ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 10 | October - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

A STUDY OF IMPROVEMENT OF HEARING USING PRE AND POST OPERATIVE PURE TONE AUDIOGRAM , BEFORE AND AFTER TYMPANO-MASTOIDECTOMY

ENT

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ABSTRACT

Chronic suppurative otitis media is a common disease in ENT . It can present as Dischargeing ear ,pain ,decreased hearing etc . For this condition Tympano mastoidectomy is a surgical option ,which can seal the perforation and may help in hearing improvement post operatively . A cross-sectional study was undertaken with an aim to evaluate the improvement in hearing in patients who undergo tympano-mastoidectomy ,with 100 patients were included who fulfilled the inclusion criteria. Pre and post operative Pure Tone Audiometry were compared and there was a statistically significant improvement. **Aim:** To evaluate the improvement in hearing in patients undergoing tympano-mastoidectomy atients and Methods: Patients referred to department of ENT Bhaskar Medical College undergoing Tympano-mastoidectomy surgeries **Results:** The mean age was 36.5± 12.3 years consisting of 71 females and 29 males. The most common diagnosis in the study was unilateral CSOM.The mean preoperative PTA of the right ear was 45.7± 17.7 dB and left ear was 46.64± 15.2 dB. 81% of the subjects underwent Type I tympanoplasty+ cortical mastoidectomy with the graft use being and temporalis fascia in 70% and temporalis fascia+ cartilage shield in 30% . The postoperative PTA was 30.1± 11.1 dB in the right ear and left ear was 28.1± 9.4 db. **Conclusion:** An improvement in the PTA was seen in the study post- surgery which was statistically significant for both right and left ear i.e. $p<0.001$ for both ears respectively. postoperative PTA levels were examined based on the graft used and a significant difference ($p= 0.04$ for both the ears) was seen between them showing temporalis fascia was better than temporalis fascia+ cartilage shield.

KEYWORDS

Tympanoplasty ,Mastoidectomy , Puretone Audiometry , Pre operative ,Post operative

INTRODUCTION

Chronic suppurative otitis media can also cause otorrhea, hearing loss, and otalgia, which can be financially and psychologically burdening on society. Many tympanoplasty surgical techniques have been developed in an effort to combat this and they can help in sealing the perforation and improvement in hearing.

The World Health Organisation (WHO) defines chronic otitis media (COM) as a middle ear cleft infection that lasts for at least two weeks and is accompanied by a non-intact tympanic membrane and drainage. The WHO estimates that between 65 and 330 million individuals worldwide have COM; of these, 50% have hearing loss, and 28,000 pass away each year from complications.[1] A permanent anomaly of the pars tensa or flaccida, most likely the consequence of previous acute otitis media, negative middle ear pressure, or otitis media with effusion, is what is meant to be understood, however broadly, by the term COM. In COM there are mucosal and squamous types, depending on the underlying disease.[2] The disease is predominantly seen in low- and middle-income countries; globally, its prevalence ranges from 4% to 33.3%, while in India, it is 7.8%.[3,4] Because of poorer socioeconomic conditions, inadequate nutrition, and a lack of health education, developing countries have a higher incidence of chronic otitis media (tubo-tympanic type). [5] In India, it is a primary cause of deafness. Chronic Suppurative Otitis Media is in two variations: A) Tubotympanic (safe or mucosal) and B) Attico-antral Type (unsafe or squamosal)[6].

Alternatively, COM has been divided into two categories: "COM without cholesteatoma" and "COM with cholesteatoma," which represent the mucosal and squamosal forms, respectively. Since the mucosal variety of COM, which is characterised by a central perforation, has been shown in both clinical and experimental settings to result in the formation of cholesteatoma (secondary acquired cholesteatoma; epithelial invasion theory), the classification of COM with/without cholesteatoma seems more reasonable. Ear discharge and hearing loss (conductive or mixed) are common symptoms of COM. Hearing loss is influenced by a number of variables, including cholesteatoma existence and extent, ossicular condition, and the size and location of perforations. Because cholesteatoma generally affects the ossicles and has the property of eroding bone, the squamous variety (COM with cholesteatoma) is associated with problems. [7]

High-resolution computer tomography (HRCT) of the temporal bones and preoperative pure tone audiometry (PTA) provide surgeons information about the kind and level of hearing as well as the ossicular status.

