

## Original Research Article

# Type 1 tympanoplasty: does the status of contralateral ear affect the outcome?

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### ABSTRACT

**Background:** The objective of the study was to investigate the effect of contralateral ear status on the success rate (anatomical closure) of type 1 tympanoplasty.

**Methods:** The study is a prospective observational study comprising of 60 patients diagnosed with chronic otitis media, who underwent type 1 tympanoplasty during 2016-2018 in a tertiary care hospital.

**Results:** In our study, contralateral ear was normal in 40 (66.7%) cases & diseased in 20 (33.3%) cases. Success rate of type 1 tympanoplasty in patients with normal contralateral ear was 90% (n=36) but success rate was only 60% (n=12) in diseased contralateral ear. This was statistically significant (p=0.006).

**Conclusions:** Our study revealed that the status of the opposite ear is an individual prognostic factor for type 1 tympanoplasty. In other words, graft-healing rates are poorer in individuals whose opposite ears are atelectatic or perforated because of chronic otitis media.

**Keywords:** Tympanoplasty, Eustachian tube

### INTRODUCTION

Myringoplasty is a surgical procedure with primary aim of repairing the tympanic membrane without any other surgical manipulation in the middle ear.<sup>1</sup> In 1878, Berthold proposed the term 'Myringoplastik'.<sup>2</sup> Zollner and Wullstein are the pioneers of tympanoplasty whose work taught us to look beyond the eardrum.<sup>3,4</sup>

Tympanic membrane perforation is one of the most common cause of recurrent ear discharge and hearing impairment.<sup>5</sup> Type 1 tympanoplasty is done in mucosal variety of COM, where perforation involves the pars tensa with intact annulus. In these conditions, it serves to separate the middle ear cavity from external environment thereby preventing contamination by pathogens and

recreates the vibratory area of tympanic membrane thus improving hearing.

The eustachian tube ventilates the middle ear cleft. Its dysfunction leads to the development of middle ear disease such as acute otitis media (AOM), otitis media with effusion (OME) and chronic otitis media (COM).<sup>6</sup> Hence, the knowledge of the Eustachian tube's functions is essential for assessing the likely success of any middle ear surgery. But no test is considered as gold standard for diagnosis of Eustachian tube dysfunction. Thus, the status of contralateral ear can serve as a valuable indicator of Eustachian tube dysfunction.

For decades various factors that directly or indirectly indicate Eustachian tube dysfunction has been studied to predict the success of ear surgery.<sup>7,8</sup> In this study we

investigate the effect of contralateral ear status on the success rate (anatomical closure) of type 1 tympanoplasty.

## METHODS

This is a prospective observational study of 60 patients who attended the OPD of our institute and were operated for tympanic membrane defect during the period of April 2016 to March 2018. The patients were followed up for six months from the date of operation. Ethical clearance for the study was obtained from the Institutional Ethics Committee. Patients were chosen randomly from those fulfilling the inclusion and exclusion criteria (described later). Informed written consent was obtained from each patient.

The inclusion criteria were patients belonging to both genders of ages 18 to 60 years, with chronic otitis media and residual perforation following ASOM, having dry tympanic membrane perforation with good cochlear reserve and healthy middle ear mucosa. The patients who were excluded from the study were those with failed type 1 tympanoplasty with or without mastoidectomy, cholesteatoma, retraction pockets or associated mastoiditis, patients with active upper respiratory tract infection, for example: sinusitis, tonsillitis or pharyngitis, etc. and anatomical defects like deviated nasal septum, deformity of external auditory canal or with any chronic systemic debilitating illness.

Apart from routine investigations and pure tone audiometry, tympanometry was done in all patients in order to assess the status of the contralateral ear. Besides otoendoscopy, tympanometry gives us valuable clues, for example a type 'C' curve indicates negative middle ear pressure and a probable Eustachian tube dysfunction or a type 'B' curve may indicate tympanic membrane perforation or middle ear effusion.

