



A Study on Frequency of Ossicular Chain Erosion in CSOM

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ABSTRACT

Aims & Objectives: This study was conducted to find out the hearing restoration surgical treatment in chronic otitis media consists of myringoplasty for drum repair and ossiculoplasty for ossicular defect if present which carries a inferior hit rate and superior chance of revision surgery. Our objective is to evaluate the frequency of ossicular erosion in chronic suppurative otitis media which could be utilized to predict the probability of need for ossiculoplasty preoperatively then patients could be properly consented about these potential issues.

Materials and Methods: A prospective study was conducted in the Department of Otolaryngology of Great Eastern Medical School & Hospital Srikakulam in the period from January 2016 to August 2017. 140 ears that underwent surgery for chronic otitis media were studied and their ossicular status was reported.

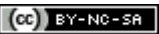
Results: Ossicular chain was eroded in 33 (23.57%) out of the 140 ears. Erosion was more frequent in cholesteatoma ears (66.6%) than in safe ears (13.57%). The most frequently impaired ossicle was the incus and was found eroded in 32 (22.8%) ears. Malleus was found to be the most resilient ossicle and was eroded only in 7 (4.2%) ears. The stapes was eroded in 16 (11.4%) ears.

Conclusion: Our study shows that in chronic otitis media, around 30% patients have ossicular chain discontinuity. More than two thirds of patients with cholesteatoma have ossicular chain discontinuity. Otolaryngologists must be capable enough to do ossiculoplasty in ear surgery to provide the finest hearing outcome

Keywords: Ossicles; CSOM; Erosion; Cholesteatoma; Otolaryngology

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INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is a prevalent middle ear pathology that constitutes of tympanic membrane perforation together with a chronically inflamed middle ear mucosa. CSOM can occur with or without cholesteatoma which is an in-growth of eardrum skin into the middle ear cavity. Ossicular erosion, a frequent complication of CSOM, may lead to total failure of middle ear mechanics and resulting in substantial hearing loss [1].

The main aim of surgery in CSOM is to eliminate disease process and reconstruct middle ear to give the patient a dry, safe and functioning ear. Success rate in the range of 95% are frequently quoted in various studies. There are many factors which influence this success rate, including age of the patient, site and size of the perforation, duration of the ear being dry prior to surgery and the presence or absence of infection at the time of surgery. Discharging ear at the time of surgery is one of them. The discharging ear presents to the otologist the dilemma of whether to operate on it or not. Hearing restoration surgery comprises ear drum repair and ossicular chain reconstruction in ears housing defective ossicles. The later scenario is associated with higher rate of long term acoustic failure that may reach 50% [2,3]. Myringoplasty in the absence of ossicular damage is bracketed with a much higher long-term success rate more than 90% even in wet ears [4].

Ossicular integrity or erosion can only be confirmed intra-operatively. The preoperative information given to the patient must be comprehensive, and should include details of the probabilities of having OCD and the associated risks of acoustic failure and need for revision surgery. This study was conducted toward evaluate middle ear ossicles state of in 140 ears that compulsory needed surgical procedure for CSOM. The result of this study might be exploited to predict preoperatively the possibility of having OCD in CSOM ears and as a result patients could be properly consented about these potential issues prior to surgery.

MATERIALS AND METHODS

We conducted a prospective study in Great Eastern Medical School & Hospital Ragolu, Srikakulam, Andhra Pradesh in the period from January 2016 to August 2017. Patients older than 18 who underwent tympanoplasty for CSOM during this period were recruited to our study. Patients younger than 18 or posted for revision

tympanoplasty were excluded. Written informed research consent was obtained from recruited subjects. Recruited subjects were interviewed preoperatively by the senior author for history taking and proper ear examination.

Intraoperatively, all patients had proper exploration of middle ear using microscope and endoscope looking and the status of each ossicle were checked. The presence of cholesteatoma was also checked. Statistical analysis was done using Statistical P values less than 0.05 were considered to be statistically significant.

RESULTS

105 patients with CSOM were recruited for this study and a total of 140 ears were included. 17 patients had both ears included which were operated sequentially. The average age was (33.4 ± 8.9) . 90 (85.7%) out of the 105 patients were younger than 40. There was 71 male (67.6%) and 34 female (32.3%). The most common complaint was recurrent otorrhea present the majority of the ears (89.2%), the next most common complaint was hypoacusia and was present in 106 ears (75.7%). Examination findings showed that most of the ears had safe CSOM (115 ears; 82.1%). While only 25 ears (17.5%) had cholesteatomatous or unsafe ear.

