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"PATTERNS OF OSSICULAR EROSION IN CHRONIC OTITIS MEDIA"

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ABSTRACT

Background and objectives

The injury or damage of some of the parts or whole ossicular chain is concerned with chronic suppurative otitis media involving active mucosaldisease.There are no precise or clear cut elements which may specify or show that in case of safe CSOM , ossicular erosion is present preoperatively. So, this research has been conducted to look into the pattern of ossicular erosion in chronic otitis media in both the cases mucosal and squamosal disease.

Methodology

This hospital based prospective study was performed at GMC Hospital, Jammu, for one year at a stretch from November 2018 to October 2019 on 100 patients with CSOMpresenting with pure conductive hearing loss, who underwent surgery.

Results

The percentage of male patient was 69 while 39% patients were in between 21-30 years of age. Ossicular chain was accurate in 35% of the patients, eroded in 55% of thepatients and absent in 10% of the patients. The patients who had Safe CSOM were in the age group of 21-30 years. Ossicular chain was unscathed in 35% of the patients, eroded in 55% of the patients and absent in 10% of the patients. Safe CSOM was noted in 51 cases (51%) andunsafe CSOM was present in 49 (49%) cases. Malleus was unharmed in 90%, damaged in 6% andabsent in 4% of the cases. Incus was proper and unmarked in 42%, eroded in 52% and absent in 6% of thecases. Stapes was found undamaged in 96% and eroded in 3.92% of the cases. In all the cases, footplate was rightly placed.

Conclusion and interpretation

The number of incidence of ossicular erosion was larger in unsafe CSOMthan safe CSOM. Further erosion of incus is common than malleus and stapes.

Key words

Chronic suppurative otitis media; Ossicular erosion; Safe CSOM; Unsafe CSOM;

Introduction

An important reason of middle ear disease from ancient times has been a common infection called Chronicsuppurative otitis media (CSOM) inOtorhinolaryngology (Browning GG et al., 2008).This condition appears due to the severe infection of the mucosa liningof tympanic cavity, eustachian tube and mastoid air cell system. Thesesymptoms include deep seated inflammation of the middleear and mastoid mucosa characterized by discharge which may be chronic, continuous or at regular intervals througha perforated tympanic membrane (Jayakumar CL et al., 2016)

Due to Poor living conditions,Higher population density, poor hygiene and nutrition, CSOM is more prevelant indeveloping countriesranging between 0.4% to 33.3%.which indicates widespread. (Varshney S et al., 2010)

The variation in proportion and location of the problem in tympanic membrane,any injury or infection in the middle ear or the ossicular chain's position may cause hearing loss. The reason of erosion of the ossicular chain may be both i.e.safe and unsafeCSOM .This intensity of ossicular destruction is much higher in cases of unsafe CSOM, due to thepresence of cholesteatomaor granulations are present there. (Balasubramanian C et al., 2017). Hearing loss caused due to CSOM is a grave concern as itaffects communication, language proficiency and learning process(Varshney S et al., 2010).

Active mucosal CSOM is characterized by damage of parts or wholeossicular chain (resorptiveosteititis). Damage or erosion of bone is a feature of active mucosal andactive squamousal CSOM. The affected ossicles has increase blood supply withproliferation of capillaries andsalienthistiocytes and affect long process of the incus, stapescrurae, body of incus and manubrium persistently. (JayakumarCL et al., 2016). The surgeon should have all the necessary pre operative knowledge of necrosis so that he plans operative schedule,keeping in mind the probability of a longer duration for surgery and should procure all the necessary tools needed to perform ossiculoplasty . The surgeon has to discuss the pro's and con's of performing an ossiculoplasty , the surgical complications with the patient prior to surgery and get his written approval. However, there is less information about specific cause to show the presence of ossicular erosion preoperatively in caseswith tubotympanic CSOMi.e safe CSOM . Considering these facts, the presentresearch studyhas been taken up to evaluatethe pattern of ossicular erosion in CSOM of both mucosal and squamosal disease at the extent of destruction of ossicles involved.

Methodology

This hospital based prospective study was performed at GMC Hospital, Jammu, for one year at a stretch from November 2018 to October 2019 on 100 patients with CSOMwho had pure conductive hearing loss, and underwent surgery. Patients aged more than 16years who had chronic otitis media (COM) and agreed to participate in the study were enrolled while the patients diagnosed with carcinoma of middle ear,otitis externa and those already had ear surgery

were not included in the study. The ethical norms as laid down indeclaration of Helsinki were followed while conducting the study. Ethical clearance was obtained fromEthics and Research Committee of GMC JAMMU before initiating the research. Patients were screened for the eligibility and those fulfillingthe selection criteria were told about the nature of the study. We took written approval from the patients who volunteered to participate in the study.

