

## Original Research Article

## ASSESSMENT OF INTRA OPERATIVE OSSICULAR CHAIN STATUS AND THEIR POST OPERATIVE HEARING OUTCOME AT TERTIARY HEALTH CARE HOSPITAL

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### ABSTRACT

**Background:** Chronic otitis media (COM) is one of the most common otological conditions encountered in ENT practice and a major cause of conductive hearing loss. Ossicular chain erosion, particularly in long-standing disease and cholesteatoma, significantly affects surgical planning and postoperative hearing outcomes. Understanding intra-operative ossicular status and correlating it with postoperative hearing improvement is essential for prognostication and patient counselling. **Materials and Methods:** This prospective observational study was conducted in the Department of ENT and Head & Neck Surgery at a tertiary care hospital over a period of 15 months. Eighty patients aged 18–65 years diagnosed with chronic otitis media (mucosal and squamous types) with conductive hearing loss were included. Patients with sensorineural hearing loss were excluded. Detailed preoperative clinical evaluation and pure tone audiometry were performed. Intra-operative assessment of ossicular chain status was documented, and tympanoplasty was performed as indicated. Postoperative hearing outcomes were evaluated at 3 and 6 months using pure tone audiometry. **Result:** Most patients presented with moderate preoperative conductive hearing loss. Type I tympanoplasty was the most commonly performed procedure. The malleus was intact in the majority of cases, whereas the incus was the most frequently eroded ossicle, with long-process necrosis being the commonest finding. Ossicular erosion was significantly more severe in attico-antral disease, where all cases showed ossicular chain involvement. Postoperative hearing improvement was significantly better following Type I tympanoplasty at both 3 and 6 months. No statistically significant difference in hearing improvement was observed among Type IIb, III, and IV tympanoplasty procedures. **Conclusion:** Ossicular chain damage in chronic otitis media is more extensive in attico-antral disease, with the incus being the most vulnerable ossicle, while the malleus and stapes show greater resistance. Type I tympanoplasty yields the best postoperative hearing outcomes. Awareness of ossicular erosion patterns aids surgeons in anticipating intra-operative findings, selecting appropriate reconstructive techniques, and providing realistic expectations regarding hearing improvement.



### INTRODUCTION

Chronic otitis media is the most common disease; ENT surgeons encounter at their outdoor patient department. And patients having most common complication due to chronic otitis media is hearing impairment.<sup>[1]</sup>

Tympanoplasty is defined as a surgical procedure performed to eradicate disease from the middle ear and reconstruct the hearing mechanism, with or without grafting of the tympanic membrane.<sup>[1]</sup> Ossicular erosion is a well-known complication of chronic ear disease, particularly when associated with cholesteatoma. Discontinuity of the ossicular chain can result in varying degrees of conductive hearing

loss.<sup>[2,3]</sup> Throughout history, many materials used for reconstruction of ossicles like a vinyl acrylic plastic, Teflon piston, patients own ossicles as a homograft material, high density polyethylene sponges, hydroxyapatite bioactive ceramic material, titanium.<sup>[4-6]</sup>

What will be the outcome of hearing when as an ear doctor you want to assure patient about possible results? What you need to see when you are assessing patient with ear disease? These all questions are well queried and answered frequently in different forum, conference and workshop.

We conducted this study to stamp on those previous answers; to reinforce previous research with more data.

## MATERIALS AND METHODS

This prospective observational study was conducted in the Department of ENT and Head & Neck Surgery, Medical College and Sir T. Hospital, Bhavnagar, over a period of 15 months starting December 2022, following approval from the Institutional Ethics Committee from the institute.

The study included 80 patients diagnosed with chronic suppurative otitis media (both mucosal and squamous types) presenting with conductive hearing loss. All patients underwent detailed history taking, comprehensive general and systemic examination, and thorough otologic, nasal, and throat examination. Relevant clinical findings were recorded using a specially designed proforma.

### Inclusion Criteria

All patients giving consent for participating in the study belonging to both genders and age group between 18-65 with chronic otitis media (Mucosal and Squamous type) with good cochlear reserve and requiring surgery and willing to come for regular follow up.

### Exclusion Criteria

Patients whose age below 18 year and beyond 65 year & patients with pre-operative sensorineural hearing loss.

## RESULTS

### Pre-operative hearing status

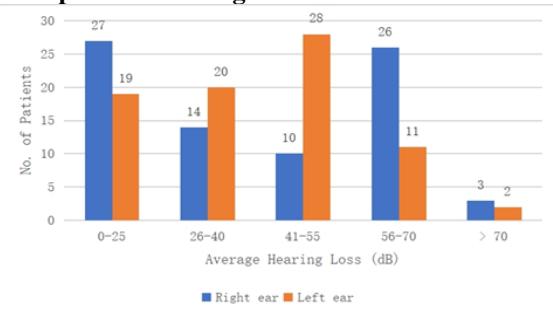


Figure 1: PTA Average hearing loss

Most patients demonstrated moderate conductive hearing loss. The left ear most commonly showed

hearing loss in the 41–55 dB range, while the right ear most frequently exhibited hearing thresholds between 0–25 dB.