This aids otologists in making decisions on ossicular reconstruction and other surgical planning.[8] But hearing outcome is not only determined by ossicular state. This explains why the best postoperative outcome for hearing following ossiculoplasty may not be achieved if the disease has sufficiently cleared. Other factors that affect the outcome of the hearing test include cholesteatoma, eustachian tube dysfunction, tympanic membrane health, middle ear environment conditions (granulation tissue, mucosal oedema, fluid/glue), external auditory canal health (polyp, granulations, posterior canal sagging), type of tympano-mastoid surgery, and prosthesis material. [9,10].

Several scoring methods, like the middle ear risk index and ossiculo-plasty outcome parameter staging, have been developed to predict the short- and long-term results of ossiculo-plasty while addressing the many previously mentioned concerns. [11].Therefore, ossicular integrity is just one of the many elements that affect hearing, and the preoperative PTA reflects the cumulative effect of these factors on the hearing status. Furthermore, preoperative PTA may even underestimate the true pathology-related hearing loss, such as bridging

by the disease (cholesteatoma and polyp) across the mesotympanum's height. Therefore, factors connected to the disease, the patient, and the surgeon all affect the surgical outcome related to hearing. When providing preoperative counselling to patients and their families, this information should be taken into account.

The primary indication for tympano-mastoidectomy is CSOM. It is a middle ear condition that affects the mastoid, facial nerve, and ET, among other pathologies. Because of this, tympano-mastoidectomy lacks a defined operating technique. The method and approach change based on the pathology and specific case findings. A tympano-mastoidectomy, with or without tympanic membrane grafting, is an operation to remove illness from the middle ear and restore the hearing mechanism. Tympanic membrane grafting may or may not be used in a tympanoplasty, an operation to remove illness from the middle ear and rebuild the hearing mechanism. [12].There are two approaches to treating suppurative otitis media: conservative therapy and surgical management. Not merely closing the air bone gap, but also lessening the patient's hearing impairment, is the goal of middle ear surgery. Small perforations typically heal on their own, but when a perforation becomes persistent and does not mend on its own and the edges are covered in stratified squamous epithelium, surgery is necessary. [13]The surgical procedure known as a tympanoplasty involves rebuilding the tympanic membrane and ossicles as well as curing middle ear disorders. [14] When there is tympanic membrane perforation but no ossicular injury, type-1 tympanoplasty is done. [15] Chronic ear disease processes such as atelectasis of the tympanic membrane, retraction pocket, cholesteatoma, tympanosclerosis, and mastoid granuloma, as well as tympanic membrane perforation brought on by prior middle ear infections, should be treated by tympanoplasty, either with or without mastoidectomy. [16].The primary treatment for this condition is thought to be tympano-mastoid surgery. Furthermore, it works well to manage infection and stop recurrence. For example, success rates above 80–90% have been recorded by researchers. [12,17]

RATIONALE OF THE STUDY : It is widely known in the literature that post-operative hearing outcomes may be unsatisfactory; this is particularly the case in cases with severe ossicular chain lesions, or non-aeration of the middle ear. [18] This has consequently led to a diverse range of grafts, biosynthetic prostheses, and surgical procedures in our practise today to meet this significant rehabilitation difficulty.

In this context, the present study was undertaken to correlate pre-operative and post- operative PTA values in patients with COM, so that the causes of the hearing deficit can be elicited.

AIM AND OBJECTIVES

AIM : To evaluate the improvement in hearing in patients undergoing tympano-mastoidectomy

OBJECTIVES

1. To assess the hearing status of patients with central perforation.
2. To estimate the prevalence of hearing loss in central perforation of tympanic membrane.
3. To study the importance and techniques of various types of tympanoplasty in hearing improvement.
4. To determine the improvement in hearing status after tympano-mastoidectomy

PATIENTS & METHODS

STUDY PLACE

The study was conducted among patients attending Department of ENT (Otorhinolaryngology), Bhaskar medical college and hospital, Moinabad, Telangana

STUDY DESIGN

Cross- sectional study

STUDY PERIOD

July 2022 to January 2024

ETHICAL APPROVAL

Institutional ethical committee approval was obtained prior to the initiation of the study

STUDY POPULATION

All patients with CSOM undergoing Tympano-mastoidectomy who fulfilled inclusion criteria attending ENT OPD at Bhaskar Medical College & Hospital at Moinabad.

