A study analysing Sensorineural hearing loss in Chronic Suppurative Otitis Media with or without Cholesteatoma in a tertiary care teaching hospital

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Abstract:

Background: Chronic Suppurative Otitis Media (CSOM) is a persistent and commonly occurring disease worldwide. Timely management is required as this disease is capable of causing serious catastrophic sequelae and can lead to long term pain and discharge from the ear. Traditionally, this disease is associated with conductive deafness and we organised a study to analyse the component of sensorineural deafness in patients presenting with CSOM with or without cholesteatoma.

Methods: We conducted a study on 80 patients of 10-60 years of age with unilateral complaints of discharging ear. The patients were divided into groups; Group CSOM comprises of the ears with complaints of unilateral ear discharge while the Control Group consists of the contemporary healthy ears of the patients visiting otorhinolaryngologic clinic for check up. After detailed history and examination by a trained otorhinolaryngologist all the positive or negative findings were documented.

Results: Cholesteatoma was observed in 32% of the patients with CSOM but in 68% of the patients no sign of Cholesteatoma was observed in the discharging ear. We observed the mean audiometric thresholds in both the control and CSOM groups. The mean bone conduction at 0.5 KHz in control group was 13.46 ± 1.89 and in CSOM group was 14.07 ± 1.57 (p=0.15). However, statistical significant difference was observed in between the groups on comparing the mean bone conduction threshold at the frequencies of 1.0, 2.0 and 4.0 Khz.

Conclusion: A greater sensorineural deafness was observed in patients suffering from cholesteatoma but however statistical difference was not observed requiring further studies with larger sample size.

Keywords: Cholesteatoma, Chronic Suppurative Otitis Media, Sensorineural hearing loss.

Introduction

Chronic Suppurative Otitis Media (CSOM) is a common manageable health problem among the developing and developed countries. In the developing countries, chronic middle ear infections are the common cause of hearing loss in

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children and the prevalence of CSOM is 72 per 1,000 inhabitants.[1,2]

The hearing loss in patients of CSOM is because of air bone gap and thus commonly said as conductive hearing impairment.[3] Many researchers had observed sensorineural hearing loss in patients of CSOM also. However, the frequency of sensorineural hearing loss in CSOM is reported between none to 13%.[4] The reason behind sensorineural deafness of CSOM has been explained by many researchers as lack of education, poor socio-economic condition, poverty and improper intake of antibiotics.[4]

Paparella et al[5] did a research to understand the mechanism of sensorineural hearing loss in CSOM patients. They observed that in CSOM toxins are produced which after crossing the membrane of round window because of alteration in the permeability causes the damage to hair cells on the basal turn of cochlea.[5] Moreover, the chronic inflammation on the round window membrane causes vasodilatation and vasoconstriction of the vessels and thereby causing circulatory disturbances leading to negative influential role on inner ear.[6] However, many researchers observed no clinically significant sensorineural impairment in patients with CSOM.[7-11]

Extensive Medline/Cochrane search revealed a large amount of literature regarding the presence of sensorineural hearing loss in patients with CSOM. Because of the controversies between different researchers we planned to do a comparative study to evaluate the frequency of sensorineural hearing impairment between control and CSOM patients. Moreover, we also correlated the incidence of sensorineural deafness (if found) with the age, duration of disease and the type of surgical findings (presence/absence of cholesteatoma and condition of ossicular chain) encountered.

Materials and Methods

After obtaining the Institutional Ethical approval, we conducted a study in , Department of ENT K.P.C Medical College & Hospital Jadavpur, Kolkata, India on the patients presented with complaints of Chronic suppurative Otitis Media (CSOM) and therefore posted for otologic surgery from July 2010 to June 2011 . The patients of 10-60 years of age presenting with unilateral complaints of discharging ear with normal contralateral ear were included in our study. The patients of less than 10 years of age, with bilateral otorrhea, prior history of ear surgery, family history of sensorineural hearing impairment, history of noise

exposure or head injury and perilymphatic fistula were excluded from the study.

We included 80 patients in our study and all the patients were divided into two groups by simple randomisation. Group CSOM comprises of the ears with complaints of unilateral ear discharge while the Control Group consists of the contemporary healthy ears of the patients visiting otorhinolaryngologic clinic for check up. A detailed history was obtained from the patients including ear discharge (onset, frequency, duration, etc), vertigo, hearing loss, tinnitus, headache, etc. The ENT examination was done by a trained otorhinolaryngologist and included the size and site of perforation, disruption in ossicular chain, type and degree of ear discharge and the presence and absence of cholesteatoma. The examination further included the tuning fork tests that are Weber's, Rinne's and Absolute Bone Conduction test. By using an Elkon Audiometer pure tone audiometry was performed in all patients in a semi sound attenuated chamber.