The patients were interviewed and their age and gender were notedalongwith detailed history.The infected ear was examined by otoscopeand was further checked through otomicroscope for better evaluationand main audiolological assessment which includes PTA, Tympanometry, speech audiometry was also conducted. Imaging study like HRCT of the temporal bone was also done as per the requirement .Modified radical mastoidectomy(MRM) was done and ossicular chain was reconstructed with auto/homologus incus or malleus head and sometimes with TORP/PORP.Assessment of data was collected during surgery and recorded in a standard format.In each patient the condition and the integrity of ossicular chain was measured in todetermine the presence and location of lesion of each ossicles. Intraoperatively, we have checked the status of ossicles of operating ear including thepresence ofcholesteatoma.

Analysis of data

Thedata collectedafter surveywas processed through Microsoft Excel Worksheet after proper coding. The statistical software SPSS version 20.0 was used to analysedata.mean±standard deviation (SD) and Categorical data as continuous variables were interpreted as rates,ratios and percentages and compared using the Chi-square or Fisher's exact.

Results

The age and gender distribution as shown in table 1 indicates that 69% of thepatients were men and 31% were women. The men to women ratio was 2.22:1 falling in theage of 21-30 years for males and 31-40 for females. The youngestpatient in the series was a 17 years old male and the oldest was 49 year old male (Table 1).The local examination revealed wet ear in 54% of the patients, unilateral involvement in 53%and intraoperative cholesteatoma in 51% of the patients (Table 2).

Table 1. Distribution of patients according to the age and sex

Age group (years)	Male	Female	Total
11-20	5 (7.24%)	3 (9.67%)	8 (8%)
21-30	31 (44.92%)	8 (25.80%)	39 (39%)
31-40	23 (33.33%)	15 (48.38%)	38 (38%)
41-50	10 (14.49%)	5 (16.12%)	15 (15%)
TOTAL	**69 (69%)**	**31 (31%)**	**100**

Table 2. Distribution of patients according to local examination findings

Parameters	Findings	Number (n=100)	Percentage
Wet and dry ears	Wet ear	54	54.0
	Dry ear	46	46.0
Laterality of the ear	Unilateral	47	47.0
	Bilateral	53	53.0
Intraopertaive status of cholesteatoma	Present	49	49.0
	Absent	51	51.0

Table 3. Distribution of patients according to ossicular erosion pattern

Ossicular erosion pattern	Findings	Number (n=100)	Percentage
Malleus	Intact	90	90.00%
	Absent	4	4.00%
	Handle erosion	4	4.00%
	Head of malleus erosion	2	2.00%
Incus	Intact	42	42.00%
	Short process of erosion	9	9.00%
	Long process of erosion	43	43.00%
	Absent	6	6.00%
Stapes	Intact suprastructure	88	88.00%
	Suprastructure erosion	12	12.00%

Table 4. Distribution of patients according to ossicular erosion pattern in different pathologies

