

## **A study of preoperative and postoperative assessment of hearing following Type 1 Tympanoplasty**

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### **I. Introduction**

Chronic otitis media is a longstanding infection of the middle ear cleft characterized by persistent or recurrent aural discharge, deafness and perforation of tympanic membrane. Mucosal type of chronic otitis media can be managed in two ways, conservative and surgical management. The aim of the middle ear surgery for hearing is reduction in the patient's hearing disability, not just closure of the air-bone gap.<sup>(1)</sup> Small perforations usually heal spontaneously but when the edges of the perforation are covered by stratified squamous epithelium, a perforation becomes permanent and does not heal spontaneously.<sup>(2)</sup>

“Tympanoplasty is an operation to eradicate the disease in the middle ear and to reconstruct the hearing mechanism, with or without tympanic membrane grafting.”<sup>(3)</sup>

Procedures such as grafting the tympanic membrane, alone, or in combination with ossiculoplasty (Tympanoplasty with ossicular chain reconstruction), comprise the varying subtypes of tympanoplasty<sup>(4)</sup>. Type-1 Tympanoplasty is performed when there is tympanic membrane perforation without any ossicular damage. Tympanoplasty type 1 can be nearly as straightforward as myringoplasty and for instance, simply involve removal of a retracted membrane in the tympanic cavity or removal of adhesions around the ossicles but it can also be an extensive and time-consuming procedure when combined with mastoidectomy procedures. The incidence of mucosal type of chronic otitis media is high in developing countries because of poor socioeconomic standards, poor nutrition and lack of health education. It is an important cause of hearing impairment<sup>(5)</sup>. More and more attention has been focused on the effectiveness of treatment modalities in relation to the costs. Evaluation of treatment results in reconstructive middle ear surgery with special regard to quality of life aspects is, therefore, of increasing importance. This study deals with functional outcome in a series of patients who underwent type-1 tympanoplasty with underlay technique using temporalis fascia graft.

### **II. Materials and Methods**

The study was a retrospective study involving all patients who underwent Type I Tympanoplasty in ENT Department, AMC-MET Medical college for perforation of the tympanic membrane during the period from December 2019 to November 2020.

#### **Inclusion criteria:**

1. Dry central perforation
2. Pure conductive hearing loss
3. Patients with inactive mucosal type of chronic otitis media
4. Patients in whom type-1 Tympanoplasty performed

#### **Exclusion criteria:**

1. Marginal or attic perforation
2. Mixed or sensorineural type hearing loss
3. Patients with active ear discharge
4. Patients with attico-antral or squamosal type of chronic otitis media
5. Patients with complications of chronic otitis media
6. Patients previously operated for ear surgery

Only 30 patients are included in the present study. All the patients who presented with COM were submitted to an assessment protocol, history taking, specific physical examination (otoscopy and rhinoscopy), audiogram, Examination under Microscope to confirm otoscopic findings.

During history taking, the patients were questioned about the disease onset, period of time spent without otorrhoea, number of otologic infections per year and if they had undergone previous otologic surgeries. Routine investigations apart from Examination under microscope were done in every case, which has provided useful information i.e., perforation size, location, Tympanosclerosis, presence or absence of inflammatory mucosa in the middle ear. Patient was assessed radiologically and pneumatization status of the mastoid bone by X-ray schuller's view. All patients underwent diagnostic nasal endoscopy (DNE) in order to check nasal conditions, to rule out pathologies that prevent proper functioning of the Eustachian tube.



**FIG:1 NORMAL TYMPANIC MEMBRANE**



**FIG:2 LARGE PERFORATION**



**FIG:3 MODERATE CENTRAL PERFORATION**



**FIG:4 ANTERIOR CENTRAL PERFORATION**



**FIG:5 POSTERIOR CENTRAL PERFORATION**



**FIG:6 TEMPORALIS FASCIA GRAFT**

The audiometry was done following standard protocol. Pure Tone Audiogram is done in every selected patient. Average of hearing loss (air conduction threshold) was calculated by selecting 500, 1000 and 2000 Hz frequencies. In this study the Audiometer used was manual. The test was performed in acoustically treated room. Standard headphones were used for air conduction. Patient was given proper explanation of the procedure before audiometry and adequate time was taken for testing.



