

Research Article

Sensorineural hearing loss in patients with unilateral safe chronic suppurative otitis media

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ABSTRACT

Background: Chronic Suppurative Otitis Media (CSOM) is the major cause of hearing impairment, mainly conductive type of hearing loss. The occurrence of sensorineural hearing loss (SNHL) in CSOM is controversial and the controversy is more for safe mucosal type. This study aims to assess the association between SNHL and safe mucosal CSOM and its relation to patient's age, sex, duration of disease, active or inactive disease and speech frequencies.

Methods: 100 patients with unilateral mucosal type of CSOM with normal contralateral ear were included in the study. The infected ear was taken as study ear and normal ear as control ear in all patients. All patients underwent hearing assessment by pure tone audiometry for both ears. In case of active disease, ear discharge was first cleared and then audiometric assessment done. Results were statistically compared in all patients for both study and control ears using parameters of patient's age, sex, duration of disease, speech frequency and active or inactive disease.

Results: There was significant higher number of study ears with CSOM having average bone conduction threshold of all frequencies above 25 decibels which implies SNHL (21%) compared to control contralateral ears without infection (5%). There was higher incidence of SNHL at higher speech frequencies. The incidence also increased with age of patient and duration of disease. The incidence was higher in active stage than inactive or quiescent stage. There was no difference among males and females.

Conclusion: Safe mucosal CSOM can cause significant SNHL and risk increases with increasing age, duration of disease, higher speech frequencies and presence of active disease.

Keywords: Chronic suppurative otitis media, Middle ear, Pure tone audiometry, Round window, Sensorineural hearing loss

INTRODUCTION

Chronic Suppurative Otitis Media (CSOM) is defined as a chronic inflammation of the middle ear or mastoid cavity, which presents with recurrent or persistent ear discharges or otorrhoea through a tympanic membrane perforation.¹ It can be divided into safe mucosal type with permanent central perforation of pars tensa without cholesteatoma or intracranial complications and unsafe

squamous type with cholesteatoma or intracranial complications. Safe mucosal type can be further subdivided into active stage with persistent ear discharge at present or within last 3 months, quiescent stage with no discharge between 3 to 6 months and inactive stage with no discharge for more than 6 months duration.²

CSOM leads to hearing loss. Conventionally hearing loss associated with CSOM is conductive hearing loss but

sensorineural component has been observed in some patients. The association between safe mucosal CSOM and sensorineural hearing loss (SNHL) remains a controversial topic.³ There is also a controversy about SNHL correlation with patient age and disease duration.⁴ The incidence of SNHL in CSOM according to Paperella⁵ is 43%, Kaur et al.⁶ is 24% and Sharma⁷ is 9.4%. But some other authors had found little or no relationship between CSOM and SNHL.⁸

So this study was planned to assess the association between SNHL and safe mucosal CSOM and its relation to patient's age, sex, duration of disease, active or inactive disease and speech frequencies.

METHODS

This prospective study was conducted in the department of ENT, CMC&H from March 2011 to August 2012. 100 patients with unilateral mucosal type of CSOM with contralateral normal ear, above 18 years of age were enrolled in the study after obtaining written consent from the patients. The approval of institutional ethics committee was taken. Exclusion criteria were presence of cholesteatoma, presence of intra cranial complications, history of meningitis, head injury, trauma, labyrinthitis, acoustic neuroma, temporal bone fracture, chronic noise exposure and history of previous ear surgery. All the patients were examined and assessed by the authors performing the study.

The infected ear with safe mucosal type of CSOM was taken as study ear and the contralateral normal ear of the same patient was taken as control ear. This was done to exclude diseases like presbycusis, ototoxic medications and metabolic disorders which affect both ears.⁹ All the patients underwent hearing assessment for both study and control ears by Pure Tone Audiometry (PTA) in a sound treated room. In case of active disease, the ear discharge was first cleared under microscope and then the patient was taken for PTA. The hearing assessment was done for speech frequencies 250 Hz, 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz. In a patient the average bone conduction threshold of all frequencies of 25 decibel or more was considered significant and was taken as indicative of SNHL in that patient.

The results were both ears were statistically compared. The assessment points were:

1. Incidence of SNHL in study and control ears for all the patients.
2. Correlation between age of the patient and SNHL if any.
3. Correlation between sex of the patient and SNHL if any.
4. Correlation between stage of mucosal CSOM and SNHL if any.
5. Correlation between duration of disease and SNHL if any.

6. Correlation between bone conduction thresholds for both study and control ears and speech frequencies if any.

RESULTS

100 patients who gave consent were enrolled in this study. All the patients had unilateral safe mucosal type of CSOM. Data was collected on all the patients. All the patients included in the study were above the age of 18 years. Among them the majority were in the younger age group (48%) followed by middle age group (34%) (Table1). Male and Female patients were almost equal (Table 1).

Table 1: Age and sex distribution.

Age group (years)	Male	Female	Total
18-40	25	23	48
41-60	19	15	34
61 and above	9	9	18
Total	53	47	100

Regarding the side of ear affected, there was almost equal incidence of CSOM in both right and left ears (Figure 1).

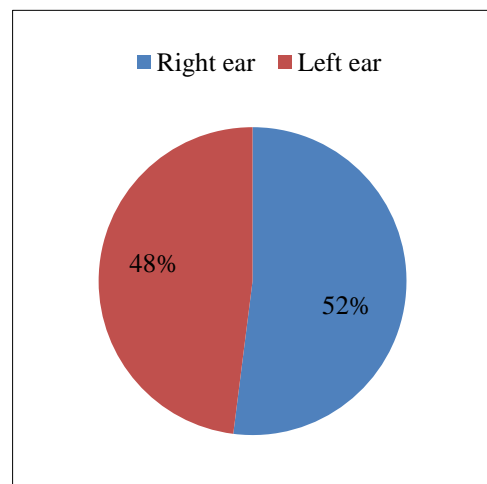


Figure 1: Incidence of CSOM related to side of ear affected.