INCLUSION CRITERIA: 1: Patients between 16 to 65 years. 2: Central perforation with active/inactive type. 3: Traumatic central perforation with active/inactive type.

EXCLUSION CRITERIA: 1. Patients with Attico-Antral disease **2:** Previously operated ear, residual/recurrent disease**.** 3: CSOM with complications 4: Tumours of the ear 5: Congenital anomalies 6: Patients with moderate to severe sensory neural hearing loss

SAMPLE SIZE : Considering the prevalence of CSOM as 4% in a previous epidemiological study, the sample size was calculated for the study using the formula

$N = 4pq/L^2$ (absolute precision)
P: Prevalence
Q: 1- prevalence
L: Allowable error

- p= 4% = 0.04
- q= 0.96 (1-p)
- L=5% = 0.05

N= 1.96*1.96* 0.04*0.96/0.05*0.05
= 0.1475/ 0.0025
= 60

The minimum sample size required was 60 patients with the above formula. As the study progressed a total of 100 patients were included

STUDY METHODS

- All patients who are evaluated underwent screening for determination of the eligibility to enrolment.
- The subjects who met the criteria of study were told about the nature and purpose of the study, informed consent was taken and socio-demographic information was recorded.
- A research proforma was used to collect data regarding the patients and their results.
- All the patients who presented with symptoms and signs suggesting CSOM were supervised based on a detailed history taking, clinical examination(otoscopy and rhinoscopy), audiogram, Examination under Microscope to better visualize the tympanic membrane status.
- During history taking, the patients were questioned about onset of disease,period of time spent without otorrhea, number of otologic infections per year and if they had undergone any previous otological surgeries.
- Investigations yield information such as the size of the perforation (the percentage of the tympanic membrane that is perforated), the location of the perforation according to quadrant (antero-inferior, antero-superior, postero-inferior, and postero-superior), the presence or absence of inflammatory mucosa in the middle ear, and Tympanosclerosis.
- Using X-ray mastoid and HRCT Temporal bone radiological status was evaluated to determine the extent of the disease.
- Every patient underwent diagnostic nasal endoscopy (DNE) to examine for any nasal pathology which might affect the Eustachian tube function causing difficulty in graft uptake.
- Preoperative pure tone audiogram and post operative pure tone audiogram was done 6 weeks following the surgery.
- Three frequencies (500, 1000, and 2000 Hz) will be used to calculate the average hearing loss (air conduction threshold). These frequencies were chosen because they correspond to the speech frequency range and also threshold elevation in these ranges will have a significant clinical impact.
- Since pure tone threshold audiometry is the accepted behavioural method for characterising audiometry sensitivity, pure tone audiometry was employed in this study to evaluate hearing level.
- Degree of impairment (WHO classification) – 0-25(not significant), 26-40(mild), 41-55(moderate), 56-70(moderately severe), 71-90(severe), >91(profound) was used to classifiy the

degree of hearing loss.

- Investigations which were done includes
- Pre- operative PTA
- X- ray (Mastoids)
- HRCT Temporal bone
- Surgical profile
-
- Post- operative PTA

STATISTICALANALYSIS PLAN

- Then Data analysis was done with statistical package for social sciences (SPSS) version 26.
- Frequencies and percentages were used to indicate all qualitative parameters, including sex, clinical traits, prior history, complications, etc
- Quantitative parameters like age, PTA of both the ears pre- and post- operatively are represented with Mean with standard deviation.
- To find the difference and association between preoperative and postoperative PTA findings Chi-Square test for measure and Paired t test of association was used.
- To compare the quantitative factors like PTA before and after surgery Pearson's & Spearman correlation test was used.
- P- value < 0.05 - considered significant

