

# Type I Tympanoplasty - Underlay Technique and Results

Naveed Aslam, Javaid Iqbal, Khalid Mehmood

Department of ENT and Head & Neck Surgery, Shaikh Zayed Hospital, Lahore

## SUMMARY

*Type I Tympanoplasty is a commonly performed procedure in otological surgical practice. It is performed to clear disease from the middle ear and seal central type of tympanic membrane perforation. We present here a review of our experience of 34 cases of tubo-tympanic type of chronic suppurative otitis media with central perforation of the eardrum who were treated with Type I Tympanoplasty with underlay technique using temporalis fascia as a graft material. The selection criteria, technique and results of surgery are discussed here in detail and compared with international studies. This underlay technique with temporalis fascia graft was found to be successful with total closure of perforation in 94% of cases and significant improvement in hearing thresholds in 74% of cases. There was no anaesthetic or surgical complication of the procedure in this series.*

*In conclusion Type-I tympanoplasty with temporalis fascia graft using careful underlay grafting technique gives good anatomic and functional results in patients with central perforation of tympanic membrane.*

## INTRODUCTION

**C**hronic suppurative otitis media (Chronic SOM) of tubo-tympanic type presents with recurrent ear discharge and hearing loss associated with central perforation of the eardrum. It is one of the commonest ear problems in ENT practice especially in third world countries. Its management with surgery is still considered to be a fairly major undertaking and its results are seen with suspicion and generally not as good as reported in the world literature.

There are many factors influencing the results of tympanoplasty, especially in children. This includes age of the patient, size and site of the perforation and surgical technique but their exact role is unclear<sup>1-3</sup>. Furthermore, there is some disagreement as to the timing of the procedure. Some surgeons prefer to perform surgery sooner to prevent disease progression, ossicular chain erosion, formation of cholesteatoma, loss of speech development in children and allow activities like swimming<sup>1</sup>. There are variations in surgical technique. Endaural and postaural approaches have been used with underlay or overlay techniques,

although underlay technique is now universally accepted and preferred method as it allows removal of disease from the middle ear, inspection of ossicular chain and minimizes risk of postoperative cholesteatoma formation which has been seen with overlay technique<sup>13</sup>.

The aim of this retrospective study was to evaluate the surgical and functional results of tympanoplasty and assess the factors potentially influencing the outcome.

## MATERIALS AND METHODS

This is a retrospective study of 34 patients who underwent Type I Tympanoplasty for central perforation of the eardrum in the department of ENT and Head & Neck Surgery, Shaikh Zayed Hospital, Lahore from June, 1998 to Dec, 2001. All cases were selected, operated and followed up by the same surgeon (NA).

The selection criteria included patients with central perforation with significant history of recurrent otitis media and conductive hearing loss. The exclusion criteria were: presence of cholesteatoma, ossicular chain abnormalities,

children below the age of 10 years and the only hearing ear. The age ranged from 14 years to 45 years with mean age of 20 years and four months. The age distribution is given in Table 1. There were 15 male and 19 female patients (Table 2). For the purpose of this study, each ear was considered separately. The clinical characteristics of the perforations and the contralateral ear are given in Table 3.

**Table 1: Age distribution of patients**

Age (years)	Number	Percent
10 - 19	8	24%
20 - 29	13	38%
30 - 39	9	26%
40 - 49	4	12%

**Table 2: Sex distribution of patients**

Sex	Number	Percent
Male	15	44%
Female	19	56%

All patients had preoperative hearing evaluation with pure tone audiometry with air and bone conduction thresholds. Average of three frequencies i.e, 0.5, 1.0, 2.0 kHz was used to calculate mean air conduction, mean bone conduction and air-bone gap.

The same surgical procedure was done in all cases. An endaural incision with conchomeatal flap was made. Temporalis fascia graft was taken. Edges of the perforation was freshened. A tympanomeatal flap was raised with some modifications for subtotal perforations. Ossicular chain was inspected and disease or granulations were removed from the middle ear. An underlay technique was used to lay graft on gelfoam in the middle ear. Tympanmeatal flap was replaced and ear canal was packed with a ribbon guaze impregnated with BIPP. The skin

stitches were removed after 6 days and the pack was removed after 2 weeks.

The patients were followed after 2 weeks, 6 weeks and then 3 monthly. Postoperatively, patient's hearing thresholds were assessed 2 months after the surgery and compared with preoperative hearing thresholds.

Anatomical results were assessed by presence or absence of residual perforation. Functional outcome was based on closure of air-bone gap.

**Table 3: Clinical characteristics of the perforations and the contralateral ear**

Characteristics	Number	Percent
No. of procedures:		
Right ear	20	59%
Left ear	14	41%
Size of perforation:		
= 25% (small)	2	6%
50% (medium)	15	44%
= 75% (subtotal)	17	50%
Location of perforation:		
Anterior	5	15%
Posterior	4	12%
Antero-inferior	7	21%
Subtotal	19	56%
Status of contralateral ear:		
Normal	26	76%
Perforation	8	24%

## RESULTS

Of the 34 ears operated, complete closure of perforation was achieved in 32 cases. The overall anatomical success rate was 94% (Table 4). The 2 failures (6%) were in patients with subtotal perforations who were found to have small, pinhead residual perforations. Functional results were assessed by comparing pre and post operative hearing tests (Table 5). Mean air conduction thresholds significantly improved postoperatively in 25 patients (74%) with complete air-bone gap closure in 8 patients (24%). There was no improvement of hearing in 9 patients (26%) but

hearing remained the same. There was no case where there was deterioration of hearing thresholds or sensorineural hearing loss (Table 6). There were no other surgical or anaesthetic complications.