**FIG:7 AUDIOMETER WITH HEADPHONES**

The operations were performed under local or general anesthesia using a microscope via post-aural incision using underlay technique. Temporalis fascia graft was used as a graft material. All the patients were followed after surgery as usual after 1 week, 6 weeks, 3 months.

### **III. Observation**

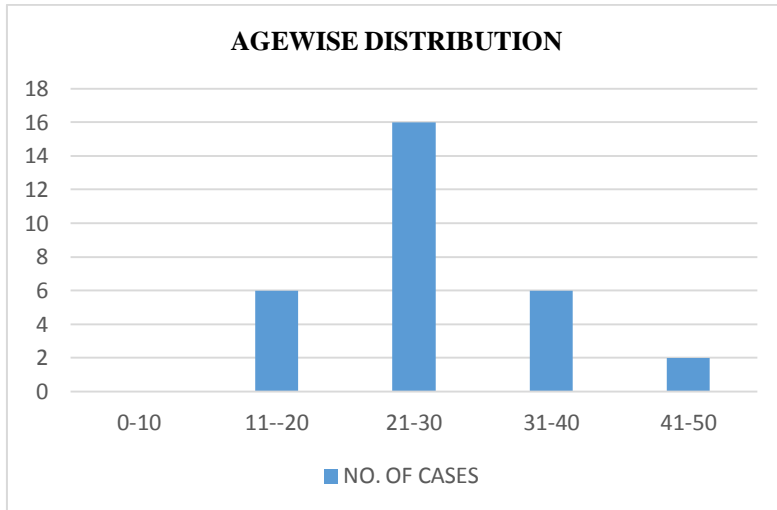
A period of 12 months was taken into study. The detailed information regarding age, sex, clinical findings, pre-operative and post-operative hearing thresholds pre-operative air bone gap findings, complications following surgery, status of graft and post-operative air bone gap findings were noted.

As shown in Table 1 majority of cases 16 (53.33%) were between 21-30 years. Females-16 (53.33%) were more as compared to male-14 (46.66%) patients in the present study as per Table 2. As per Table 3 out of the 30 patients, 13 (43.33%) patients had disease in the right ear, 17 (56.66%) had disease in the left ear; 23 (76.66%) patients had unilateral & 7 patients (23.33%) had bilateral disease (Table 4). Out of the 7 patients with bilateral disease, the ear with more hearing loss was operated on first.

The commonest presenting complaint was intermittent ear discharge in 30 (100%) patients. Hearing loss was seen in only 18 (60%) of patients. Tinnitus was found in 2 (6.66%), pain in the ear in 11 (36.66%) and vertigo in 0% patients as shown in Table 5. On microscopic examination of the operating ears, the presence of moderate central perforation was the commonest finding in 10 (33.3%) patients. Large perforation was seen in 8 (26.66%) patients, Posterior central perforation in 7 (23.33%) patients and anterior central perforation was seen in 5 (16.66%) patients as shown in Table 6.

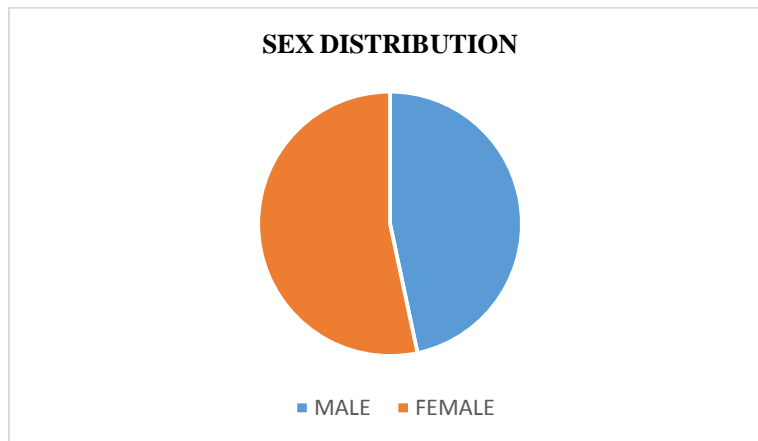
**TABLE:1 AGEWISE DISTRIBUTION OF PATIENTS**