RESULTS

Table 1: Distribution according to age

Age	Frequency	Percent
<20 years	12	12%
21- 30 years	20	20%
31- 40 years	34	34%
41- 50 years	22	22%
51- 60 years	8	8%
>60 years	4	4%
Total	100	100%
Mean age: 36.5± 12.3 years		

Table 1 shows the age distributions were 12% were below 20 years, 20% were between 21 to 30 years, 34% were between 31- 40 years, 22% were between 41 and 50 years, 8% were between 51 to 60 years and 4% were above 60 years. The mean age was 36.5± 12.3 years.

Table 2: Gender distribution

Gender	Frequency	Percent
Male	29	29%
Female	71	71%
Total	100	100%
Sex ratio: 0.4: 1 [M: F]		

The study consisted of 71% females and 29% males with showing female predominance with the sex ratio being 0.4: 1 [M: F] as shown in table 2.

Table 3: Distribution according to diagnosis

Diagnosis	Frequency	Percent
CSOM left ear	50	50%
CSOM right ear	35	35%
Bilateral CSOM	14	14%
Traumatic central perforation	1	1%
Total	100	100

Based on the findings diagnosis was made were 50% had left ear CSOM, 35% had right ear CSOM, 14% had bilateral CSOM and one patient had traumatic central perforation (right ear) as seen in table 3.

Table 4 shows the perforations were most of the subjects had large CP- ASQ,AIQ,PIQ, Large CP- AIQ, PSQ, PIQ, Medium CP- AIQ, ASQ and Medium PSQ, PIQ 12% each respectively and Medium CP- AIQ, PIQ was 16%. STP was seen in 15% subjects and the remaining 20% had small perforations.

Table 4: Distribution according to perforation

Perforation	Frequency	Percent
Large CP-ASQ, AIQ,PIQ	12	12%
Large CP- AIQ, PSQ, PIQ	12	12%
Medium CP- AIQ, ASQ	13	13%
Medium CP- AIQ, PIQ	16	16%
Medium PSQ, PIQ	12	12%
Small CP- AIQ	8	8%
Small CP- ASQ	7	7%
Small CP- PIQ	5	5%
STP	15	15%
Total	100	100%

Table 5: Type of surgery

Surgery	Frequency	Percent
Type I tympanoplasty	9	9%
Type I tympanoplasty+ cortical mastoidectomy	81	81%
Type II tympanoplasty+ cortical mastoidectomy	8	8%
Type III tympanoplasty+ cortical mastoidectomy	2	2%
Total	100	100%

In the study most of the subjects i.e 81% underwent Type I tympanoplasty+ cortical mastoidectomy followed by 9% underwent Type I tympanoplasty, 8% underwent Type II tympanoplasty+ cortical mastoidectomy and 2% underwent Type III tympanoplasty+ cortical mastoidectomy as seen in table 5.

Table 6: Distribution according to graft use

Graft	Frequency	Percent
Temporalis fascia	70	70%
With Cartilage shield	30	30%
Total	100	100%

Among the 100 subject's temporalis- fascia+ cartilage shield was done in 70 and in 30 only cartilage shield was done as shown in table 6.

Table 7: Preoperative and post PTA of the left ear (n= 56)

PTA (dB)	Preoperative PTA	Postoperative PTA
0-20 dB	-	15
20- 40 dB (mild)	25	35
40- 55 dB (moderate)	19	6
55- 70 dB (mod- severe)	7	-
70- 90 (severe)	5	-
>90 dB (profound)	-	-
Mean	46.6± 15.2	28.1± 9.4

Figure 1: Bar chart showing left ear PTA's

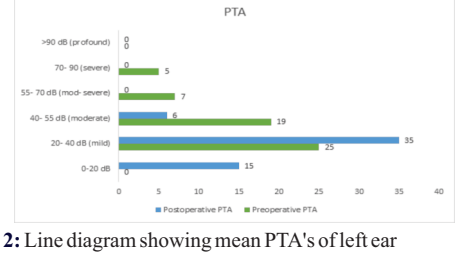
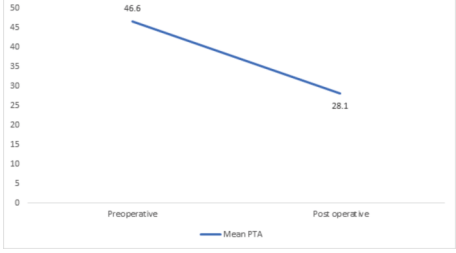


