

A STUDY ON OSSICULAR DEFECTS IN PATIENTS WITH TUBO-TYMPANIC TYPE OF CSOM

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ABSTRACT: OBJECTIVE: To assess ossicular defects in patients with tubo-type of CSOM in relation to size of tympanic membrane perforation and its associated hearing loss. **SETTING:** This study was carried out in department of Oto-rhino-laryngology, Vinayaka Mission Medical College, Karaikal. (Tertiary Care hospital). **METHODS:** The study included 150 patients who attended ENT OPD from May 2012 to May 2013. The patients underwent ossiculoplasty and were diagnosed to have tubo-tympanic type of CSOM. The parameters studied were size of perforation of tympanic membrane, pre-operative hearing levels and intra-operative ossicular defects. **RESULTS:** Incus was the commonest ossicle affected especially the long process of incus. In some cases the entire incus was absent. Involvement of the incus was seen was highly evident in patients with subtotal perforation of the tympanic membrane. Majority of patients had conductive hearing loss between 39.40 to 59.60 dB in patients having either single or multiple ossicular involvements. **CONCLUSIONS:** Ossicular defects and associated hearing loss may occur in tubo-tympanic type of CSOM. Ossicular defects were more common in sub-total perforation of tympanic membrane than central perforation. Knowledge gained from this study could be utilized by ENT surgeons in efficient management of tubo-tympanic type of CSOM.

KEYWORDS: otitis media, ear ossicles, tubo-tympanic, tympanic membrane perforations

INTRODUCTION: Chronic suppurative otitis media (CSOM) is a chronic middle ear infection with or without discharge with a permanent perforation of tympanic membrane. The incidence of CSOM is high worldwide, especially in the underdeveloped countries. Young age, overcrowding, inadequate health care, poor hygiene, recurrent upper respiratory tract infections, poor nutrition, exposure to cigarette or wood burning smoke are the common risk factors for development of CSOM.

CSOM is characterized by recurrent events of otorrhoea and mucosal changes with associated erosions of temporal bone and ossicles. Tubo-tympanic type of CSOM with absence of cholesteatoma was considered in our study. Due to poor hygienic conditions in societies of underdeveloped countries, tubo-tympanic type of CSOM is common. It is reported that 42 % of non-cholesteatoma cases of CSOM (tubo-tympanic disease), inflammation of the ossicles with partial or total destruction is common. In this study about 150 patients were studied with respected to size of perforation and its associated hearing loss in CSOM (Tubo-tympanic type) was studied.

METHODS: All the 150 patients who presented to the department of ENT in Vinayaka mission medical college, Karaikal from may 2012 to may 2013 and having diagnosed to be having Tubo-Tympanic type of CSOM pre-operatively and underwent ossiculoplasty, were our study group. In all the 150 cases there was involvement of individual ears and none of the patients underwent ossiculoplasty for both ears. The study protocol conformed to the standards and ethical guidelines set by the Institutional Research Guidance Committee. The parameters studied were size of

ORIGINAL ARTICLE

perforation of the tympanic membrane as assessed by pre-operative oto-endoscopy, pre-operative hearing levels as recorded by pure tone audiometry and intra-operative oto-microscopic assessment of ossicular defects. All the cases underwent tympanoplasty without mastoidectomy.

RESULTS: The age of patients ranged from 10 years to 50 years. There were 90 male (60%) and 60 female (40%) patients. Duration of ear discharge ranged from 2 years to 15 years.

OSSICULAR DEFECTS: In our study patients presented with either central perforation or sub-total perforation of tympanic membrane. Sixty ears (40%) had central perforation and 90 ears (60%) had sub-total perforation. In all the 150 ears studied, either single or multiple ossicular defects were noted. Out of 90 ears with subtotal perforation 25 ears (28%) were found to have multiple ossicular involvements. Out of 60 ears with central perforation 15 ears (25%) were found to have multiple ossicular involvements. Thus a total of 40 ears had multiple ossicular involvements.

Defect of incus was seen in 135 ears (90%). Among them, 55 ears had central perforation and remaining 80 had sub-total perforation. Isolated erosion of long process of incus was found in 15 ears with central perforation. And 25 years with sub-total perforation. This was noted in a total of 40 ears (27%) (Table no 1).

Isolated erosion of lenticular process was found in 15 ears with central perforation and 20 ears with sub-total perforation (table no. 2). This was noted in a total of 35 ears (23%). Isolated absence of incus was noted in 10 ears with central perforation and 25 ears with sub-total perforation. This was observed in a total of 35 ears. (23%) [Table no.1]. Stapes was least involved with only 5 ears [3%] which had central perforation. [Table No.1].

Stapedial involvement was associated with absence of incus in all the 5 ears. Ossicular chain fixation was seen in 5 ears with central perforation and 10 ears with sub-total perforation. Thus a total of 15 ears had ossicular fixation [10%] {Table2}.

