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## CORRELATION BETWEEN PREOPERATIVE HEARING EVALUATION WITH INTRA-OPERATIVE OSSICULAR STATUS IN COM MUCOSAL

### Objective:

To correlate the preoperative pure tone audiogram findings with intra-operative status of ossicular chain in patients with chronic otitis media mucosal type.

### Material and Methods:

Prospective, descriptive study conducted over a period of twenty months at GMSMA of ENT-Head and Neck Studies, TUTH, IOM, Kathmandu, Nepal. Patients included in the study were both children and adults with central perforation in tympanic membrane which was dry for at least 4 weeks. Patients with SNHL or mixed HL and in those where ossicular status was not assessed were excluded from study.

### Results:

There were 274 patients operated for COM Mucosal and 67 patients were excluded from study as they did not meet inclusion criteria. Hence, there were 207 patients included in the study. Out of them, 4 (1.9%) patients had minimal hearing loss, 73 (35.3%) had mild hearing loss, 117 (56.5%) had moderate hearing loss and 13 (6.3%) had severe hearing loss. On correlating with ossicular status, when there was discontinuity of ossicular chain average hearing loss was more than 50 dB and none of the patients had mild hearing loss. When there were restricted or fixed ossicles, there was moderate to severe hearing loss in majority of cases (85%). With intact and mobile ossicles, about 95% patients had mild to moderate hearing loss. When there was only mild hearing loss, 90% patients had intact and mobile ossicles and 10% had ossicular fixation or restricted mobility.

### Conclusion:

In our study, we found that preoperative pure tone audiogram can predict the possibility of the involvement of the ossicular chain in patients with COM Mucosal. Ossicular involvement is more common with moderate to severe hearing loss either in the form of fixation or discontinuity.

**Key words:** Pure tone audiogram, Chronic otitis media, Myringoplasty, Ossicular status

## INTRODUCTION:

Chronic Otitis Media (COM) is any structural change in the middle ear system associated with a permanent defect in the tympanic membrane.<sup>1</sup> COM with a perforation often is accompanied by a past and present history of intermittent otorrhea and conductive hearing loss. It is an important cause of preventable hearing loss, particularly in the developing world.<sup>2</sup> COM is classified as squamous disease (or unsafe type) and mucosal disease (or safe type). Squamous disease is associated with more complications and severe hearing loss compared to mucosal type of disease. Ossicular chain involvement is found in both squamous and mucosal type of diseases. In mucosal type, although the involvement of ossicular chain is less common, still significant numbers of patients are having hearing deterioration due to it.<sup>3</sup> The definite treatment modality for both types of disease is surgery. Although the main aim of surgery is to make ear dry, patients are more concerned about their hearing improvement after surgery. The possible reasons for hearing loss in COM Mucosal may be perforation in TM, ossicular fixation/tympanosclerosis or erosion of ossicles (loss of ossicular coupling). Many times we cannot predict the outcome of surgery on the hearing improvement of the patient. Discontinuity of the ossicular chain is typically confirmed only during an operation.<sup>4</sup> Knowing before surgery whether the patient has an ossicular discontinuity is important because it allows the surgeon to know the possibility of performing an ossiculoplasty.<sup>4</sup>

If the preoperative audiogram could predict the ossicular status, then we might be able to counsel patients about possible need of ossiculoplasty as well as expected hearing improvement postoperatively. So, the aim of our study was to correlate preoperative pure tone audiogram

with the status of ossicles assessed during the surgery.

## MATERIAL AND METHODS:

It was a prospective, descriptive study carried out at Ganesh Man Singh Memorial Academy (GMSMA) of ENT-Head and Neck Studies, TU Teaching Hospital, Institute of Medicine (IOM), Kathmandu, Nepal. The study included cases operated over a period of 20 months from October 2011 to June 2013. The inclusion criteria were all patients above 6 years, COM mucosal type inactive (dry) for at least 4 weeks. The exclusion criteria were congenital craniofacial abnormalities, frank otorrhea, previous tympanoplasty in same ear, patients with sensorineural and mixed hearing loss and patients where ossicular chain was not assessed during surgery. All cases meeting the inclusion criteria were included in the study. There were total of 274 patients who underwent myringoplasty over that period, 67 patients were excluded from study as they did not meet inclusion criteria. Hence, there were 207 patients included in the study. Ethical committee approval was obtained from the Ethical Committee of Institutional Review Board (IRB) of Institute of Medicine. Pure tone audiogram were done about a week prior to surgery. The hearing was calculated as mean of 500, 1000, 2000 and 4000 Hz frequencies for both bone conduction and air conduction thresholds. Patients with chronic otitis media, mucosal type who visited in GMSMA of ENT-Head and Neck Studies outdoor clinic were included. The ear should have been dry for at least four weeks for inclusion. Detailed relevant history was obtained, general physical examination, ear examination with Otoscope and Tuning fork test with 512 Hz was done. Children were operated under general anesthesia while adult patients were operated under local anesthesia after sedation with pethidine. The approach for surgeries were either of permealta, endaural or postaural. Postoperative care was

similar for adults and children. The operating surgeons were unaware of the audiogram findings and ossicular chain status was noted in operative notes by assistant. The analysis was done by the first author who was not involved in the surgeries.