**Table 4: Results of surgery**

Characteristics	Number	Percent
Anatomical result:		
Complete closure	32	94%
Residual perforation	2	6%
Functional result:		
Hearing Improvement (air-bone gap = 15dB)	25	74%
No hearing improvement	9	26%

**Table 5: Results of preoperative and postoperative audiometric assessment**

	Preop.	Postop.
Mean air conduction threshold	45 dB	30 dB
Mean bone conduction threshold	15 dB	15 dB
Mean air-bone gap	30 dB	15 dB

**Table 6: Effect of surgery on air-bone gap**

Air-bone gap (dB)	Number	Percent
Closed (no A-B gap)	8	24%
Reduced (= 15 dB gap)	17	50%
No change	9	26%

## DISCUSSION

Type I Tympanoplasty, often called myringoplasty, is a standard and universally accepted method of closing central type of perforations of the eardrum. Truly speaking, the

term myringoplasty is reserved for any operation performed to close the perforation without inspection of ossicular chain and removal of disease from the middle ear cavity. This includes onlay tympanoplasty, fat graft myringoplasty etc. Tympanoplasty, generally, refers to a procedure that involves removal of disease from the middle ear, closure of perforated eardrum and reconstruction of ossicular chain if required. There are 5 types of tympanoplasties described in the literature<sup>20</sup>. Type I tympanoplasty refers to closure of tympanic membrane perforation with clearance of disease from middle ear where there is no abnormality of the ossicles.

Since the introduction of tympanoplasty in 1952 by Zollner<sup>5</sup> and Wulstein, several surgical methods, approaches and graft materials have been described. The middle ear can be approached via an endaural or postaural incision. Temporalis fascia and tragal perichondrium are the most commonly used materials for the purpose of grafting<sup>4</sup>. It is easily available through the same incision and successful closure is anticipated in approximately 90% of primary tympanoplasties<sup>6</sup>. However in certain clinical conditions like atelectatic ear drums, cholesteatoma, revision tympanoplasty, the fascia has been shown to undergo atrophy and subsequent failure<sup>7,8</sup>. In such situations, composite cartilage-tragal perichondrium grafts have been used with good results. Fat graft myringoplasty could be a good alternative in cases with a small perforation of the eardrum with a success rate as high as 80%<sup>9</sup>.

There is no clear consensus on the optimum age at which tympanoplasty can be successfully performed in children. There is some evidence that eustachean tube may not be fully developed and functional till the age of 8 years<sup>11</sup>, although the importance of eustachean tube function in predicting the outcome after myringoplasty remains unclear.

Sade et al<sup>12</sup> showed a significant relationship between size of the perforation and success of operation. By contrast Berger et al and some other authors<sup>13,14</sup> did not find a significant difference between perforations that occupied more than half of the tympanic membrane and those covering a smaller area.

The site of perforation does not statistically affect outcome as supported by many studies<sup>15</sup>, however a higher failure rate has been observed and reported by some authors with anterior perforations<sup>16,17</sup>. This may have been due to limited

vascularization of the anterior part of the eardrum<sup>18</sup>.

Another important prognostic factor is presence or absence of infection at the time of surgery. Most surgeons prefer to have a reasonably dry ear before performing tympanoplasty. Although it has been documented that the presence of mucopurulent ear discharge at the time of surgery reduces the success rate for tympanoplasty<sup>16,19</sup>, some studies contradict this and claim success rates to be comparable whether the ear is wet or not<sup>7</sup>.

In our study, overall success rate was 94% which is comparable to international studies. In various studies, success rate has been reported to range from 75.3% to 92%. The size of the perforation seems to be an important prognostic factor as both failed grafts occurred in patients with nearly total perforations. There was a significant improvement of hearing thresholds, reduction of air-bone gap to =15dB, in 74% of patients. There was no surgical or anaesthetic complication of the procedure.

## CONCLUSION

Type I tympanoplasty with temporalis fascia graft, using careful underlay grafting technique, gives good anatomic and functional results in patients with central perforation of tympanic membrane (Tubo-tympanic type of Chronic SOM). Preoperative evaluation of the ear, preferably under the microscope, control of ear infection, and hearing assessment are important considerations before performing such surgery. Age of the patient, size of the perforation and presence or absence of ear infection seem to be important factors predicting the outcome of this surgery. Careful selection and meticulous surgical technique should achieve successful closure of the perforation in more than 90% of cases with significant hearing improvement in more than 75% of cases.

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## Address for Correspondance:

Dr. Naveed Aslam  
Assistant Professor  
Department of ENT and Head & Neck Surgery,  
Shaikh Zayed Hospital and Federal PGMI, Lahore,  
Pakistan