Figure 2: Line diagram showing mean PTA's of left ear



In the study when the left ear preoperative PTA was noted were majority of the subjects had mild to severe hearing loss and postoperatively majority of them were normal and few had mild hearing loss (20- 40 dB). The mean PTA in the left ear preoperatively was 46.6± 15.2 dB and postoperatively it was 28.1± 9.4 dB as shown in table 7.

Table 8: Preoperative and post PTA of the right ear (n= 44)

PTA (dB)	Preoperative PTA	Postoperative PTA
0-20 dB	1	11
20- 40 dB (mild)	21	26
40- 55 dB (moderate)	6	6
55- 70 dB (mod- severe)	11	1
70- 90 (severe)	5	-
>90 dB (profound)	-	-
Mean	45.7± 17.7	30.1± 11.1

Figure 3: Bar chart showing right ear PTA's

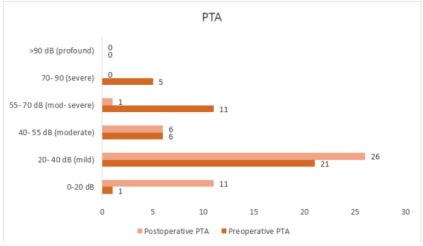
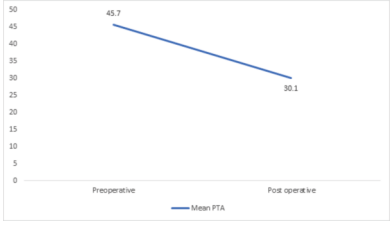


Figure 4: Line diagram showing mean PTAs of right ear



In the study when the right ear preoperative PTA was noted were majority of the subjects had mild to severe hearing loss and postoperatively majority of them were normal and few had mild hearing loss (20- 40 dB). The mean PTA in the right ear preoperatively was 45.7± 17.7 dB and postoperatively it was 30.1± 11.1 dB as shown in table 8.

Table 9: Comparison between preoperative and postoperative PTA

PTA	Mean	SD	SE	95% CI		p-value
				Lower	Upper	
Pre- op Rt	45.7	1.7	2.6	14.1	22.6	<0.003*
Post- op Rt	30.1	11.1	1.6			
Pre- op Lt	46.6	15.2	2.04	9.1	21.8	<0.001*
Post- op Lt	28.1	9.4	1.2			
*Level of significance: <0.05						

When the PTA values of preoperative and postoperative was compared as statistically significant difference was noted between suggesting significant improvement in hearing as shown in table 9.

Table 10: Comparison between graft material and postoperative PTA

Ear	Graft	Mean	SD	95% CI		p-value
				Lower	Upper	
R	Temporalis fascia+ cartilage shield	30.1	11.4	5.4	2.8	0.04*
	Temporalis fascia	28.8	8.6	5.9	3.3	
L	Temporalis fascia+ cartilage shield	28.07	10.1	6.5	2.7	0.04*
	Temporalis fascia	26.1	10.8	6.3	2.6	
*Level of significance: <0.05						

In the study the postoperative PTA levels were examined based on the graft used and a significant difference was noted between them suggesting temporalis fascia was better than temporalis fascia+ cartilage shield (p= 0.04) for both the ears as seen in table 10.

DISCUSSION

In this study, 12% were below 20 years, 20% were between 21 to 30 years, 34% were between 31- 40 years, 22% were between 41 and 50 years, 8% were between 51 to 60 years and 4% were above 60 years. The mean age of the study population was 36.5± 12.3 years. Around 71% were females and 29% were males. Female predominance was observed and the sex ratio was 0.4: 1 [M: F].