**RESULTS:**

There were total of 274 cases of chronic otitis media mucosal type who underwent type I tympanoplasty during our study period. Out of which 31 patients had either sensorineural or mixed hearing loss and hence were excluded from the study. Similarly, ossicular status were not assessed in 36 patients during surgery and hence were also excluded from the study. So, there were 207 patients available for the analysis. The age of the patients ranged from 6 to 64 years with mean age of 21.60±10.46 years. There were 57 children of less than 15 years of age and 150 were adult patients. There were 102 male patients and 105 female patients with male to female ratio of 1:1.03. On evaluating the preoperative pure tone audiogram, majority of the patients had either mild or moderate hearing loss. Only 6.3 percent patients had severe hearing loss.

Tab. 1: Preoperative hearing level on pure tone audiometric evaluation.

Degree of hearing loss	Number (n)	Percentage (%)
Minimal	4	1.9
Mild	73	35.3
Moderate	117	56.5
Severe	13	6.3
Total	207	100

On grouping the patients depending upon the intra-operative findings of ossicular chain status, majority had intact and mobile ossicular chain which was 78.3% of the total patients. Fixed ossicles were present in 18.3% of the patients and 3.4% patients had discontinuity of ossicles due to erosion.

Tab. 2: Intraoperative ossicular chain status

Ossicles status	Male	Female	Total (n)	Percentage (%)
Intact and mobile	77	85	162	78.3
Fixed	19	19	38	18.3
Erosion	6	1	7	3.4
Total	102	105	207	100

Tab. 3: Ossicles status and preoperative air conduction threshold (ACT)

Ossicles status	Mean (dB)	S. D.	P value
Intact and mobile (n=162)	43.1	10.0	0.000
Fixed (n=38)	50.0	9.6	
Discontinuity/Erosion (n=7)	52.1	6.2	

(ANOVA test)

The mean air conduction threshold in the group of patients with intact and mobile ossicular chain found during surgery was 43.1±10.0 dB. Similarly, the mean ACT in patients with fixed ossicles and discontinuity of ossicles due to erosion were 50±9.6 dB and 52.1±6.2 dB respectively. The difference of hearing threshold between the groups was statistically significant (p=0.000).

Tab. 4: Ossicles status and preoperative air bone gap (ABG)

Ossicles status	Mean (dB)	S. D.	P value
Intact and mobile (n=162)	31.7	9.7	0.001
Fixed (n=38)	37.1	8.9	
Discontinuity/Erosion (n=7)	40.5	3.7	

(ANOVA test)

When the air bone gap was compared between groups, again the difference was statistically significant (p=0.001).

Tab. 5: Showing degree of hearing loss and Ossicular status

Degree of hearing loss	Status of the ossicles			Total (n)
	Intact & mobile	Fixed	Discontinuity	
Minimal	4	0	0	4
Mild	66	7	0	73
Moderate	84	27	6	117
Severe	8	4	1	13
Total	162	38	7	207

In patients with intact and mobile ossicles found during surgery, hearing loss ranged from minimal to severe with majority having mild to moderate hearing loss (92.6%). Majority of patients having fixed or discontinuity of ossicles had moderate hearing loss. All patients who had discontinuity of ossicles had at least moderate hearing loss.

**DISCUSSION:**

COM Mucosal is associated with hearing loss of varying degree depending on various factors which includes involvement of ossicular chain by the disease process. The involvement of ossicles in safe COM is not very common.<sup>3,5</sup> Hearing assessment (PTA) is done in patients with safe COM to evaluate the extent of hearing loss. Generally, it would be reasonable to think that ossicular involvement would lead to the greater extent of the hearing loss as the coupling of sound would be disturbed. There were more adult patients operated during the period compared to the children mainly due to the requirement of general anaesthesia for the children while adults can be operated on local anaesthesia. Comparing the gender, there was similar number of male and female patients with ratio of 1:1.03 with slightly more female patients. The gender distribution was similar in other studies carried out to evaluate ossicles in CSOM.<sup>4,5,6</sup> In our study, 78.3% of the patients had intact and mobile (normal) ossicular chain and the hearing loss ranged from minimal to severe hearing loss which implies that there

are other factors than only ossicular involvement which leads to the hearing loss and there could be technical fault while recording pure tone audiometry. In other studies, the percentage of intact and mobile ossicular chain ranged from 53.3% (included mixed hearing loss)<sup>6</sup>; 88.9% (fixation not considered)<sup>4</sup>; 89.4%<sup>7</sup>; 77.2%<sup>5</sup>; 63%.<sup>3</sup> Finding in our study correlates with other similar studies done in the past. But, there are few studies correlating preoperative hearing status with the ossicular chain involvement and many of them are retrospective ones where possibility of bias cannot be ruled out.

The involvement of the ossicles could be in the form of fixation or erosion leading to ossicular discontinuity. 21.7% of the patients had either fixed or eroded ossicles. In other studies, it ranged from 10.6% to 46.7%.<sup>3-7</sup> In our study, in ossicular involvement groups the mean hearing loss was more than 50 dB and the difference between groups was significant ( $p=0.000$ ). The mean hearing loss in patients with TM perforation with intact and mobile ossicular chain was  $43.1 \pm 10.0$  dB. The hearing loss in patients with ossicular erosion was  $52.1 \pm 6.2$  dB in our study and it was significantly higher compared to intact ossicular chain. Similar result was obtained in a study by Sathyaki et al.<sup>6</sup> In their study, they concluded that ossicular erosion can give rise to a hearing deficit of more than 60dB.

## CONCLUSION:

In our study, we found that with preoperative pure tone audiogram can predict the involvement of the ossicular chain in patients with COM Mucosal. When the average hearing loss is greater than 50 dB, there is likelihood of ossicular chain involvement either in the form of fixation or discontinuity due to erosion. It would help in counseling patients about the outcome of surgery and need for second stage surgery in future.

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