On the study proforma, all the positive or negative surgical findings were documented. Special focus was directed towards the absence or presence of cholesteatoma and the condition of ossicular chain.

Statistical Analysis: All the parametric data was analysed using Student's t-test and non-parametric data using Chi-Square/Fisher test whichever is applicable. Data was analysed using statistical package for social sciences (SPSS) version. A p value of <0.05 was considered statistically significant.

Results

All patients participated in our study were successfully enrolled and completed the study without any drop-outs. 63% of the CSOM patients had complaint of discharge from the last three years whereas 37% of the patients had a chronic history of discharging ear. On examination of the type of CSOM; 70% of the cases were Tubotympanic type while only 30% of the patients were suffering from Atticoantral type of CSOM [Table 1]. Cholesteatoma was observed in 32% of the patients with CSOM but in 68% of the patients no sign of Cholesteatoma was observed in the discharging ear. Therefore, ossicular chain was found to be intact in 74% of the patients under CSOM group while 26% of the patients had disrupted ossicular chain [Table 1].

We observed the mean audiometric thresholds in both the control and CSOM groups. The air conduction in CSOM group (44.37 Db) was found to be significantly elevated than the control

group (26.89 Db) of patients. Upon observing the bone conduction, a slight increase in the threshold was found in the CSOM group (16.35 Db) as compared to the control group (13.00 Db) [Table 2, Figure 1].

The mean bone conduction value in CSOM group does not changed appreciably by the duration of discharge [Table 3]. However, we observed a rising trend in the mean values of bone conduction during increase in the age from 10 years to 60 years. Moreover, the mean BC values were also increased with the presence of cholesteatoma [Table 3].

We also compared bone conduction frequencies between control and CSOM groups. The mean bone conduction at 0.5 KHz in control group was 13.46 ± 1.89 and in CSOM group was 14.07 ± 1.57 (p=0.15) [Table 4]. However, statistical significant difference was observed in between the groups on comparing the mean bone conduction threshold at the frequencies of 1.0, 2.0 and 4.0 Khz [Table 4].

Table 1: CSOM data

Clinical Observation		**Percentage (%)**
M:F	14:21	
Duration of Discharge	< 3 years	63
	> 3 years	37
Type of CSOM	Atticoantral	30
	Tubotympanic	70
Cholesteatoma	Present	32
	Absent	68
Ossicular Chain	Intact	74
	Disrupted	26

Table 2: Mean audiometric thresholds

Variables	**Control Group**	**CSOM Group**
Air Conduction (AC)	26.89 Db	44.37 Db
Bone Conduction (BC)	13.00 Db	16.35 Db

Table 3: Mean bone conduction values of CSOM group

Variables		**Mean BC value (Db)**
Duration of Discharge	< 3 years	13.75
	> 3 years	12.99
Age (years)	10-20	13.45
	21-30	16.32
	31-40	18.23
	41-50	19.25
	51-60	20.63
Cholesteatoma	Present	16.41
	Absent	12.65

Table 4: BC thresholds at different frequency (Mean ± SD)

Frequency	**Control group**	**CSOM group**	**Difference**	**P value**
0.5 KHz	13.46 ± 1.89	14.07 ± 1.57	0.61	0.15
1.0 KHz	12.24 ± 2.13	16.57 ± 2.38	4.33	0.001*
2.0 KHz	13.29 ± 1.41	16.93 ± 1.69	3.64	0.001*
4.0 KHz	12.62 ± 1.67	14.33 ± 2.09	1.71	0.003*

