

Bone Resorption in Chronic Otitis Media

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Abstract

Introduction: Chronic otitis media (COM) is a common condition seen in patients attending the ENT clinics and out patient's department, especially in the developing country like India.

Aims and Objectives: To study the pattern of bone erosion as well as to identify areas of the temporal bone that are resistant to erosion based on intraoperative findings in cases of both active mucosal and active squamosal type of COM.

Materials and Methods: This study was carried out in Department of ENT, Teerthankar Mahaveer Medical College and Research Centre, Moradabad for period of 1 year. A total of 46 cases of COM of both active squamosal and active mucosal type were included in this study, and the intraoperative findings of these cases were studied regarding the pattern of bony erosions.

Result: Out of 46 patients of COM selected for this study, 18 (39.1%) had active mucosal, and 28 (60.9%) had active squamous epithelial type of COM. Mastoid was found to be sclerosed in 41 (89.1%) cases and pneumatic in 5 (10.9%) cases. The ossicles were found to be damaged in 40 (80.7%) cases with the incus being most commonly involved ossicle. Fallopien canal was found to be dehiscient in 15 (32.6%) cases with a horizontal portion of the facial nerve exposed in 10 (21.7%) cases. The lateral semicircular canal had performed fistula in 8 (17.4%) cases. Jugular bulb was found to be exposed in 2 (4.3%) cases and carotid canal was dehiscient in one case.

Conclusion: There was no clear cut pattern of bony resorption in cases of COM. The magnitude of resorption was higher in cases of cholesteatoma. The ossicles were found to be most commonly involved.

Keywords: Bone resorption, Cholesteatoma, Chronic otitis media

INTRODUCTION

Chronic otitis media (COM) is a common condition seen in patients attending the ENT clinic especially in the developing country like ours. It is defined as a long standing infection of mucoperiosteal lining of a part or whole of the middle ear cleft, characterized by ear discharge, a permanent perforation and varying degree of hearing loss. Histopathologically,¹ COM is defined as irreversible mucosal changes within the middle ear cleft.²

Both types of COM have potential to incite resorption of bone.³ This propensity for bony resorption is greater in cases of active squamosal type of COM because of the presence of cholesteatoma.⁴ Various hypotheses have been postulated to establish the molecular mechanism which triggers bone resorption in COM.

The proposed mechanism for resorption of bone is chronic middle ear inflammation which leads to elaboration of a variety of molecular factors including cytokines such as interleukin-1 (IL-1), IL-6 and tumor necrosis factor alpha (TNF- α), growth factors, prostaglandins, neurotransmitter and nitric oxide. In the last decade, it has been established that whatever be the triggering factor activation of osteoclast remains the final common pathway that induces bone resorption in both active squamosal as well as in active mucosal type COM. TNF- α also produces neovascularization and hence granulation tissue formation. COM is thus an inflammatory process with defective wound healing mechanism.⁵

Longer these inflammatory processes stay in the middle ear, the more harmful it is.⁶ Initially, this is confined to the

ossicular chain and scutum. As it expands, erosion of the otic capsule, fallopian canal and tegmen can occur. There is no clear cut pattern in which this bony destruction occurs. Some areas invariably show erosion whereas others resistant to erosion even in cases of extensive cholesteatoma.

MATERIALS AND METHODS

This study was carried out in Department of ENT, Teerthankar Mahaveer Medical College and Research Centre, Moradabad, a total of 46 cases of COM (both active squamous and active mucosal type) were included in this study. Of these 26 (56.5%) were female patients and 20 (43.5%) were male patients. The selected patients were subjected to the detail history, complete ENT examination including otomicroscopic examination to precisely establish the pre-operative diagnosis of active squamosal and active mucosal type of COM. Inactive cases of COM were excluded from the study. These patients underwent pure tone audiometry to know pre-operative hearing status of the patient and X-ray mastoid lateral oblique view to assessing pathology and surgical anatomy of mastoid. Computed tomography scan was done in selected patients who had complications of COM.

These patients were subjected to various types of mastoid surgery depending on pre-operative evaluation of the patients and intraoperative findings regarding the extent of resorption of bone were observed.

RESULT

A total of 46 patients of COM selected for this study were divided into active mucosal and squamosal type. Of these 18 (39.1%) were classified as active mucosal type, whereas rest 28 (60.9%) were classified as active squamosal type of COM (Figure 1).

All these patients complained of ear discharge and varying degree of hearing loss ranging from mild to the profound degree. Dead ear was observed in 3 (6.5%) cases. 6 (13.0%) presented with subperiosteal mastoid abscess while 8 (17.4%) cases had mastoid fistula at the time of presentation. 3 (6.5%) presented with facial palsy and 5 (10.9%) patients had vertigo with positive fistula test. One case each had a history of meningitis and cerebral abscess (Table 1).

Out of the total number of patients, 6 (13%) underwent cortical mastoidectomy with reconstruction, 13 (28.2%) atticotomy with Type III tympanoplasty, 24 (52.1%) underwent modified radical mastoidectomy and 3 (6.5%) underwent radical mastoidectomy. (Figure 2) 43 (93.4%)

cases were carried out through postaural approach and the rest 3 (6.6%) cases end aural approach was used.

The mastoid was found to be sclerosed in 41 (89.1%) cases and pneumatic in 5 (10.9%) cases. Korner's septum was found to be present in 1 (2.2%) case. Tegmen plate was found to be dehiscent in 5 (10.9) cases. Low lying Dura was seen in 8 (17.4%) cases whereas antiposed sinus was observed to be present in 12 (26.1%) cases. Dura exposed at multiple sites in (13.0%) cases with exposure of posterior and middle cranial fossa.