After detailed examination of diseased and contralateral ears of 60 patients, we divided the patients into two groups.

- Normal contralateral ear—patients with normal tympanic membrane.
- Diseased contralateral ear- middle ear effusion, TM retraction, TM perforation.

All patients underwent type 1 tympanoplasty under local anaesthesia using 2% lignocaine with adrenaline in 1:1,00,000 concentration. To exclude other confounding factors all cases were operated by the same surgeon with assistant. Type 1 tympanoplasty was done via post-auricular approach under operating microscope. Post-aural Wilde's incision was made 1 cm behind the retro-auricular groove. Temporalis fascia graft was harvested. Margins of perforation were freshened. Superiorly, canal incision is made anterior to the lateral process of malleus and inferiorly at 6 'o' clock position. After elevation of

tympano-meatal flap, middle ear mucosa and the ossicular chain were inspected (Figure 1). Ossicular chain mobility was confirmed by checking the round window reflex. Graft was placed by "underlay" technique. Gelfoam packing was used to support the graft (Figure 2). All patients were discharged after 2 days and followed up after one week. Intact tympanic membrane after four weeks of surgery was documented as successful anatomical closure. However, the patients were followed up for a period of six months.



**Figure 1: View of ossicular chain and middle ear mucosa of left ear after elevation of tympanomeatal flap.**



**Figure 2: Temporalis fascia graft placed by "underlay" technique in right ear and supported with gelfoam.**

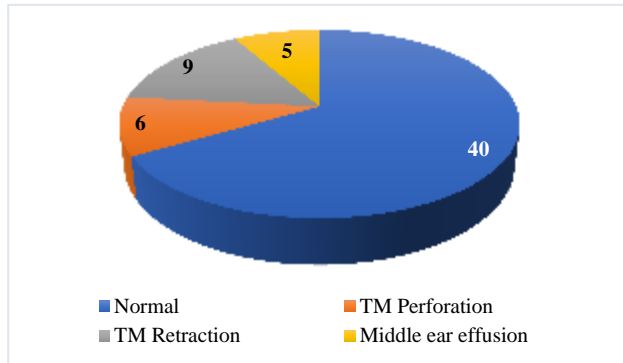
For statistical analysis data was analysed by SPSS (version 24.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism version 5. Data has been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Paired t-test was used for paired samples. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate.  $P \leq 0.05$  was considered as statistically significant.

## RESULTS

Sixty consecutive patients fulfilling the inclusion criteria underwent type 1 tympanoplasty between April 2016 to March 2018. For statistical analysis, we divided the

patients into two groups- 1. Normal contralateral ear 2. Diseased contralateral ear.

In this study the age range of patients were from 18 to 60 years. 68% patients belonged to 21–30 years of age. In our study, male: female ratio was 1.3:1. Left sided disease was predominant in our study and right: left ratio was 1:1.3.



**Figure 3: Statistical representation of status of contralateral ear.**

In our study contralateral ear was normal in 66.7% (n=40) cases and diseased in 33.3% (n=20) cases. Among 20 diseased contralateral ears we found, TM perforation in 6 cases, TM retraction in 9 cases and middle ear effusion in 5 cases (Figure 3).

**Table 1: Status of contralateral ear and corresponding outcomes.**

		Result		Total
		Failure	Success	
		N (%)	N (%)	N (%)
<b>Contra-lateral ear</b>	Normal	4 (10.0)	36 (90.0)	40 (100.0)
	Diseased	8 (40.0)	12 (60.0)	20 (100.0)
<b>Total</b>		12 (20.0)	48 (80.0)	60 (100.0)

Pearson Chi-Square Test: P value → 0.006 (<0.05)

Overall success rate of type 1 tympanoplasty in our study was 80% (n=48) and failure was 20% (n=12). But success rate in patients with normal contralateral ear was 90% (n=36) and success rate was only 60% (n=12) in diseased contralateral ears. This was statistically significant (p=0.006) (Table 1).