The present study findings were similar to a study by Vybhavi M et al in which mean age of study participants was 25.3 years and 48.3% were males and 51.7% were females.[19]

The present study findings differed with a study by Mahesh Babu M et al in which majority of the study subjects were in the age group of 10-20 years. Around 68.5% were males and 31.5% were females.[20]

The present study findings were similar to a study by Y Tang et al in which 54.22% were females and 45.78% were males and the mean age of patients was 32.67 years.[21]

The present study findings concurred with a study by Namita K et al in which mean age was 32.2 years and 60% was females and 40% were males.[22]

The present study findings were consistent with a study by Lokhna H et al in which majority of study subjects (52%) were in the age group of 21 – 30 years followed by 31 – 40 years (34.7%). Female preponderance (56%) was noted.[23]

The present study findings were comparable to a study by Batni G et al in which mean age of study participants was 27.17 years and 41% were males and 59% were females.[24]

The present study findings were similar to a study by Latoo MA et al in which majority of the patients were in the age group of 20 – 29 years and the sex ratio was found to be 1.2:1 (M: F).[25]

The present study findings were consistent with a study by BA Rao et al in which mean age was 31.68±9.19 years and Male to female ratio was 1.17.[26]

In the present study, 50% had left ear CSOM, 35% had right ear CSOM, 14% had bilateral CSOM and one patient had traumatic central perforation (right ear).

The present study findings were similar to a study by Y Tang et al in which 45.78% had right ear CSOM, 31.33% had left ear CSOM and 22.89% had bilateral CSOM.[21]

The present study findings were consistent with a study by Lokhna H et al in which 44% had right ear CSOM and 56% had left ear CSOM.[23]

The present study findings were comparable to a study by Batni G et al in which 48% had unilateral left sided disease, 34% had unilateral right sided disease and 18% had bilateral disease.[24]

The mean PTA in the left ear preoperatively was 46.6± 15.2 dB and and in the right ear preoperatively was 45.7± 17.7 dB.

The present study findings were similar to a study by Vybhavi M et al in which mean preoperative PTA was 42.2±10.5 dB.[19]

The present study findings differed with a study by Mahesh Babu M et al in which mean preoperative PTA was 53.8 dB.[20]

The present study findings were similar to a study by Y Tang et al in which preoperatively, 6.02% had normal hearing, 31.33% had mild hearing loss, 30.12% had moderate hearing loss and 20.48% had moderate to severe hearing loss. Around 8.43% had severe hearing loss and 3.61% had profound hearing loss.[23]

The present study findings were consistent with a study by Lokhna H et al, in which 58.66% had moderate hearing loss followed by 41.33% - Mild hearing loss pre-operatively. The mean AB gap in patients with large central perforation was 46.62 ± 7.89 dB, among small central perforation was 34.43 ± 8 dB and among patients of medium central perforation was 36 ± 8 dB.[23]

The present study findings were comparable to a study by Batni G et al in which mean air bone gap preoperatively was 23.55 ± 7.56 dB.[24]

The present study findings were similar to a study by Latoo MA et al in which PTA showed 48.33% patients had mild degree of hearing loss, 30% had moderate degree of hearing loss, 16.67% patients had minimal hearing loss and moderately severe hearing loss was seen in 5% patients.[25]

The present study findings were comparable with a study by Pathak NA et al in which mean preoperative air bone gap was 37.5 dB.[27]

In this study, most of the subjects had large Central perforation, Large Central Perforation- Anterior Inferior Quadrant, Posterior Superior Quadrant, Posterior Inferior Quadrant, Medium Central Perforation- Anterior Inferior Quadrant, Anterior Superior Quadrant and Medium Posterior Superior Quadrant, Posterior Inferior Quadrant 12% each respectively and Medium Central Perforation- Anterior Inferior Quadrant, Posterior Inferior Quadrant was 16%. Subtotal perforation was seen in 15% subjects and the remaining 20% had small perforations.