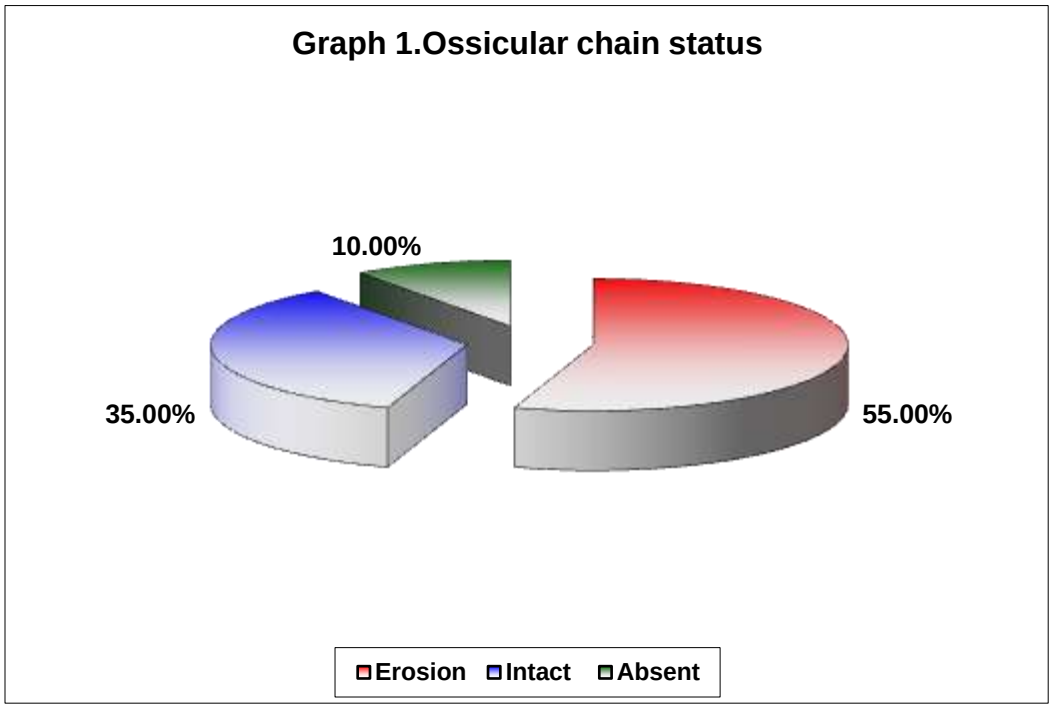
Ossicular erosion pattern	Findings	Squamosal (n=49)		Mucosal (n=51)		P value
		No.	%	No.	%	

Malleus	Handle of malleus erosion	4	8.16	0	0.00	**<0.001**
	Head of malleus erosion	2	4.08	0	0.00	
	Absent malleus	2	1.08	2	3.92	
	Total	**8**	**16.32**	**2**	**3.92**	
Incus	Long process of erosion	31	63.26	12	23.52	**<0.001**
	Short process of erosion	9	17.64	0	0.00	
	Absent	4	8.16	2	6.45	
	Total	**44**	**89.78**	**14**	**45.16**	
Stapes	Intact suprastructure	10	20.40	0	0.00	**0.011**
	Suprastructure erosion	2	4.08	0	0.00	

Table 5. Relation between pre op air bone gap and ossicular erosion

Pre op AB bone gap	Long process of incus erosion + stapes supra structure erosion	Handle of malleus erosion + long process of incus erosion (	Long process of incus erosion in isolation	Short process of incus erosion	Absent incus	Head of malleus erosion	Handle of malleus erosion in isolation	Absent malleus
11-20DB				8				

21-30 DB				1		1	2	4
31-40 DB	6		26		6	1		
41-50 DB	6	2	3					



Overall, ossicular chain was accurate in 35% of the patients, damaged in 55% of thepatients and not found in 10% of the patients (Graph 1). The ossicular erosion pattern in asshown in Table 3. It was observed that, malleus was unharmed in 90% of the patients, incus wasunscathed in 42% and stapes was unharmed in 88% of the patients. Handle was the most common part of the malleus which was involved as many as in 4 patients (4%), head of malleus was involved in(2%). The malleus was found to be missing in 4 patients (6%). The most commonly involvedpart of incus was the long process in as many as 44 patients (44%), short process of incusinvolved in (9%). The incus was found to be missing in 6 patients (6%). Stapessuprastructure was seen damage in 12% of the patients and in 88% of the patient's stapessuprastructure was found proper (Table 3). In squamosal disease handle of malleus erosionwas found in 4 (8.16%) patients. In squamosal disease head of malleus erosion was found

in2 (4.08%) patients. Frequency of long process of incus erosion was found to be higher insquamosal disease i.e. 31 (63.26%) patients followed by short process of incus in 9 (17.64%)patients and in mucosal disease frequency of long process of incus erosion was present in 12(23.52%) patients. Overall ossicular chain erosion status was significantly high in squamosaldisease than mucosal disease including malleus (p< 0.001), incus (p< 0.001) and stapes(p=0.011) (Table 4).Pre op AB gap was seen with involvement of long process of incus erosion and stapessuprastructure followed by involvement of handle of malleus erosion and long process ofincus erosion. Least pre op AB gap was seen involving of short process of incuserosion (Table 5).

Discussion

Our research revealed that out of a total of 100 patients, 69% patients were men and 31%were women. So,men to women ratio is 2.22:1 suggesting men preponderance. The resultsin our study were strongly corroborated with earlier studies in the literature (Haidar etal., 2015 and Hossain et al., 2015). In contrast, several other studies (Varshney et al., 2010and Jayakumar et al., 2016) reported women preponderance.