Intra-operative findings

Intra-operative middle ear exploration matched completely our pre-operative diagnosis; none of the patient who presumed to have safe ear turned to have cholesteatoma and vice versa. Overall, the ossicular chain was eroded in 33 ears out of the 140 (23.6%). In noncholesteatomous ears, the ossicular status was intact in 100 ears (86.9%), eroded in 15 ears (13.1%). In cholesteatoma ears, the ossicular status was intact in 8 cases (33.3%), eroded in 16 ears (66.7%).

Ossicular erosion

Malleus (Table 1): It was found intact in 133 (95.0%), eroded in 7 (4.2%) ears. Malleus erosion was associated with incus erosion in all of the cases except one ear. In safe CSOM (total of 115), 114 (99.13%) of the ears had intact malleus. Only 2 ears (0.87%) had erosion of the malleal handle; one of the two ears had isolated erosion of the handle, the second one was associated with incus long process erosion. In cholesteatomous ears (total of 24), the malleus was found intact in 19 (79.1%), eroded in 5 (20.9%). Erosion involved the head of malleus in 4 ears, the handle of the malleus in 1 ears and the whole malleus (head and handle) in 1 ear.

Malleus	Malleus CSOM (%) n=140	Non-cholesteatomous ears (%) n= 115	Cholesteatomous ears (%) n=24	P value
Intact	133 (95.0%)	114(99.1%)	19(66.6%)	0.027*
Handle necrosed	4 (2.8%)	1 (0.9%)	1 (4.1%)	0.000*
Head necrosed	2 (1.4%)	-	3 (12.5%)	0.016*
Handle+ Head	1 (0.7%)	-	1 (4.1%)	0.212

* Statistically significant

Table 1: Malleus status in chronic suppurative otitis media (CSOM).

Incus (Table 2): We found the incus intact in 108 (77.1%) and eroded in 32 (22.8%) ears. Incus erosion was most frequently localized to the lenticular process (17 ears) and to the long process (14 ears). In non-cholesteatomous ears, it was intact in 100 ears (86.9%) and eroded in 15 ones (13.1%) in which erosion were most frequently

localized to the lenticular process 9 ears. In cholesteatoma ears, it was found intact in 8 (33.3%) and eroded in 16 (66.6%). Lenticular process was anew the most frequently involved portion in 8 ears (33.3%), next most common was the long process in 7 (29.1%) ears. The incus was completely absent in 1 case(4.1%).

Incus	CSOM (%) n=140	Non-cholesteatomous ears (%) n= 115	Cholesteatomous ears (%) n=24	P value
Intact	108(77.1%)	100 (86.9%)	8 (33.3%)	0.000*
Lenticular process	17 (12.5%)	9(7.8%)	8 (33.3%)	0.56
Long process	9 (9.6%)	6 (5.2 %)	7(29.1%)	0.017*
Absent	1 (0.4)	-	1 (4.1%)	0.000*

* Statistically significant

Table 2: Incus status in chronic suppurative otitis media (CSOM).

Stapes (Table 3): It was respected in 124 (88.6%) ears and eroded in 16 (11.4%) ones. The disease respected the footplate in all the cases and erosion was localized solely to stapes superstructure and was associated with incus erosion in all of the

cases. Stapes erosion was infrequent in safe ears; it was present in 6.1% of the cases only. Conversely, the presence of cholesteatoma was associated with stapes superstructure erosion in most of the ears (66.6%).

Stapes	CSOM (%) n=140	Non-cholesteatomous ears (%) n= 115	Cholesteatomous ears (%) n=24	P value
Intact	124(88.6%)	108(93.9%)	8(33.3%)	0.007*
Super structure erosion	16(11.4%)	7(6.1%)	16(66.6%)	0.000*

* Statistically significant

Table 3: Stapes status in chronic suppurative otitis media (CSOM).

DISCUSSION

We analyzed data composed as of a sample size of 140 ears with CSOM to establish their ossicular chain status. 24 out of the 140 operated CSOM ears (17.6%) had related to cholesteatoma.

