

	Group A	Group B	Total
<b>Successful</b>	26	28	54
<b>Unsuccessful</b>	04	02	06
<b>Total</b>	30	30	60

## DISCUSSION

A tympanic membrane perforation is hole in the eardrum, TM perforation occurs as a result of chronic suppurative otitis media. Other causes are acute otitis media with TM rupture, trauma, or surgical interventions like the placement of a pressure equalization tube. In the 1950s, Wullstein and Zoellner popularized tympanoplasty, different type of materials have been used for the procedure including fascia, skin, vein, dura, and cartilage. Currently, temporalis muscle fascia is the most frequently used grafting material in tympanoplasty.<sup>1,2</sup>

Mostly TM perforations if not heal with in three months is unlikely to close spontaneously be considered a chronic perforation, making the surgical repair an appropriate step. The pre-requisites for a successful tympanoplasty are:

1. Repair of defect so as to close the tympanic cavity. Thus, preventing recurrent middle ear infection.
2. Neo-tympanum should be able to resist middle ear pressure changes in eustachian tube dysfunction where the perforation is large.
3. The acoustic properties of the Neo-tympanum should be similar to a healthy tympanic membrane.

Temporalis fascia and perichondrium alone often fails as graft material for tympanic membrane reconstructions because of their low stability and tendency to atrophy over the years.<sup>11</sup> However, cartilage graft is characterized by its resistance to resorption, retraction and negative pressure in middle ear.<sup>11,12</sup>

**Table 3: Advantages of temporalis fascia versus tragal cartilage perichondrium.**

Advantages of temporalis fascia	Advantages of tragal cartilage perichondrium
<b>(1) from the same incision large graft can be taken up.</b>	(1) Easily available in operative field.
<b>2) It is thin, relatively strong and withstands the rigors of the hearing process</b>	(2) Easy to shaped.
<b>3) Metabolic rate low</b>	(3) No extra cost.
	(4) Large graft can be harvested from tragus and concha.
	(5) It has its own blood supply.

In 2005, Couloinger et al performed 59 cartilage graft tympanoplasties and 20 temporalis fascia graft tympanoplasties, and reported no postoperative hearing difference between the two groups.<sup>13</sup>

In 2004, Gierek et al, worked 112 cases with cartilage and 30 cases with temporalis fascia and observed that

there was no significant hearing difference between the two groups.<sup>14</sup>

Temporalis fascia is ideal in the characteristic, of the primary hearing improvement; it is softer than normal TM, so it is more likely to be retracted or re-perforated after tympanoplasty.<sup>15</sup>

**Table 4: Recent studies on tympanoplasty according to graft material taken up.**

Author	Graft material	Take-up (%)
<b>Dornhoffer<sup>16</sup></b>	Perichondrium	85
<b>Borkowski et al<sup>17</sup></b>	Cartilage, perichondrium	100
<b>Neumann et al<sup>18</sup></b>	Cartilage palisade	100
<b>Indorewala<sup>19</sup></b>	Fascia lata	95
<b>Indorewala<sup>19</sup></b>	Temporalis fascia (TF)	66
<b>Mundra et al<sup>20</sup></b>	TF/perichondrium with cartilage slice	98.94
<b>Present study</b>	Temporalis fascia (TF)	86
<b>Present study</b>	Tragal Cartilage parichondrium	93

In the present study tragal cartilage parichondrium was taken up in 93 % cases. This is higher to previous studies using different graft material.<sup>16-20</sup>

## CONCLUSION

It would be beneficial to use tragal cartilage perichondrium alternative to temporalis fascia. The key seems to be the use of appropriate thickness of cartilage. Cartilage will protect from retraction or re-perforation of the neo tympanum and not hamper conduction of sound. Perichondrium is a tough graft material with good revascularization. The use of cartilage with perichondrium would prevent negative middle ear pressure. This is more important in poor eustachian tube function and in ears with a large perforation.

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