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To Evaluate the Correlation between Preoperative Otoscopic Features, Pure Tone Audiometric Findings and Intraoperative Ossicular Chain Status in Patients with Chronic Otitis Media

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Abstract

Aim: Chronic otitis media (COM) is chronic muco purulent discharge through a perforated tympanic membrane. Theossicular chain damage is found in both mucosal and squamosal types of COM. We aim to evaluate relationship between preoperative otologic features, pure tone audiometric findings and intraoperative ossicular chain status in patients with chronic otitis media. **Material and Methods:** 100 patients of either sex aged between 12 to 60 years operated for active or inactive, squamosal or mucosal chronic otitis media attending Ram Lal Eye and ENT Hospital, Government Medical College Amritsar were taken. The preoperative ossicular chain status based on set parameters was compared with the intraoperative ossicular chain status. **Results:** The ossicular chain integrity is more commonly compromised in squamosal COM and the most common ossicle eroded is Incus. Pure tone audiogram has got a very important role in determining the ossicular chain integrity preoperatively and must be done in all cases with accuracy. **Conclusion:** It is concluded that on the basis of otoscopic examination and pure tone audiometry values, we can accurately classify the COM as mucosal or squamosal type and get an idea of the ossicular chain integrity preoperatively hence planning the extent of surgery.

Keywords

Otoscopy, Pure Tone Audiometry, Ossicular Chain Status

1. Introduction

Chronic otitis media (COM), is a commonly diagnosed condition in otorhinolaryngology, characterized by intermittent or persistent chronic purulent discharge through a perforated tympanic membrane [1]. Chronic middle ear inflammation is a result of overproduction of cytokines such as TNF-alpha, interleukin-2, fibroblast growth factor, and platelet derived growth factor. This promotes hypervascularization, osteoclast activation and bone resorption causing ossicular damage [2].

Ossicular chain damage is found in both mucosal and squamosal type of COM, more so in cholesteatoma cases. In most instances, erosion is a result of non specific hyperemia associated with mucosal inflammation. Whenever, an area of inflammation stays in contact with a bone, resorption and remodelling takes place.

Granulation tissue is found most frequently around the ossicular chain hence ossicular chain becomes the predominant site for bone resorption and damage [3].

Ossicular erosion is seen five times more frequently in wet, inflamed ears than in those with a dry perforation [4].

Chronic otitis media causes chronic infection of middle ear, resulting in oedema of mucosal lining, discharge, tympanic membrane perforation, and possibly ossicular chain disruption, resulting in a conductive hearing loss ranging from 20 to 60 dB [5]. The most frequently affected parts of the ossicular chain are the long process of the incus and the stapes superstructure [6]. The duration of the disease has been found to have a direct bearing on the amount of hearing loss with the hearing threshold increasing with duration of disease [7].

2. Aims and Objectives

1) To evaluate the correlation between the preoperative otoscopic findings and intraoperative findings in chronic otitis media.

2) To evaluate the correlation between the preoperative pure tone audiometry findings and ossicular chain status intraoperatively, in patients with chronic otitis media.

3. Materials and Methods

The present study is a cross sectional study conducted in Ram Lal Eye and ENT Hospital attached to Government Medical College, Amritsar after the approval from Institutional Ethics Committee. Informed consent of 100 patients of either sex aged between 12 to 60 years was taken. They were admitted and operated for active or inactive, squamosal or mucosal chronic otitis media during a period from June 2016 to December 2018. The number of patients were taken as 100 keeping in view the overall average of cases of chronic otitis media operated during period of one and half years.

Inclusion Criteria:

1) All cases operated for active or inactive mucosal or squamosal chronic otitis media between 12 to 60 years of age of either sex.

Exclusion Criteria:

1) Children below 12 years and old aged above 60 years.

2) Traumatic perforation.

3) Patients with intracranial or extracranial complications of chronic otitis media.

4) Patients with associated comorbidities unfit for surgery.

5) Patients with history of previous ear surgery for any pathology.

Methodology: After clinical examination, otoscopic examination, examination under magnification and pure tone audiometry, the final diagnosis about the type of chronic otitis media, ossicular chain integrity was made and the ear to be operated was decided. Later on the intraoperative findings were noted. The preoperative status of ossicular chain was compared with the intraoperative ossicular chain status.