### Type of tympanoplasty

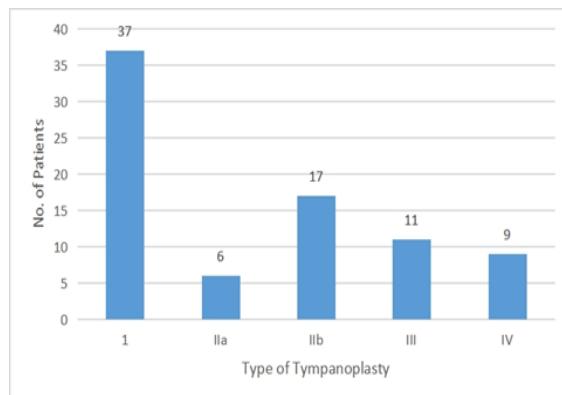


Figure 2 Type of Tympanoplasty in various Patients

Type I tympanoplasty was the most commonly performed procedure (46.3%), followed by Type IIb (21.3%). Type IV tympanoplasty was performed in the fewest cases (11.3%).

### Intra Operative Malleus findings among patients

[Figure 3] Intra Operative Malleus findings among patients

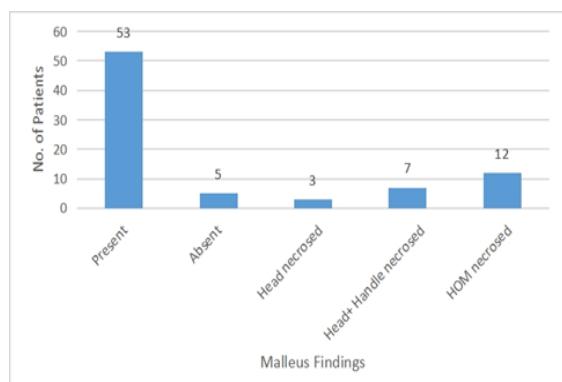


Figure 3: Malleus findings in various patients

Malleus was intact in 66.3% (53 patient) of cases; the most common pathology was necrosis of only the handle of malleus.

### Intra Operative Incus examination

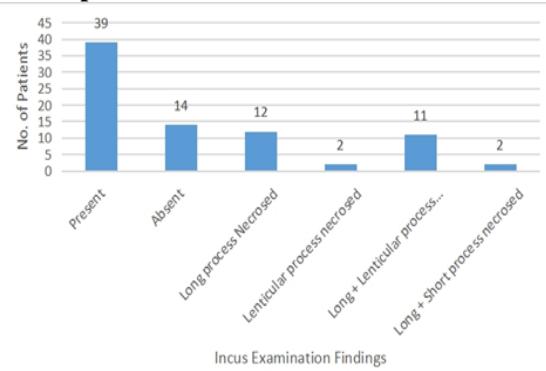
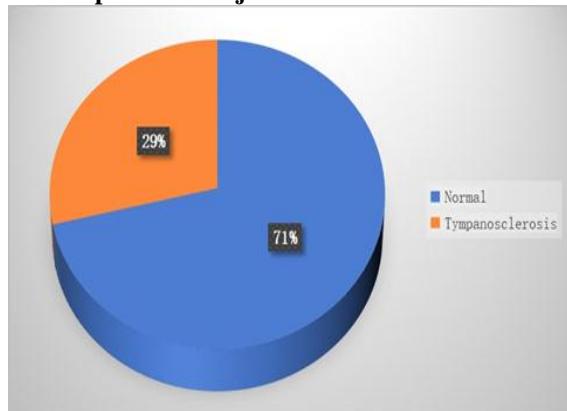


Figure 4: Incus Examination Findings

Incus was the most frequently eroded ossicle, with long-process necrosis being the predominant finding.

#### Intra Operative MI joint examination



**Figure 5: Malleo-incudal Joint Dispersion**

Malleo-incudal joint was normal in 71% of cases, while tympanosclerosis was observed in 29%.