<b>Age group (Age in years)</b>	<b>No. of cases (n=30)</b>	<b>Percentage (%)</b>
0-10	0	0
11-20	06	20
21-30	16	53.33
31-40	06	20
41-50	02	6.66
Total	30	100



**TABLE: 2 SEX DISTRIBUTION**

SEX	NO. OF PATIENTS (n=30)	PERCENTAGE (%)
Male	14	46.66
Female	16	53.33
Total	30	100



**TABLE: 3 DISTRIBUTION OF THE OPERATIVE SIDE OF THE EAR INVOLVED**

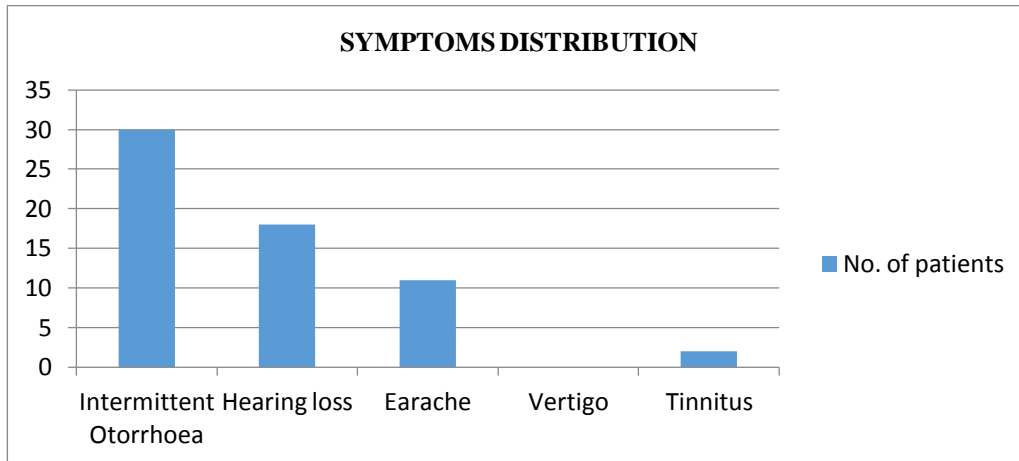
Side	No. of patients (n=30)	Percentage (%)
Right	13	43.33
Left	17	56.66
Total	30	100

**TABLE:4 DISTRIBUTION OF THE LATERALITY OF THE DISEASE**

Laterality	No. of patients (n=30)	Percentage (%)
Unilateral	23	76.66
Bilateral	7	23.33

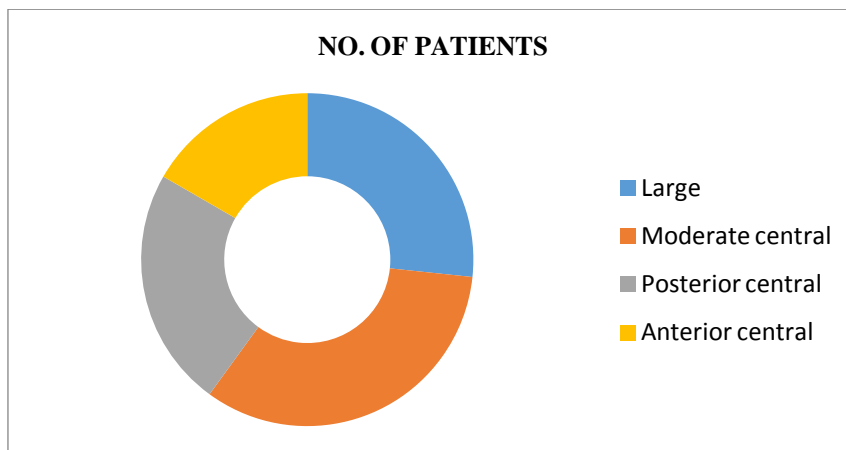
**TABLE 5 : SYMPTOMS DISTRIBUTION**

Sr. no.	Symptoms	No. of patients	Percentage
1	Intermittent otorrhoea	30	100
2	Hearing loss	18	60
3	Earache	11	36.66
4	Vertigo	0	0
5	Tinnitus	2	6.66



**TABLE 6 : LOCATION OF PERFORATIONS**

S. no.	Location of perforations	No. of patients	Percentage
1	Large	8	26.66
2	Moderate central	10	33.33
3	Posterior central	7	23.33
4	Anterior central	5	16.66



