

ANALYTICAL STUDY OF SENSORY NEURAL HEARING LOSS IN CSOM WITH AND WITHOUT CHOLESTEATOMA

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ABSTRACT

BACKGROUND

Chronic suppurative otitis media still remains a major cause of conductive hearing loss in our country. But, a few patients also display an added sensorineural hearing loss.

MATERIALS & METHODS

Hundred patients with CSOM undergoing surgery at our department were included in the study. The affected ears formed the 'CSOM Group' and the normal ears formed the 'Control group'. Detailed otological history, clinical, surgical and audiometric findings were recorded and analysed.

RESULTS

It was inferred that CSOM associated with sensorineural hearing loss was found in small number of patients only. No correlation was established between duration of discharge and sensorineural loss.

CONCLUSION

Though greater SN loss was seen in patients of CSOM with cholesteatoma it was not statistically significant. Whether an early surgery in CSOM can prevent SN loss or not needs further studies.

KEYWORDS

Chronic Suppurative Otitis Media, Conductive Hearing Loss, Sensorineural Loss.

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INTRODUCTION: Chronic suppurative otitis media is a common ENT problem and it still remains the commonest cause of hearing impairment, which can be prevented if treated. Conventionally, hearing loss in CSOM is conductive. In pure tone Audiometry there is Air bone gap. But, it has been observed that some patients display an added sensorineural component i.e. mixed deafness. Azevedo et al in their study found that in CSOM, the incidence of SNHL was 13%. It is likely that SNHL associated with CSOM is higher in population of lower socioeconomic status. This may be due to a difficulty in treatment with antibiotics, inadequate followup and poor hygiene and education in the lower socioeconomic group.¹ Papastavros and Varlejides in their study of 66 cases of CSOM observed SNHL, which could be reversible or permanent. Permanent component was present in whole range of tested frequencies and reversible component was present in higher frequencies.² Paparella et al. in their study found that the toxins cross the round window

membrane and cause irreversible cochlear hair cell loss mostly affecting the basal turn of the cochlea.³

On reviewing the literature, it was evident that the issue of SNHL in CSOM with or without cholesteatoma still remains a matter of debate. Even the patients who have a definitive raised bone conduction threshold do not have any symptoms of labyrinthitis. Thus, 100 patients suffering from unilateral CSOM with chosen criteria were selected for further study. Otologic history and examination and audiometry finding were recorded and analysed statically.

MATERIAL AND METHODS: The primary objective of this study was to evaluate the incidence and degree of sensorineural hearing loss in CSOM and also to find the correlation between SNHL (if any) with age of the patient, duration of disease and surgical findings observed.

PATIENT SELECTION: The present study was undertaken in the Department of ENT and Head/Neck Surgery at Kalinga Institute of Medical Science. The study group included the patients who were operated in institute for CSOM. The patients had to meet the following criteria to become eligible for the study. The patient had to be suffering from unilateral CSOM with normal contralateral ear. The normal ear was used as a control after ruling out the confounding factors such as presbycusis, noise induced or congenital hearing loss, etc. The patients between 10 and 50 years were included in the study.

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The children below 10 years was excluded as they were expected to be uncooperative for accurate testing. Also those above 50 years were not included as there is a possibility of an element of presbycusis. Subject with a history suggestive of systemic disease like diabetes, meningoencephalitis, head injury, and familial hearing loss, prolonged noise exposure, previous otologic surgeries were excluded from study.

Inclusion Criteria:

- Unilateral CSOM.
- Age-10-50 yrs.
- With no comorbidity.

Exclusion Criteria:

- Bilateral CSOM.
- Age below 10 and above 50 yrs.
- With comorbidity.

Patient Assessment: Detailed otolaryngological history including hearing impairment, ear discharge, vertigo, tinnitus, etc. was taken. Detailed ENT examination was done in all subjects to look for status of otorrhoea, site and size of perforation, ossicular disruption and presence of cholesteatoma. Tuning fork test (Rinne’s, Weber’s and Absolute bone conduction test) was carried out in all the cases. Pure tone audiometry was done in all subjects using an audiometer in a fully sound attenuated room. Air conduction and bone conduction thresholds were tested by a trained audiologist. Narrow band masking was used whenever applicable. The surgical finding of all the patients were observed and documented. Special observation regarding presence and absence of cholesteatoma and ossicular chain status was noted. All these findings were documented as per the study proforma.

RESULTS: The age of the subjects in the study ranged from 12-50 years with a mean of 24.6 years, 36% being male and 64% female. There was no significant difference in the left or right ear. Around 52% of patients had history of otorrhoea for less than 2 years where only 8% had history for more than 5 years. Atticoantral type of CSOM was found in 28% of the study ears. Tubotympanic type of CSOM was seen in the remaining 72% ears. Distribution of various size of central perforation was observed as in Table 1. Also, it was, observed that cholesteatoma was present in 28% of cases. However, ossicular chain was eroded in 20% of ears and in rest 80% it was intact. As expected mean AC threshold in CSOM group was significantly elevated (48.25 dB) as compared to mean AC threshold of the control group.

The mean BC threshold in the control group was 12 dB and in CSOM groups, it was observed to be 15.03 dB. This difference though not large was significant ($p < 0.05$) [Table 2]. It was observed in CSOM group that the mean BC threshold did not increase with the duration of discharge, but it does appear to rise with the increasing age and presence of cholesteatoma [Table 3]. However, difference in the BC threshold in the ears with or without cholesteatoma was not significant.