The present study findings differed with a study by Mahesh Babu M et al in which 68.5% had mucosal CSOM and 31.5% had squamosal CSOM.[20]

The present study findings were consistent with a study by Lokhna H et al, in which 69.3% had large central perforation.[23]

The present study findings were similar to a study by Latoo MA et al in which 45% had medium sized perforations, 31.67% had large size perforation and 23.33% had small size perforation. Around 61.66% had central perforation, 25% had subtotal and 6.67% each had marginal & total perforation respectively.[25]

The present study findings were consistent with a study by BA Rao et al in which 72% patients had central perforation, 16% had attic perforation and 12% had marginal perforation.[26]

In the present study, 81% underwent Type I tympanoplasty + cortical mastoidectomy followed by 9% underwent Type I tympanoplasty, 8% underwent Type II tympanoplasty + cortical mastoidectomy and 2% underwent Type III tympanoplasty + cortical mastoidectomy.

The present study findings were similar to a study by Y Tang et al in which 7.23% underwent Type I tympanoplasty, 62.65% underwent Type II tympanoplasty and 30.12% underwent Type III tympanoplasty.[21]

The present study findings were consistent with a study by Lokhna H et al, in which 78.67% underwent type 1 tympanoplasty and 21.33% underwent cortical mastoidectomy with type 1 tympanoplasty.[23]

The present study findings were similar to a study by Latoo MA et al in which 61.6% were operated with Tympanoplasty I procedure, 25% underwent Tympanoplasty III and 6.7% had Tympanoplasty II and IV each respectively.[25]

The mean PTA in the left ear was 28.1± 9.4 dB and the right ear was 30.1± 11.1 dB.

The present study findings were similar to a study by Vybhavi M et al in which mean postoperative PTA was 33.8±11.4 dB.[19]

The present study findings concurred with a study by Mahesh Babu M et al in which mean postoperative PTA was 29.35 dB.

The present study findings were similar to a study by Y Tang et al in which postoperatively, 25.3% had normal hearing, 37.35% had mild hearing loss, 22.89% had moderate hearing loss and 12.05% had moderate to severe hearing loss. Around 1.2% had severe hearing loss and 1.2% had profound hearing loss.[23]

The present study findings were consistent with a study by Lokhna H et al, in which 77.33% had normal hearing followed by 21.33% - Mild hearing loss post-operatively. The mean post-operative AB gap in patients with large central perforation was 23.43 ± 5.5 dB, among small central perforation was 19.2 ± 5.7 dB and among patients of medium central perforation was 15.1 ± 2.7 dB.[23]

The present study findings were comparable to a study by Batni G et al in which post operatively mean air bone gap was 11.60 ± 7.70 dB.[24]

The present study findings were similar to a study by Latoo MA et al in which the mean postoperative gain in AB gap was 21.6 dB in type I tympanoplasty and in Type II tympanoplasty it was 19.2 dB. The mean postoperative gain in AB gap was 13.7 dB in type III tympanoplasty and it was 2.1 dB in type IV tympanoplasty.[25]

The present study findings were comparable with a study by Pathak NA et al in which mean postoperative air bone gap was 29.7 dB.[27]

In this study, preoperative and postoperative PTA values were found to be statistically significant suggesting significant improvement in hearing post-surgery.

The present study findings were similar to a study by Vybhavi M et al in which mean preoperative PTA and mean postoperative PTA was compared and the difference was found to be statistically significant. The mean hearing gain was 8.2 dB.[29]

The present study findings concurred with a study by Mahesh Babu M et al in which statistically significant improvement in hearing was observed.[20]

The present study findings were similar to a study by Y Tang et al in which statistically significant improvement in hearing was observed post-surgery (tympanoplasty).[21]

The present study findings concurred with a study by Namita K et al in which there was statistically significant improvement in hearing after tympanoplasty. There was considerable improvement in postoperative PTA as compared to preoperative PTA.[22]

The present study findings were consistent with a study by Lokhna H et al, in which there was highly significant association in the post-operative PTA values as compared to PTA values among patients of large, medium and central perforation.[23]

The present study findings were comparable to a study by Batni G et al in which there was significant improvement in hearing ($p<0.01$).[24]
The present study findings were similar to a study by Latoo MA et al in which the mean postoperative gain in AB gap was statistically significant in Type I, II and III tympanoplasty.[25]