**TABLE :7 PREOPERATIVE HEARING THRESHOLD IN OUR STUDY**

S. no.	Hearing threshold (in dB)	No. of pts.	Percentage
1	30-34	13	43.3
2	35-39	15	50
3	40-44	2	6.6

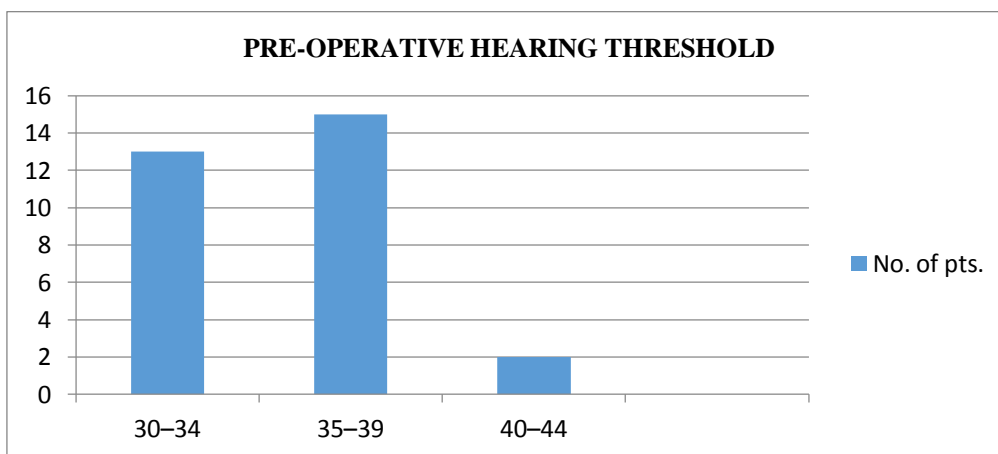
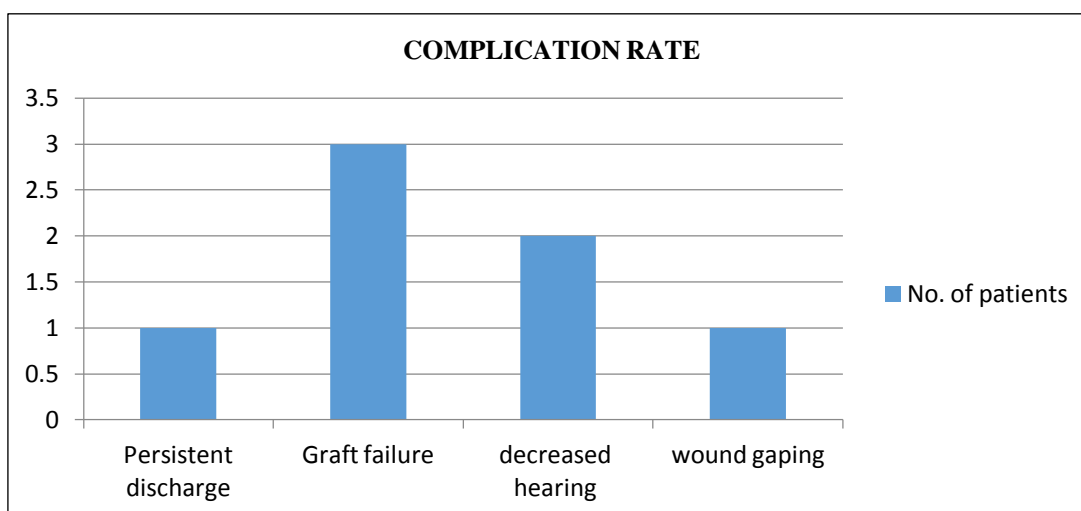


Table 7 shows preoperative hearing threshold of half of the patients 15 (50%) was in range 35-39 dB, whereas in 13 patients (43.3%) hearing threshold was in 30-34 dB range and only 2 (6.6%) patients had hearing threshold in 40-44 dB range.