Duration of Discharge	
< 2 Years	52%
2-5 Years	40%
> 5 Years	8%
Type of CSOM	
Atticoantral Tubotympanic	28%
Perforation Small	32%
Perforation Medium	24%
Perforation Large	16%
Surgical Assessment Cholesteatoma	
Present	28%
Absent	72%
Ossicular Chain Eroded	20%
Ossicular Chain Intact	80%

Table 1: Disease Profile in CSOM Group (Clinical Observation)

	Control Group	CSOM Group
Air conduction	28.99 dB	48.25 dB
Bone conduction	12.00 dB	15.03 dB

Table 2: Mean Audiometric Threshold

Variables	Mean Bone Conduction Threshold CSOM Group in dB
Duration of Discharge	
< 2 Years	15.75
2-5 Years	14.47
> 5 Years	13.12
Age	
10-20	13.40
21-30	15.28
31-40	17.50
41-50	19.16
Cholesteatoma	
Present	17.82 $p > 0.05$
Absent	13.94

Table 3: Mean Conduction Values in Relation to Duration of Discharge, Age of the Patient and Presence of Cholesteatoma

Frequency	BC- Control	BC-CSOM	Difference	p-value
500 Hz	12.0±1.66	14.6±2.64	2.6	>0.05#
1 KHz	11.8±1.45	15.2±2.84	3.4	<0.01**
2 KHz	12.8±1.92	17.2±3.84	4.4	<0.05*
4 KHz	11.4±1.70	13.2±2.97	1.8	>0.05#

Table 4: Comparison of Bone Conduction Threshold at Various Frequencies Between control and CSOM Group

#not significant, *significant, ** highly significant

Table 4 shows means and comparisons of bone conduction threshold were observed in the CSOM group. But the difference was statically significant at 1 KHz and 2 KHz of the frequencies tested.

DISCUSSION: Conventionally, a conductive hearing loss is expected in a patient suffering from CSOM. Occasionally, elevated BC threshold has been observed in audiometric recording in patients suffering different from CSOM indicating a SN element. On reviewing, the literature results from different authors on this issue have been variable. Our aim was to find out whether there is any relation between CSOM and SN hearing loss. And if any, does the presence of cholesteatoma, duration of discharge, or the age of the patient affect the degree of SN element. Present study was done in 100 patients of unilateral CSOM. The normal ears formed the control group and 100 ears suffering from CSOM formed the CSOM group. Detailed otologic history, clinical, surgical, and audiometric findings were recorded and analysed. The mean difference in the preoperative BC threshold in the normal ear (Control Group) and ear suffering from CSOM (CSOM group) was around 3 dB. MacAndie and O'Reilly in their study observed that this difference was 5.24-9.02 across the frequency range.⁴

Though this was on lower side in our study it was significant. A number of authors studied the BC threshold in CSOM across various frequency ranges. Redaelli et al. stated that differences in mean BC threshold varied from 0.6 dB at 500 Hz to 3.7 dB at 4 KHz.⁵ In the series by Noordzig et al., it was found that these values were small. They were -0.5 dB at 500 Hz, 0.9 dB at 1 KHz, 4.4 dB at 2 KHz and 3.6 at 4 KHz.⁶

Paparella et al. came to conclusion that SN hearing loss does occur in CSOM, especially at higher frequencies.³ BC threshold was also elevated in the CSOM group in our study. The mean difference across the various frequency ranges was 2.6 dB at 500 Hz, 3.4 dB at 1 KHz, 4.4 dB at 2 KHz, and 1.8 at 4 KHz. The difference in mid frequencies i.e. 1 and 2 KHz were statically significant but not at 500 Hz and 4 KHz.

The relationship between duration of discharge and mean BC threshold in CSOM group was assed. BC threshold did not show any rise when ears with different ranges of duration of discharge were analysed. In a similar assessment, de Azavedo et al. did not find any significant difference in the BC threshold in patients having prolonged history of ear discharge. In contrast, Handa et al. found that the relative SN loss varied significantly with the duration of disease.⁷ Papp et al. in their study concluded that BC threshold shift was more accentuated as the age increased.

In our series, there was a gradual elevation of BC threshold from 13.4 dB in 10-20 years age group to 19.16 dB in 40-50 years age group. With regard to the association of cholesteatoma and SN loss in patient with CSOM, different studies have produced variable results, most of the research reviewed in the literature did not

show significant correlation. Though BC threshold was higher in CSOM group having cholesteatoma it was not significant, which is in consistency with above studies. However, Papp et al. have shown a significant correlation.⁸

Paparella et al. showed in their extensive experimental research, this association between SN hearing loss and CSOM⁹. They emphasised the deleterious consequence of chronic otorrhoea for the inner ear. In a study, break down of round window membrane permeability, Feng H et al proposed that damage to the round window membrane by potent pore-forming cytolysin (Pneumolysin and streptolysin-o) leads to leakage of ions from perilymph¹⁰. Ionic disequilibrium and passage of toxic macromolecules to the cochlea could contribute to disturbance of inner ear function. Thus, detailed statistical analysis of our study along with the review of available literature on the subject, it is inferred that CSOM can cause variable degree of SN hearing loss. Moreover, if definitive treatment is done earlier, a greater number of patients presenting with mixed losses may be prevented. In view of the fact that national programme prevention and control of deafness is already under way in India, the above finding is of importance.

CONCLUSION: In the analysis of SN hearing loss in CSOM with or without cholesteatoma, the following conclusions were drawn. Chronic otitis media appears to be associated with SN hearing loss, but the degree of SNHL is small in majority of patients. The degree of SNHL did not bear any correlation with the duration of ear discharge. Greater SN hearing loss is present in the ears suffering from CSOM with cholesteatoma, but is not significant. Although we have concluded that there is an association of CSOM with SN loss, still a study with large sample size is needed to evaluate the role of cholesteatoma. Also, further studies, whether an early surgery in CSOM can prevent an added SN loss or not is desirable.

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