4. Results

Out of total 100 patients included in the study majority of patients were in the age group of 16 to 25 years with mean age of incidence 29.76 years with 69% females and 31% males.

The primary complaint of the patients was ear discharge seen in all the cases with duration ranging from 3 months to 20 years, with majority having duration between 1 to 5 years.

On the basis of history and preoperative clinical findings, 76 cases were labelled as mucosal COM while remaining 24 cases were labeled as squamosal COM. Based on the intra operative findings, the patients were reclassified into those with mucosal COM (72%) and squamosal COM (28%). 4 cases which were clinically diagnosed as mucosal were found to be squamosal intraoperatively and this diagnosis was based on finding the cholesteatoma sac in these 4 cases.

Otoscopic findings Out of 72 cases of mucosal COM, 69 cases (95.8%) had a central perforation and amongst 28 cases of squamosal COM, 10 cases (35.7%) had an attic pathology and 8 cases (28.57%) had a pars flaccida retraction which were the most common otoscopic findings [Table 1].

Preoperative status of different ossicles was noted on the basis of otoscopy and Examination under Magnification [Table 2, Table 3].

Intraoperative status of ossicular chain

The malleus (M) was found to be the most resistant ossicle to erosion in COM, found intact in 90% cases, eroded in 6% and absent in 4% cases with the handle of malleus as the most commonly necrosed part. Incus (I) was the most common ossicle to get necrosed, partially eroded in 22% cases and completely eroded in 7% cases with the long process of incus being most commonly involved, necrosed in 28% cases. Stapes (S) was found intact in 86% cases while in 14% cases, the superstructure of stapes was found eroded by the disease. The intraoperative status of ossicular chain was classified using Austin's classifica-

tion.

The ossicular chain was found intact (M+I+S+) in 71% cases of COM, only incus eroded (M+S+) in 9% cases, both incus and stapes eroded (M+S-) in 9% cases. Both malleus and incus eroded (M-S+) in 6% cases whereas in 5% cases all three ossicles were eroded (M-S-). Out of 28 cases of squamosal COM diagnosed intraoperatively majority 9 cases had both incus and stapes eroded (M+S-) [Table 4].

Table 1. Preoperative Tympanic membrane findings.

Otoscopic finding	Number of cases (mucosal)	Number of cases (squamosal)	Total
Central perforation	69	6	75
Marginal perforation	1	4	5
Attic pathology	0	10	10
Retraction	2	8	10
Total	72	28	100

Table 2. Preoperative status of Malleus (M).

	Otoscopy	EUM
Handle of malleus	Number of cases	Number of cases
Intact	63	68
Foreshortened	18	27
Not visualized	19	5
Total	100	100

Table 3. Preoperative status of Incus (I) and Stapes (S).

Ossicle	Number of cases Visualised on otoscopy	Number of cases visualised on EUM
Incus	21	45
Stapes	5	20

Table 4. Intraoperative status of ossicular chain (MSI).

Ossicular status	Number of cases	Percentage
M+I+S+	71	71
M+S+	9	9
M+S-	9	9
M-S+	6	6
M-S-	5	5
Total	100	100%

Preoperative pure tone audiometric finding (Figure 1)

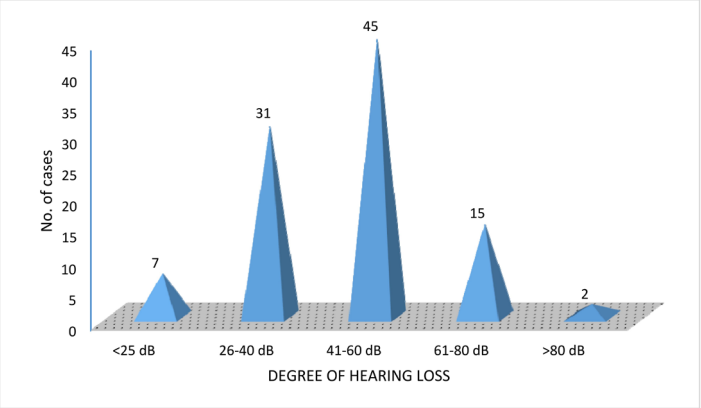

Figure 1. Majority of the patients (45) had moderate hearing loss (41 - 60 dB), while 31 cases had mild hearing loss (26 - 40 dB). 7 cases had hearing levels within normal limits (<25 dB).