**TABLE 8 : COMPLICATION RATE**

Sr. no.	Complication rate	No. of patients	Percentage
1	Persistent discharge	1	3.33
2	Graft failure	3	10
3	Decreased hearing	2	6.66
4	Wound gaping	1	3.33



As per Table 8, only 7 out of 30 patients had complications following surgery. 3 patients (10%) had graft defect, 2 patients (6.66%) had residual hearing loss. 1 (3.33%) patient had wound gaping and 1 (3.33%) patient had persistent discharge.

**TABLE:9 GRAFT UPTAKE RATE**

Tympanic membrane		Number of patients (n=30)	Percentage (%)
Graft uptake		27	90
Graft failure (total=3)	Complete graft failure	0	0
	Medialization of graft	2	6.66
	Residual perforation	1	3.33

Table 9 shows 27 (90%) out of 30 patients had successful graft uptake. 3 (10%) patients had graft failure out of which 2 patients (6.66%) had medialization of graft and 1 patient (3.33%) had residual perforation.

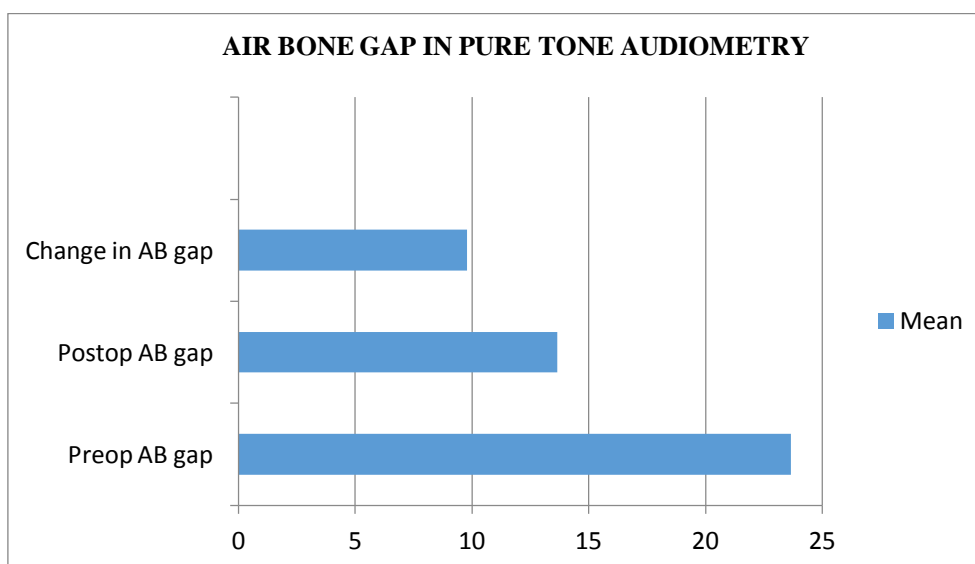
**TABLE:10 POSTOPERATIVE HEARING THRESHOLD**

Sr. no.	Hearing improvement in dB	No. of patients	Percentage (%)
1	0-25 (normal range)	26	86.6
2	26-40 (mild deafness range)	4	13.3

**TABLE:11 AIR BONE GAP IN PURE TONE AUDIOMETRY**

Sr. No.	Air bone gap	Mean (in dB)
1	Preop Air bone gap	23.66
2	Postop Air bone gap	13.66
3	Change in Air bone gap	9.8

As per Table 10, post operatively in 26 (86.6%) out of 30 patients hearing improvement occurred in normal range. Only 4 patients (13.3%) were in mild deafness range. Mean of preoperative Air bone gap was 23.66 dB, whereas postoperatively air bone gap was 13.66 dB. Improvement in air bone gap was 9.8 dB.



#### IV. Discussion

The present study showed that out of 30 cases, 21-30 years age group people were high (53.33%) with the mean age being 24.8 years. Indicating the fact that CSOM is mainly the middle ear infection which tends to occur more in early decades of life and resolves to leave permanent perforations with conductive hearing loss in many cases. This finding is consistent with the other studies called M. Mohamad et-al<sup>(6)</sup> in which commonly affected age group was 21-30 years and mean age was 28.5 years. In other studies like Biswas et-al<sup>(7)</sup> the lowest age was 12 years and the highest was 46 years, whereas mean age was 29 years, Joshi et-al<sup>(8)</sup> the lowest age was 12 years and the highest age was 42 years and mean age was 25.5 years.