In our study , the mostof the patients were having the age of 21-30 years followed by 38% aged in between 31-40 while only 8% cases fell in the group of 11-20 years andonly 15% cases were aged 50 years indicating that most of the patients in the presentstudy were young. These observations were similar to one study (Jayakumar et al., 2016)which stated that themost commonly affected age group was between 18-30 years. The earlyconsultation noted in the present study and other study may be due to increased awareness tohealth issues anddifficulty in hearing affecting the efficiency of work, job opportunities and their daily life chores leading toseek early medical advice.

In the present study ossicular erosion was found in more than half of the patients(55%). The rate of ossicular erosion in one study (Jaykumar CL et al. 2016) was 23.1% that is,the rate of ossicular erosion seen in the present study was very high compared to the previousstudy (Jaykumar CL et al. 2016) by ossicular erosion.

In the present study 51% of the cases were divided as having safe CSOM and 49% asunsafe CSOM. These findings are similar to a study (Varshney et al., 2010), where 64% ofthe cases had safe CSOM (64%) and 36% had unsafe CSOM.

In the present study, malleus was unharmed in 90%, eroded in 6% and absent in 4% of the cases suggesting it to be the most resistant ossicle both in safe and unsafe types of CSOM.The most commonly necrosed part of malleus was the handle (4%). Among those with safeCSOM, malleus was intact in majority of the cases (96%) cases, and absent in 3.9%. Inunsafe CSOM, malleus was unscathed in majority (83%) cases, damaged in 12.2% and absent in 4%of the cases. These observations were consistent with a previous study (Varshney et al.2010).

In this study, incus was found unharmed in 42% cases, damaged in 52% cases and absent in6% of the cases. Erosion of the long process of incus which wasseen in 43% of the cases was the most common feature. In safe CSOM, incus was unscathed in majority of the cases (72.54%),damaged in 23.5% cases and absent in 3.9% of the cases while in unsafe CSOM, it was unscathed in10.2% cases, damaged in majority of the cases (81.63%) and absent in 8.16% of the cases. Similarfindings are reported in a previous study (Hossain et al., (2015).

In the present study, stapes was found unmarked in majority of the cases (88%) in bothsafe and unsafe ears. Only 12% of the cases withCSOM showed involvement of stapes superstructure. The footplate was found properin all the cases. In safe CSOM, stapes was intact in 96% cases and eroded in 3.92% of the cases. In unsafe CSOM, stapes was unharmed in79.5% cases and damaged in 20.4% of the cases. In contrast to the present study, higher figureswere reported in one study (Hossain et al., 2015).

In our study, ossicular chain (M+I+S+) was found proper and mobile in 35 (35%) of ourcases. In safe CSOM, the ossicles were mostly unharmed. M+I-S-(unscathed malleus with damaged orabsent incus and stapes) was found in 2(3.9%) patients. M+I-S+ configuration was found in12 (23.5%) patients. In unsafe CSOM, we did not find intact ossicular chain in any of thepatients. M+I-S+ (intact malleus with damaged or absent incus) was seen in 31(63.2%) cases,M+I-S- (intact malleus with eroded incus and stapes) in 10 (20.4%) cases, M-I-S+ (absent oreroded malleus and incus with intact stapes suprastructure) in 8 (16.3%) cases. Similarfindings were reported in a study (Austin 1971) in which 59.2% patients were found to have the defect of where M+S+ and others number was M+S - (23.2%), M-S+ (7.8%), and M-S- (8.2%).

In this study, the most common type of defect was M+S+ ossicular defect in 50.53% ofthe cases followed by M+S- in 25.80% cases. M-S+ defect was found in 13.97% cases, while as M-S- defect was seen in 9.67% cases.

In the present study, in relation to ossicular erosion in cholesteatoma with incus was foundin 89.7% patients, malleus in 16.3% patients, and stapes in 20.4% of the patients and in non-cholesteatomous patients the pattern of ossicular erosion was incus in 27.4% patients, malleusin 3.9% patients and stapes in 3.9% of the patients. In contrast to the present study, one study(Mohammadi et al., 2012) stated that ossicles were affected in 94.5 % of 166 patients, incuswas involved in 86.1%, stapes in 66.8% and malleus in 43.9%.