*p<0.05

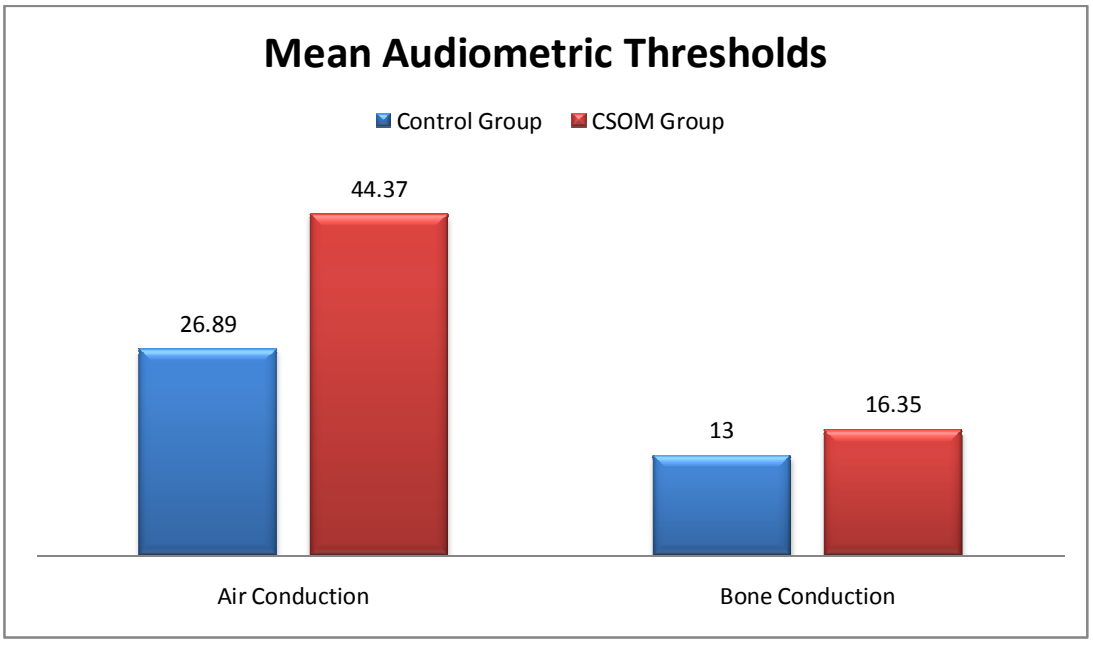

Figure 1: Mean Audiometric Thresholds between Control and CSOM groups.

Discussion

In the present study, we evaluated if there is a component of sensorineural hearing impairment in patients suffering from CSOM. Moreover, we evaluated the association of sensorineural deafness with the presence of cholesteatoma, age, ossicular disruption and the duration of disease.

We observed the difference in pre-operative thresholds in BC in our study. In the normal ears the mean audiometric thresholds was 13.00 Db whereas the audiometric thresholds in CSOM group was 16.35 Db, thus a difference of 3.35 Db was observed. A difference of 5.24-9.02 Db was observed by MacAndie and O' Reilly in their study over a wide frequency range. In our study, BC thresholds were observed to be elevated in our study.[11] The BC threshold difference between control and CSOM group at 0.5 KHz, 1 KHz, 2 KHz, 4 Khz frequencies was observed to be 0.61, 4.33, 3.64, 1.71 Db respectively. However, statistical significant difference was observed at higher frequencies. Noordiz et al[12] also observed the mean BC thresholds at 0.5 KHz, 1 KHz, 2 KHz, 4 Khz frequencies as -0.5 dB, 0.9 dB, 4.4 dB and 3.6 dB respectively and thus a minimal difference was observed in between the groups.

In our study, we assessed the BC threshold with the duration of disease and no direct relationship was observed in patients with the duration of disease either less than or more than 3 years. Our findings were further supported by Azavedo et al[4] who also observed no significant difference between a short/long term disease with the BC threshold. However, Handa et al[13] observed that duration of disease plays a crucial role in the degree of sensorineural deafness.

In our study, we observed an increasing trend in the mean values of bone conduction the age of 10 years to 60 years. At 10 years the mean BC value was 13.45 Db which gradually increased to 20.63 Db at 60 years of age. Papp et al[14] observed that changes in BC thresholds were more highlighted with the advancement of age.

Many researchers had shown a controversial association between sensor-ineural deafness and CSOM. In our study, we observed an elevated mean BC threshold in presence of cholesteatoma which are consistent with other studies.[4,11,15]

Round window membrane is present between middle and inner ear and is the only barrier between the two.[16,17] During CSOM, many toxins passes through this membrane due to its semi-permeable nature leading to damage of inner hair

cells. In a study done by Paparella et al[5], they observed a large number of inflammatory cells in the inner ear of the patients suffering from CSOM. Due to this inflammatory and immunological effect they observed sensorineural hearing impairment in patients with CSOM. Engel et al[18] in a study proposed that the deleterious effect on inner ear could be attributed because of the ionic disequilibrium at the cochlea. Moreover, they also observed cytolysins (streptolysin O and pneumolysin) are the culprits behind the leakage of ions from the round window membrane.[5,18]

After performing a detailed study together with review of literature we infer that sensorineural hearing loss occurs in patients' suffering from CSOM. Moreover, by providing prompt diagnosis and timely management of CSOM we can culminate/minimise the effects of CSOM.

One of the limitation in our study is that we could have a large sample size to better understand the gravity of the problem. Moreover, with greater sample size the association of sensorineural hearing impairment component could be better understood.

Conclusion

From our study we conclude that sensorineural deafness is present in patients suffering from CSOM. Although, the degree of sensorineural hearing impairment is independent on the duration of disease but still providing better education and timely management of CSOM could help in eliminating the element of sensorineural deafness in patients suffering from CSOM.

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