In our study male: female ratio was 1:1.14, which goes well with study by Gaurav Batni<sup>(9)</sup> et-al in which male: female ratio was 1:1.4. In which 41% of male and 59% of females were affected. Studies conducted by Islam et-al<sup>(10)</sup>, MR Dawood et-al<sup>(11)</sup>, H. Lokhna et-al<sup>(12)</sup> had similarly female preponderance whereas in other studies like Shetty et-al<sup>(13)</sup>, M. Mohamad et-el<sup>(6)</sup> had male preponderance.

In our study intermittent otorrhoea was present in 100% (30) patients which was similar with studies like M. Mohamad et-al<sup>(6)</sup> and Shetty et-al<sup>(13)</sup>, Lokhna et-al<sup>(12)</sup>. Tinnitus was present in 7% of cases whereas in study by Shetty et-al,<sup>(13)</sup> it was present in 18% of cases and in study by Lokhna et-al<sup>(12)</sup> – 5.4% of cases. In our study ear ache was present in 37% of cases whereas in study by Shetty et-al<sup>(13)</sup> earache was present in 29% of cases.

Large perforation was seen in 8 (26.66%) cases, moderate central in 10 (33.33%) cases, posterior central in 7 (23.33%) cases, anterior central in 5 (16.6%) cases. In study by Biswas et-al<sup>(7)</sup> 28.33% anterior central, 28.66% posterior central and 45% subtotal perforation were seen. Whereas in Joshi et-al<sup>(8)</sup> 36.53% anterior central, 34.61% posterior central and 28.84% subtotal perforation were seen. Posterior perforation had a greater hearing loss than anterior perforation. Probably because of round window exposure and higher incidence of ossicular fixation.<sup>(14)</sup>

Most common complication was graft failure and decreased hearing, 10% and 6.66% of cases respectively in our study. Graft take up rate was 90%. In graft failure medialisation of graft was seen in 2 (6.66%) cases whereas residual perforation was seen in 1 (3.33%) cases. In study by Biswas et-al<sup>(7)</sup> had graft take up rate 82.69% whereas total graft failure rate was 17.30%. In which complete graft failure was seen in 2 (3.85%) cases, medialization in 3 (5.77%) cases and residual perforation was seen in 4 (7.70%) cases. Higher rate of graft failure seen with anterior perforation which is due to limited vascularization of anterior part of ear drum and limited access to this perforation as well as difficulty in graft placement<sup>(8)</sup>.

In our study preoperative hearing AC threshold was in 35-39 dB range in 50% of patients, mean preoperative AC threshold was 32.5 dB. Whereas in studies by Biswas et-al<sup>(7)</sup> mean preoperative threshold was 34dB, in Joshi et-al<sup>(8)</sup> it was 38.69dB. Mean postoperative AC threshold in our study was 23.5 dB, whereas in studies conducted by Biswas et-al<sup>(7)</sup> it was 24 dB, Joshi et-al<sup>(8)</sup> it was 30.35 dB.

In our study mean preoperative AB gap and postoperative AB gap was 23.66 dB and 13.66 dB respectively and mean of change in AB gap was 9.8 dB. In studies by Biswas et-al<sup>(7)</sup> mean of change in AB gap was 11 dB and in Joshi et-al<sup>(8)</sup> it was 10 dB. Thus 1 out of 30 cases had no improvement in postoperative AB gap. 29 out of 30 patients had improvement in hearing threshold after type 1 tympanoplasty.

Majority of patients had been benefited by tympanoplasty in our study. Out of 30 patients 26 patients came into normal range of hearing and only 4 patients were still lying in range of mild deafness due to complications following surgery.

## V. Conclusion

Present study supports that chronic otitis media is most commonly seen in young age group. There is no significant predilection for gender. From our study it seems reasonable to assume that intermittent otorrhoea is the most common symptoms of patients of mucosal type of chronic otitis media and hearing loss is not seen significantly in every patient of mucosal type of chronic otitis media. Posterior perforation has a greater hearing loss than anterior perforation. Hearing improvement was assessed by improvement in Air bone gap in this study by Pure Tone Audiometry and is significantly improved after type 1 tympanoplasty. Type 1 tympanoplasty is a beneficial procedure for hearing improvement in patients of mucosal type of chronic otitis media.

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