TABLE 1: OSSICULAR PATHOLOGY IN RELATION TO TYPE OF TYMPANIC PERFORATION

Type of perforation	Number of patients (%)	Malleus Involvement	Incus Involvement	Stapes Involvement
Central	60(40%)	10	10	5
Sub-total	90(60%)	25	25	Nil
Total	150(100%)	35	35	5

TABLE NO. 2: HEARING LOSS ASSOCIATED WITH OSSICULAR DEFECTS

Type of Ossicular Defect	Types of Perforation	No. of patients (%)	Air Conduction (Mean+/_ SD)
Isolated erosion of lenticular process of incus	CP	15(10%)	50.72+/-6.95
	STP	20(13.3%)	
Isolated erosion of long process of incus	CP	15(10)	50.1+/-15.48
	STP	25(16.6)	
Isolated absence of incus	CP	10(6.67)	59.58+/-1.77
	STP	10(6.67)	
Erosion of malleus handle and long process of incus	CP	10(6.67)	39.38+/-5.15
	STP	10(6.67)	
Erosion of malleus handle and absence of incus	CP	0	53.73+/-7.05
	STP	15(10)	
Absence of incus and stapes suprastructure	CP	5(3.33)	60+/-00
	STP	0	
Ossicular chain fixation	CP	5(3.33)	49.54+/-5.99
	STP	10(6.67)	

CP-Central perforation, STP-Sub-total perforation

HEARING LOSS IN RELATION TO OSSICULAR DEFECTS: Conductive hearing loss is a common sequela to tympanic membrane damage and /or damage to the ossicular chain. In ears with single or multiple ossicular involvements, the average hearing loss was noted to be between 39.40 to 59.60 dB. The average hearing loss in patients with isolated erosion of lenticular process of incus was 50.72+/-6.95dB, while the hearing loss with isolated erosion of long process of incus was 50.10+/-15.48dB. However, the average hearing loss in patients with isolated loss of incus was 59.58+/-1.77 dB. In patients with erosion of handle of malleus and the long process of incus, the average hearing loss was 39.38+/-5.15 dB. But hearing loss was higher in patients with erosion of handle of malleus and absence of incus {53.73+/-7.05 dB}. The hearing loss was highest in patients with absence of incus and stapes suprastructure {60 dB}. The average hearing loss in patients with ossicular chain fixation was 49.54+/-5.99 dB {Table no, 2}.

DISCUSSION: Thomsen and others [7] found that, bone erosion in those with chronic otitis media was more prevalent when cholesteatoma was present but still occurred in the absence of cholesteatoma [8]. In a study by Karja et al. regarding the ossicular chain erosion in chronic suppurative otitis media, infected ears without cholesteatoma, the ossicular chain was disrupted in 59-78% cases. The authors concluded that vascular bone erosion caused by active granulation tissue, the process triggered initially by infection, is the main mechanism for destruction of ossicles both in cholesteatomatous and non-cholesteatomatous ears [8]. Kurihara et al. analyzed surgical specimens of middle ear inflammatory granulation tissue with or without cholesteatoma, to clarify specific mechanisms underlying cholesteatoma induced bone destruction. Almost the same levels of bone resorbing activity and prostaglandin E2 were found in both types of tissue [8].

According to Thomsen et al., the erosion of the ossicular chain is due to hyperemia associated with mucosal inflammation, rather than due to ischemia. The long process of incus and the stapes superstructure are the parts of the chain, which are most frequently affected [8]. Schuknecht has mentioned that, rarefying osteitis of the ossicles is a common complication of chronic infection. The long process of incus, crural arch of the stapes, body of the incus and manubrium are involved in that order of frequency [8].

In our study, the most commonly involved ossicle in any type of ear perforation was the incus. In the incus, involvement of long process was most common. This was followed by that of malleus and stapes. According to Austin [9], the long process of the incus commonly undergoes necrosis, because of thrombotic disease of the mucosal vessels supplying the incus, but when secondary squamous epithelium in growth has occurred, the arch of the stapes and the handle of the malleus may be destroyed by the formation of osteolytic enzymes or collagenases in the subepithelial connective tissue.

In our study, ossicular involvement was more common in subtotal perforation of tympanic membrane than in central perforation. This is due to large perforation exposing the middle ear mucosa to the atmosphere and its external allergens such as dust, water and microbes. Continuous exposure of the ossicles resulted in poor vascularity and ossicular necrosis.

The resorption of handle of malleus was significantly more common in sub-total perforation than in central perforation. In sub-total perforation, handle of malleus gets involved, because the handle is completely exposed, resulting in insufficient blood supply, leading to necrosis. In our study, 15 ears had ossicular chain fixation (10%). Ossicular chain fixation occurs due to tympanosclerosis, caused by otitis media.

In our study, with patients having single or multiple ossicular involvements, the average hearing loss was noted to be between 39.40 to 53.60 dB. Approximately 60% of patients undergoing surgery for chronic ear disease have perforation with ossicular interruption. An analysis of this clinical problem by Austin [9] indicates that, the typical hearing loss averages 38 dB. Larger perforations cause slightly worse hearing, but this difference is variable [10]. With total loss of tympanic membrane and ossicles, the contour of the hearing loss is the same as the previous group, but more severe, averaging 50dB [9]. The greater hearing loss is probably due to increased phase cancellation at the round window [10].

All our cases underwent ossiculoplasty. Mastoidectomy was not done in any of the cases, as all the cases were not having discharging ears at the time of operation. The need of mastoidectomy in NCSOM is controversial. Mishiro [11] in a retrospective study of 251 ears with non-cholesteatomatous chronic otitis media operated upon over 11 year period, concluded that, mastoidectomy is not helpful in tympanoplasty for non-cholesteatomatous disease, even if the ear is discharging. Myringoplasty was done with autologous temporal fascia graft.

CONCLUSION: Ossicular defects were more common in sub-total perforation of the tympanic membrane than central perforation. Incus was the most common ossicle to be involved. Isolated erosion of the long process was more common than isolated erosion of the lenticular process. Malleus was the second most common ossicle to be damaged. Stapes was the least involved ossicle. The average hearing loss was between 39.40 to 59.60 dB with patients having single or multiple ossicular involvements. Our data highlights the underlying ossicular defects and conductive hearing

ORIGINAL ARTICLE

loss associated with NCSOM. This study highlights that, ossicular defects and the associated hearing loss may happen even in NCSOM, thus enabling the ENT surgeons to efficiently manage such cases.

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