Regarding ossicular chain status it was observed that ossicles were damaged in the majority of cases. Incus was

Table 1: Cases presenting with complication at the time of presentation

Symptoms and complications	Number of cases	Percentage
Ear discharge and hearing loss	46	100
Subperiosteal mastoid abscess	6	13
Mastoid fistula	8	17.40
Facial palsy	3	6.50
Vertigo	5	10.90
Cerebral abscess	1	2.20
Meningitis	1	2.20

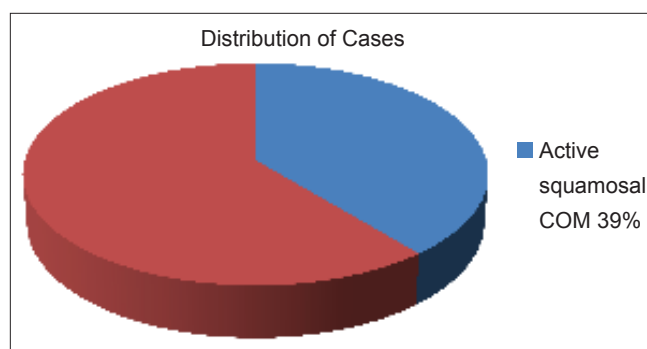


Figure 1: Distribution of active chronic otitis media cases

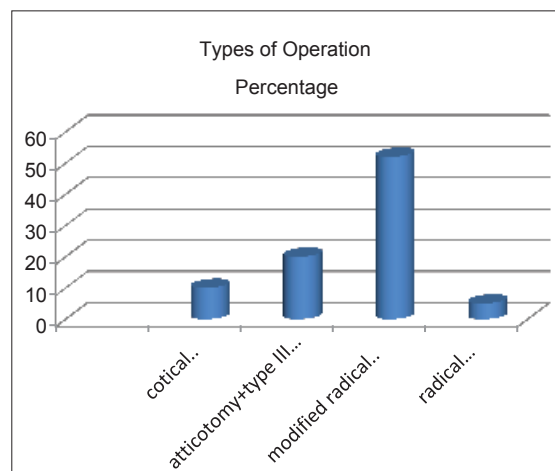


Figure 2: Types of operation performed

found to be most commonly involved either eroded or completely absent. 40 (87.0%) cases showed involvement of incus in some form. Stapes superstructure was found to be eroded in 13 (28.3%) cases. Malleus was found to be involved in 11 (23.9%) cases, showing that, of all the ossicle, this is most resistant to erosion. Ossicular chain was found to be intact in 6 (13%) cases.

Fallopian canal was found to be dehiscient in 15 (32.6%) cases with labyrinthine segment found to be dehiscient in one case. Horizontal portion of the facial nerve exposed in 10 (21.7%) cases while vertical portion was found to be dehiscient in four cases. The lateral semicircular canal had performed fistula in 8 (17.4%) cases.

In tympanic cavity, jugular bulb was found to be exposed in 2 (4.3%) cases in hypotympanum. In an incidental finding, it was seen that carotid canal was dehiscient in one case with exposure of internal carotid artery in antero-inferior segment of tympanic cavity.

It was also observed that petrous apex was most resistant to erosion, with none of the cases in the study showing its involvement. This was attributed to the high density of bone in this region and also due to the fact that prevalence of pneumatization is low. Hence, infection in sclerotic or marrow-containing petrous apices is uncommon.

DISCUSSION

Active mucosal and active squamous epithelial COM (cholesteatoma) are dangerous because of their potential to incite resorption of bone. Various hypothesis have been postulated to establish the molecular mechanism which triggers bone resorption in COM. In the past decade, it has become evident that activation of osteoclast is the common pathways that induce bone resorption in cholesteatoma as well as in active mucosal type COM. Initially, this confined to the ossicular chain and scutum. As cholesteatoma expands, erosion of the otic capsule, fallopian canal and tegmen can occur.

In this study, 46 patients of COM, both active mucosal and squamosal type were studied. Most of these cases were neglected cases where disease process was present for more than 2 years. Near about 50% of the cases had some form of complication of COM at the time of presentation. This was mainly due to unawareness on account of poor socio-economic condition as well as a lack of proper health care facility in adjoining areas.

The aim of this study was to study the pattern of bone erosion as well as to identify areas of the temporal bone

that are resistant to erosion based on intraoperative findings. It was observed that no clear-cut pattern existed regarding the extent of bone resorption in cholesteatoma. Some areas invariably showed erosion whereas others were resistant to erosion even in case of extensive cholesteatoma.

In this study, it was seen that mastoid sclerosed in 41 (89.1%) cases. Incus was the most common ossicle to be involved, followed by stapes and malleus. Ossicles were found to be intact in 6 (13%) cases. These findings were consistent with findings of previous studies.^{6,7}

A total of 15 (32.6%) cases showed involvement of fallopian canal most commonly dehiscient in the horizontal segment. This may not be only due to the disease process but can also be attributed to the fact that this portion is naturally dehiscient in 15-30% cases.⁸ Fistula was observed to be present over lateral semicircular canal in 8 (17.4%) cases. Jugular bulb was found to be exposed in two cases while internal carotid artery was found to be exposed in one case. Petrous apex was observed to be most resistant to bony resorption with none of the above cases showing its involvement. This was attributed to the high density of bone in his region and also due to the fact that prevalence of pneumatization is variable in this part of the temporal bone.⁹

CONCLUSION

- a) Bone resorption can take place without the presence of a cholesteatoma
- b) The magnitude of resorption is higher in cases with cholesteatoma
- c) Some areas invariably show erosion whereas others are resistant to erosion even in cases of extensive cholesteatoma
- d) Ossicular chain is the most vulnerable to bony resorption
- e) Petrous apex is most resistant to bony resorption.

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