Correlation of ossicular chain status with hearing loss in COM (Figure 2)

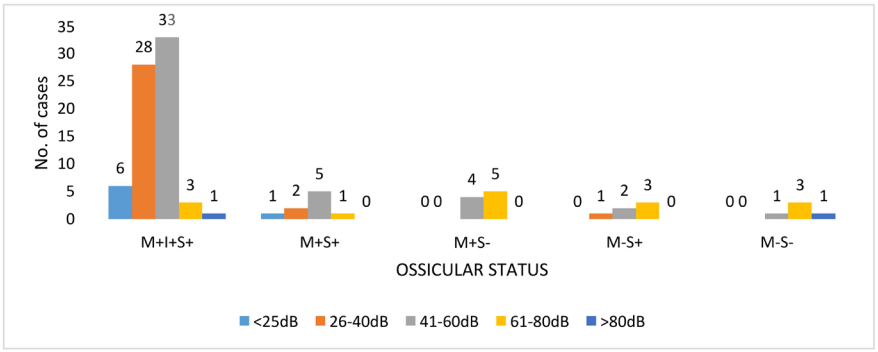

Figure 2. The preoperative audiometric findings were analysed in the light of the intra operative findings of the ossicular chain status and it was observed that in cases where only incus is eroded with other 2 ossicles intact, the hearing loss was mild to moderate in most of the patients whereas in cases of erosion of the malleus and/or stapes superstructure, hearing loss of severe degree was observed.

5. Discussion

Hearing loss is the most common complication of chronic otitis media leading to work impairment. This study was done to evaluate relationship between otologic features and pathological characteristics found during operation in patients with chronic otitis media [8].

The primary complaint of the patient was ear discharge, with duration ranging from 3 months to 20 years similar to findings of El-Sayed [9].

In our study, the most common otoscopic finding in cases of mucosal COM was central perforation while in cases of squamosal COM, the otoscopic finding was variable with attic perforation and pars flaccida retraction as the common findings, which is in accordance with findings of Mathur *et al.* [10] where central perforation was the most common otoscopic finding in mucosal COM, and attic

pathology in squamosal COM.

Majority of cases (86%) in our study had pure conductive hearing loss and 7% cases had mixed hearing loss. Tuz *et al.* [11] and Gulati *et al.* [7] also found conductive hearing loss as the predominant type in chronic otitis media.

In our study malleus was found to be the most resistant ossicle, and Incus was observed to be the most common ossicle to get necrosed with the most common defect being erosion of the long process of incus. These findings are consistent with those of Udaipurwala *et al.* [12] and Shreshtha *et al.* [13] and Austin [14].

An intact and mobile ossicular chain (M+I+S+) in majority (71%) of the cases of COM, only incus involved (M+S+) in 9% cases, both incus and stapes superstructure eroded (M+S-) in 9% cases, both handle of malleus and incus eroded (M-S+) in 6% cases and all ossicles eroded (M-S-) in 5% cases. Similar findings were observed by Dasgupta *et al.* [15]. In our study it was observed that in cases where only incus is eroded with other 2 ossicles intact, the hearing loss was mild to moderate in majority of patients. In cases of erosion of the malleus and /or stapes superstructure hearing loss of severe degree was observed. These findings were consistent with Feng *et al.* [16], Gulati *et al.* [7], and Mukherjee *et al.* [17].

6. Conclusion

It is concluded that on the basis of history, otoscopic examination and Pure tone audiometry values (specially the degree of hearing loss), we can get an idea of the ossicular chain integrity preoperatively. The ossicular chain integrity is more commonly compromised in patients presenting with moderate to severe hearing loss and the most common ossicle eroded is incus, with the most commonly involved part being its long process. The ossicle most resistant to erosion is the malleus.

7. Summary

Pure tone audiogram has clearly got a very important role in determining the ossicular chain integrity preoperatively and must be done in all cases with accuracy. This is of importance since tympanoplasty can be recommended to patients with a small chance of having ossicular discontinuity as assessed by PTA.

8. Limitations

The number of cases were less (100) keeping in view the overall average of tympanoplasty being done yearly.

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Ethical Approval

The study was approved by institutional ethics committee.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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