The majority of our patients were young which probable reproduce improved health consciousness between the populace of Andhra pradesh with easy access to supervision sponsored medicinal care, particularly, when hearing injury affects work competence. The male to female ratio in our study was approximately 2:1 in difference to earlier reported literature which showed almost equal

gender distribution [1-4]. The possible explanation for males predominance could be that in the rapidly developing State of Andhra pradesh, the majority of the population is male expatriate workers and laborers.

OCD was apparent in 23.6% ears. The most frequently impaired ossicle in both types of CSOM was the incus. It was found unscathed in 77.4% cases, eroded in 22.2% cases and absent in 0.4% cases. The common of the experiential erosions were localized to the lenticular process in 12.5% ears and the long process in 9.6% ears. Hence, incudal erosion was observed to be the most prevailing ossicular pathology in cases of CSOM

correlating with previous studies in which the prevalence ranged from 20 to 30% [5,6].

Malleus was the the majority insolent and resilient middle ear ossicle. It was esteemed in additional than 95% of studied ears. In cases of rare malleal association, erosion affects frequently the head of the malleus and spares the handle. This might be is endorsed to the firm attachment of the handle to the tympanic membrane which acts as a reflex barricade and allows adequate blood flow to the handle . The combined effect diminishes the risk of malleus handle necrosis.

The stapes was unviolated in 248 (88.9%) ears and its superstructure was involved in 31 (11.1%) ears with CSOM. The presence of stapedia necrosis in all cases of CSOM was found to be less than that documented in former literature [1,5,7]. Our outcome showed that OCD is much more prevalent in cholesteatomous ears (66.6%) vs. in non-cholesteatomous CSOM ears (13.4%).

In non-cholesteatomous ears (115), incus was eroded in 16 ears (13.9%). Incus erosion was most frequently localized to the lenticular process in 17 (14.7%) ears followed by long process in 13 (11.3%) ears. Necrosis typically spared the body of the incus. Malleus handle was eroded in 1 (0.8%) ears; both of them had subtotal perforations. Stapes was eroded in 6 (5.2%) ears.

It is hypothesized with the intention of middle ear ossicles damage in CSOM is induced by an vigorous phenomena of osteoclastic osseous resorption rather than by a passive vascular necrosis [8]. The recommended method for bony erosion is excessive formation of inflammatory mediators in the tympanic cavity which induces osteoclast activation and bony resorption ensuing in ossicular destruction. The interval of the inflammatory process and its vicinity to the ossicular chain are factors which emerge to be the the majority harmful for the ossicles [9,10]. The factors that might explain that the incus lenticular and extended processes being more exposed are possibly their tenuous blood supply, noticeable bone marrow, and their contact to the external milieu particularly in posterior perforations [11,12].

Resorption of malleus handle is additional frequent in subtotal perforations where the handle is completely exposed to the external environment mutually with the increasing result of reduced blood supply from the drum.

The occurrence of cholesteatoma is related with a elevated frequency of ossicular erosion. It is also related with two or more ossicles being affected simultaneously. In our study, ossicular erosion in cholesteatomous ears was as follows: incus 66.6%, malleus 22.8%, and stapes 63.3%. In a study by Kurien et al. these figures were: incus 100%, malleus 67%, and stapes 67% [13]. In another study by Garap and Dubey, the figures were: incus 89%, malleus 32%, and stapes 41% [14]. In cholesteatomous ears, incudal erosion was most frequently localized to the lenticular process (33.3%) and the long process (29.1%). The hypotheses of bone erosion in cholesteatoma ears involve several mechanisms including among others pressure induced erosion and enzymatic destruction by inflammatory products secreted by cholesteatoma matrix [15,16].

Even though the improved health awareness between the population of Andhra Pradesh with simple access to medical care centers, ossicular chain erosion remains to be a recurrent and common problem of CSOM in Andhra population. We believe that the patients are referred to tertiary care center for surgical treatment only in advanced stages of the disease. It is renowned that inflammation in the tympanic cavity is additional damaging to middle ear ossicles the longer it stays [9,10].

Studying the frequency and the extent of OCD in CSOM is significant as it helps surgeon to predict pre-operatively its probability according to the patient's disease. The occurrence of widespread OCD implies complexity of restoring the hearing throughout the single procedure, and the probable requirement for revision surgery. So as Otolaryngologists we must be capable enough to do the ossicular chain reconstruction throughout surgery to provide the best hearing results to our patients. Patients as a result be fully informed and consented about these possible issues prior to surgery.

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