In our study, patients having squamosal disease had a greater mean air bone gap onpure tone audiometry (31.95 dB) when it was compared to mucosal disease patients (21.54 dB) andthis mean difference was statistically significant (p< 0.05). The erosion of each ossiclein a graded and independent manner which increasesthe AB gap with the position ofthe incus having the most statistically significant association with AB gap.Furthermore, AB gap and PTAcannot be called as a possible indicatorpreoperatively for predicting ossicular chain status and in our study it is found that incus erosion is notstatistically significant (p> .05) with pre op AB gap. Earlier a study by Mohanty S., 2019determines the predictive value of preoperative audiological factors indiagnosing incus necrosis in patients with chronic otitis media (com)—mucosal type. This study shows that incus necrosis is best diagnosed by the presence of moderate to moderatelysevere hearing loss (45–70 db hl). Surgical decision making and preparedness regarding ossiculoplasty and patientconsent in accordance with our study depended upon this information before operation.

Conclusion

The number of incidence of ossicular erosion was larger in unsafe CSOM than safe CSOM. Further erosion of incus is common than malleus and stapes.

References

1. Austin DF, (1971) Ossicular reconstruction. Arch Otolaryngol 94(6): 525-535.

2. Balasubramanian C, Santhanakrishnakumar B, Anandan H, (2017) A Study onOssicular Erosion in Chronic Suppurative Otitis Media. Int J Sci Stud 2017; 5(5):94-97.
3. Browning GG, Merchant SM, Kelly G et al., (2008) Chronic Otitis Media. M Gleeson,editor. Scott-Brown's Otolaryngology, Head Neck Surgery, 7 th ed. Vol-3, HodderArnold, 237c:3395-3445.
4. Haidar H, Sheikh R, Larem A, et al., (2015) Ossicular Chain Erosion in ChronicSuppurative Otitis Media. Otolaryngol (Sunnyvale), 5(4):1-4
5. Hossain MD, Ahamed MNU, Sumon MMAK, et al., (2015) Shoyeb BARM. Status ofOssicles in Cholesteatoma. Bangladesh J Otorhinolaryngol, 21(2):97-101.
6. Jayakumar CL, Inbaraj LR, Pinto GJ, (2016) Pre-operative Indicators of OssicularNecrosis in Tubotympanic CSOM. Indian J Otolaryngol Head Neck Surg,2016;68(4):462–467.
7. Mohammadi G, Naderpour M, Mousaviagdas M, (2012) Ossicular Erosion in PatientsRequiring Surgery for Cholesteatoma. Iranian J Otorhinolaryngol, 24(3):125-128.
8. Mohanty S, (2019) Ossicular Integrity in Chronic Otitis Media (Mucosal Type): A SurgicalReview. Ann OtolNeurotol ISO, 2:41-42.
9. Sudhoff H, Tos M, (2000) Pathogenesis of attic cholesteatoma clinical and histochemicalsupport for combination of retraction theory and proliferation theory. Am J Otol21:786-792.
10. Varshney S, Nangia A, Bist SS, et al., (2010) Ossicular chain status in chronic suppurativeotitis media in adults. Indian J Otolaryngol Head Neck Surg, 2010; 62(4):421-426.
11. ROSHAN, KASHYAP, ROY MANJU, and ROY SUSHOVAN. "ISOLATION AND IDENTIFICATION OF PATHOLOGICAL AGENTS INDOGS WITH OTITIS EXTERNA." International Journal of Agricultural Science and Research (IJASR) 8.2 (2018):19-24.
12. Ahmed, Ayesha Sultana, and P. Radha Rani. "A Study on Sensory Limitations among Elderly, in the Selected Oldage Homes of Hyderabad City." *IMPACT: International Journal of Research in Applied, Natural and Social Sciences (IMPACT: IJRANSS) 5.12 (2017):13-20.*
13. ADEGUN, ADEWOLE ISAU. "EFFECTS OF CATALOGUING AND CLASSIFICATION SCHEMES ON THE ORGANIZATION OF KNOWLEDGE IN

MEDICAL LIBRARIES." IASET: International Journal of Library & Educational Science (IASET: IJLES) 2.1 (2019):9-20

14. DEVANAND, I. ISAAC, and I. MERLIN KAMALA. "INDIGENOUS TRADITIONAL KNOWLEDGE ON CROP PROTECTION PRACTICES." International Journal of Agricultural Science and Research (IJASR) 7.5 (2017):345-352