**DISCUSSION**

The surgical outcome of middle ear surgery has been a matter of great concern to the otologist since decades. The graft uptake or the anatomical closure of a perforated ear happens to be one the most important outcomes with paramount importance to both the patient as well as the operating surgeon. There is an interplay of several factors contributing to the final result. The outcome of type 1 tympanoplasty in paediatric population is influenced by a

number of confounding factors, for example concomitant adenoid hypertrophy, anatomical vulnerability to recurrent middle ear infections and technical difficulties faced during surgery (anatomical disposition). A number of existing studies have identified status of contralateral ear as a poor prognostic factor for tympanoplasty. But most of these studies were done on paediatric patients. Our study is aimed at finding out the effect of contralateral ear status on type 1 tympanoplasty in adult population.

In our study, success rate was 80% (n=48) and failure was 20% (n=12). In literature, the success rates have been found to vary widely. A summary of review of literature of the same is presented in Table 2.

**Table 2: Success rates of type 1 tympanoplasties: a review of literature.**

Study	Success rate (%)
Sirena et al <sup>9</sup>	80
Wasson et al <sup>10</sup>	80.8
Aviles Jurado et al <sup>11</sup>	75.9
Awan et al <sup>12</sup>	84
Biswas et al <sup>13</sup>	85
Shaikh et al <sup>14</sup>	81
Black, Wormald et al <sup>15</sup>	78
Kotecha et al <sup>16</sup>	82.2
Vartianinen et al <sup>17</sup>	88
Sheehy et al <sup>18</sup>	97

In spite of having such diversity, our success rate of tympanoplasty corresponds with majority.

Onal et al found that the success rate of myringoplasties of the patients with a pathological opposite ear (perforation or atelectasis) was 52%, whereas it was 80% in the group of the patients whose opposite ear was normal at the time of operation.<sup>19</sup>

Aviles Jurado et al in their study demonstrated that the success rate in pathologic contralateral ear was 65.38% but with healthy contralateral ear it was 93.54%, and it was statistically significant.<sup>11</sup>

Khan et al showed 69 cases with unilateral perforation the success rate was 88.4% and for 44 patients with bilateral perforations it was 77.3%.<sup>20</sup> There is a significant difference between the two categories.

In our study, success rate in patients with normal contralateral ear was 90% (n=36) but success rate was only 60% (n=12) in diseased contralateral ears, which was found to be statistically significant (p=0.006).

Dangol et al in their study found that the graft uptake was 88.2% with normal opposite ear. Whereas the uptake with contralateral ear having tubotympanic type of chronic otitis media was 75%. Graft uptake was significantly

poor when the contralateral ear had tubotympanic disease ( $p < 0.05$ ).<sup>21</sup>

However, in contrary to our findings and the studies mentioned above, Albera et al and Chandrasekhar et al found no statistical relationship between the condition of the contralateral ear and the final surgical outcome.<sup>22,23</sup>

There is broad consensus about the importance of tubal function in the outcome of tympanoplasty. It is proposed that the state of the contralateral ear is a vital prognostic factor because it may indicate tubal dysfunction, and thus would mark a predisposition to surgical failure. In such cases, balloon eustachian tube dilatation in the same sitting as the tympanoplasty may prove to be beneficial and enhance the surgical outcome.<sup>24</sup> Multi-centric randomized control trials are required in the days to come to establish its clinical efficacy.

## CONCLUSION

Tubal assessment should be carried out systematically in all patients undergoing tympanoplasty. However, there are no affordable and accessible means to evaluate tubal function. For this reason, we consider the condition of the contralateral ear as an indicator of this function. It is feasible and readily accessible. Moreover, it helps to prognosticate the possible surgical outcome, which is especially helpful during pre-operative patient counselling. Thus, the status of the contralateral ear is indeed invaluable.

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