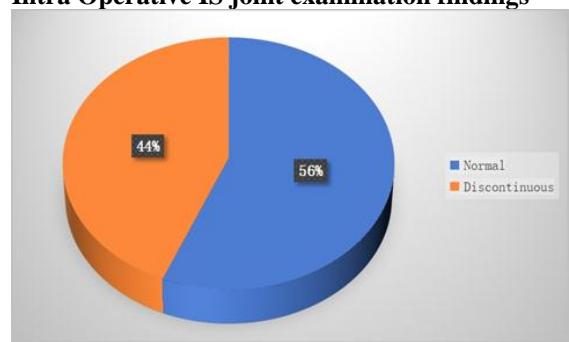
#### Intra operative findings of ossicles in COM

**Table 1: Intra operative findings of ossicles in COM**

Ossicles	Tubotympanic type		Atticoantral type	
	Number of pt (58)	Percentage (72.5%)	Number of pt (22)	Percentage (27.5)
All Intact	37	63.8	0	0
Incus necrosed	13	22.4	4	18.18
Incus + malleus necrosed	8	13.8	9	40.90
Incus + stapes necrosed	0	0	1	4.5
Incus + malleus + stapes necrosed	0	0	8	36.36

In Tubotympanic disease, 63.8% of patients had intact ossicles. In contrast, all cases of Atticoantral disease showed ossicular chain erosion, most commonly involving the incus and malleus.

#### Intra Operative IS joint examination findings



**Figure 6 Incudo-stapedial joint Dispersion in patients**

[Table 6] Intra Operative IS joint examination findings.

Incudo-stapedial joint showed discontinuity in 44% of cases.

#### Comparison

**Table 2: Comparison of Type of tympanoplasty and postoperative hearing improvement at 3rd month**

Type of tympanoplasty	No. of patients	Postoperative average hearing improvement (dB)			P value
		0-10	11-20	21-30	
1	37	26	11	0	0.002
2a	6	6	0	0	
2b	17	14	3	0	
3	11	11	0	0	
4	9	9	0	0	

Type I tympanoplasty resulted in significantly better hearing improvement at 3 months postoperatively compared to Types IIa, IIb, III, and IV.

**Table 3: Comparison of Type of tympanoplasty and postoperative hearing improvement at 6th month**

Type of tympanoplasty	No. of patients	Postoperative average hearing improvement (dB)			P value
		0-10	11-20	21-30	
1	37	4	26	7	0.024
2a	6	1	5	0	
2b	17	9	6	2	
3	11	8	3	0	
4	9	8	1	0	

Type I tympanoplasty resulted in significantly better hearing improvement at 6 months postoperatively compared to Types IIa, IIb, III, and IV.

### Hearing improvement

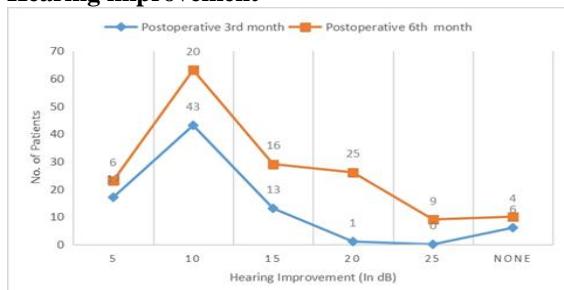


Figure 7: Hearing Improvement with postoperative months.

Table 4: Intra operative Incus examination comparison

Incus examination	In present study	Varshney S et al [7]	Sinha A et al [8]	Horvath T et al [9]
Present	39	51	51	7
Absent	14	7	9	-
Necrosed	27	58	41	22

The incus was the most commonly eroded ossicle (44 patients out of 80), corroborating observations by Varshney S et al, Sinha et al, and Horvath T et al.<sup>[7-9]</sup> Atticoantral disease showed more extensive ossicular damage compared to tubotympanic disease, highlighting the aggressive nature of cholesteatoma. Postoperative hearing outcomes were superior in Type I tympanoplasty, whereas no significant difference was observed among Types IIb, III, and IV procedures.<sup>[10]</sup>

### CONCLUSION

Most patients presented with moderate preoperative conductive hearing loss. Ossicular chain damage was significantly greater in attico-antral type chronic otitis media, with incus erosion being the most common finding. Malleus and stapes were more resistant to disease, with the malleus being the most durable ossicle. Postoperative hearing improvement was significantly better following Type I tympanoplasty and there is no significant difference in hearing improvement was observed among Types IIb, III, and IV tympanoplasty.

Understanding the patterns of ossicular erosion in chronic otitis media and post operative outcome allows surgeons to reassure patients expectation, anticipate intraoperative findings and select appropriate reconstructive techniques.

### DISCUSSION

A study conducted by Sharma et al. concluded that the majority of patients (49 out of 66) had moderate preoperative conductive hearing loss, which is consistent with our study finding.<sup>[7]</sup>

Malleus and stapes demonstrated greater resistance to disease (present in 53 patients), with the malleus being the most durable ossicle, corroborating observations by Sinha et al. (84 patients out of 96).<sup>[8]</sup>

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