The present study findings were consistent with a study by BA Rao et al in which there was significant improvement in hearing outcome in terms of postoperative PTA as compared to preoperative PTA.[26]

The present study findings were comparable with a study by Pathak NA et al in which there was significant improvement in hearing postoperatively as compared to mean preoperative air bone gap. There was a hearing gain of 7.8 dB and this difference was found to be statistically significant.[27]

The present study findings were similar to a study by Dangol K et al in which there was significant improvement in hearing after surgery and the air bone gap closure achieved was 8.8 dB.[28]

The present study findings concurred with a study by Muqtadir F et al in which type I with cortical mastoidectomy showed the best mean improvement of 16.7 dB, followed by type II with CM which had a mean improvement of 12.66 dB.[29]

The present study findings were consistent with a study by Sivasankari L et al in which there was significant difference in pre and postoperative mean air bone gap.[30]

The present study findings concurred with a study by Subramaniam S et al in which there was significant difference in hearing outcome postoperatively as compared to preoperative mean air bone gap.[31]

In the present study the postoperative PTA levels were examined based on the graft used and a significant difference was noted between them suggesting Temporalis fascia+ cartilage shield was better than only cartilage shield ($p= 0.04$).

The present study findings were similar to a study by Vybhavi M et al in

which temporalis fascia & cartilage shield was found to have better results than only cartilage.[19]

The present study findings were consistent with a study by BA Rao et al in which temporalis fascia graft was found to have better hearing outcome as compared to cartilage graft.[26]

The present study findings were consistent with a study by Sivasankari L et al in which the graft uptake was 88.33% and it was significant with temporalis fascia graft.[30]

The present study findings differed with a study by Subramaniam S et al in which there was no significant difference in graft uptake in temporalis fascia group vs cartilage only group.[31]

The present study findings were consistent with a study by Jain K et al in which temporalis fascia graft was found to have greater uptake and significant improvement in hearing.[32]

The present study findings were comparable to a study by Khafagy, A.G et al in which there was significant improvement in hearing outcome after tympanoplasty among patients who had temporalis fascia graft as compared to tragal cartilage. The difference in hearing improvement was found to be statistically significant.[33]

The present study findings were similar to a study by Rehman A et al in which there was significant improvement with tympanoplasty and cortical mastoidectomy in terms of graft uptake and hearing outcome.[34]

SUMMARY & CONCLUSION

The present cross- sectional study was undertaken with an aim to evaluate the improvement in hearing in patients who undergo tympano-mastoidectomy which was done between July 2022 and January 2024. A total of 100 patients were included who fulfilled the inclusion criteria. The study started following ethics clearance.

The results were- mean age was 36.5± 12.3 years consisting of 71 females and 29 males. In the selected CSOM cases, most of them were unilateral.

The mean preoperative PTA of the right ear was 45.7± 17.7 dB and left ear was 46.64± 15.2 dB.

All the types of perforations were seen in the study. 81% of the subjects underwent Type I tympanoplasty+ cortical mastoidectomy with the graft use being and temporalis fascia in 70% and temporalis fascia+ cartilage shield in 30% The postoperative PTA was 30.1± 11.1 dB in the right ear and left ear was 28.1± 9.4 db.

An improvement in the PTA was seen in the study post- surgery which was statistically significant for both right and left ear i.e. $p<0.001$ for both ears respectively. postoperative PTA levels were examined based on the graft used and a significant difference ($p= 0.04$ for both the ears) was seen between them showing temporalis fascia was better than temporalis fascia+ cartilage shield.

LIMITATIONS

1. Small sample size
2. There could be an element of information bias in this study.
3. Patients with postoperative residual perforation and recurrent disease are not included in the study.
4. Attico-antral disease is not included.

RECOMMENDATIONS

1. To identify and diagnose patients as early as possible
2. Identification of risk factors.
3. Regular timely follow up (special testing parameters).
4. Reduce further complications
5. Reduce the incidence
6. Early intervention

CONFLICT OF INTERESTS : No Financial issues were involved. The Institute has provided the facilities for the investigations and surgeries were done as per the institutional protocols.

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