Regarding the incidence of SNHL in study ears with safe mucosal type CSOM and normal contralateral control ears, it was found that there was much higher incidence of SNHL in study ears (21%) than control ears (5%) (Table 2). It was also found out that the incidence was much higher in older age group study ears (38.8%) followed by middle age group study ears (20.6%) as compared to younger age group study ears (14.6%) (Table 2).

Regarding the relation of the incidence of SNHL in mucosal type CSOM and sex of patient, it was found almost equal incidence of SNHL in study ears in males (20.8%) and females (21.6%) (Table 3).

Table 2: Incidence of SNHL in study and control ears and its relation to age of the patient.

Age group (years)	Study ears (Total number and percentage of patients with SNHL)		Control ears (Total number and percentage of patients with SNHL)	
	Number of patients	% of patients	Number of patients	% of patients
18-40	7 out of 48	14.6%	1 out of 48	2.1%
41-60	7 out of 34	20.6%	1 out of 34	2.9%
61 plus	7 out of 18	38.8%	3 out of 18	16.6%
Total	21	21%	5	5%

Table 3: Incidence of SNHL in study ears with CSOM in relation to sex of the patient.

Sex	Total patients	Patients with SNHL	Percentage
Male	53	11	20.8%
Female	47	10	21.6%

Regarding the stage of disease, it was found that the incidence of SNHL in study ears was highest in patients in active stage of disease (33.3%) as compared to quiescent stage (12.5%) and inactive stage (13.5%) (Table 4).

Table 4: Incidence of SNHL in study ears with CSOM in relation to stage of disease.

Stage of disease	Total number of patients	Patients with SNHL	Percentage
Active stage	39	13	33.3%
Quiescent stage	24	3	12.5%
Inactive stage	37	5	13.5%

Regarding the duration of disease, it was found that the incidence of SNHL in study ears with safe CSOM was highest in patients with longer duration of disease (30.3% in patients with disease duration more than 10 years) as compared to shorter duration (Table 5).

Table 5: Incidence of SNHL in study ears with CSOM in relation to duration of the disease.

Duration of disease	Total number of patients	Patients with SNHL	Percentage
Less than 1 year	28	4	14.2%
1 year to <5 years	21	3	14.2%
5 years to 10 years	18	4	22.2%
More than 10 years	33	10	30.3%

Regarding the relationship between speech frequencies and bone conduction thresholds of study ear with CSOM, it was found out that larger number of patients had bone conduction threshold more than 25 decibel at higher

speech frequency (27% at 4000 Hz) as compared to lower speech frequencies in the study ears (Table 6).

Table 6: Patients with bone conduction thresholds more than 25 decibels in study and control ears and its relation to speech frequencies.

Speech frequencies	Study ears (Total number and percentage of patients with bone conduction thresholds more than 25 decibels)		Control ears (Total number and percentage of patients with bone conduction thresholds more than 25 decibels)	
	Number of patients	% of patients	Number of patients	% of patients
250 Hz	15 out of 100	15%	3 out of 100	3%
500 Hz	16 out of 100	16%	3 out of 100	3%
1000 Hz	19 out of 100	19%	5 out of 100	5%
2000 Hz	22 out of 100	22%	5 out of 100	5%
4000 Hz	27 out of 100	27%	5 out of 100	5%

DISCUSSION

The incidence of SNHL in unilateral safe mucosal type CSOM was investigated in this study. The aim of this study was to assess the association between SNHL and safe mucosal CSOM and its relation to patient's age, sex, duration of disease, active or inactive disease and speech frequencies.

Safe mucosal CSOM is one of the most common otological condition encountered in ENT OPD. It is one of the major cause of conductive hearing loss. The incidence of SNHL in safe CSOM is still a matter of debate. The correlation between SNHL and CSOM has been shown in literature. According to Paparella et al.,⁵ CSOM can cause SNHL by passage of inflammatory agents through round window and the anatomical position and characteristic of round window encourages this passage. Levine et al.¹⁰ found SNHL in 34% of 225 ears undergoing tympanoplasty for various reasons. In our study the incidence of SNHL in safe CSOM was 21% (Table 2). Levine et al.¹⁰ stated that there is a small but statistically significant relation between SNHL and age of the patients suffering from CSOM. Similar results were obtained in our study where percentage of patients suffering from SNHL increased with increasing age (Table 2). According to our study there was no correlation between sex of the patient with mucosal CSOM and SNHL (Table 3). Similar results were obtained by Vanderveen et al.¹¹

According to Kholmatov¹² in 2001 duration of disease when compared with incidence of SNHL, a progressively high increased incidence of SNHL was found as the duration of disease increased. Various other studies have shown increasing age was a risk factor in the evolution of SNHL in patients with CSOM.¹³ Similarly in our study we found much higher incidence of SNHL when the duration was disease was more, with maximum at more than 10 years duration (Table 5). In our study we found

that the incidence of SNHL is maximum in the active stage of disease as compared to inactive stage and quiescent stage of disease (Table 4). Presence of active discharge in middle ear will cause more damage to inner ear as compared to absence of discharge as fewer toxins will enter the inner ear through round window. Passage of toxins through round window can cause damage to hair cells.¹⁴ Paparella et al.⁵ also showed that chronic otorrhea has deleterious consequences to inner ear. Papp et al.¹⁴ showed affects of speech frequency on bone conduction thresholds in CSOM. Similar results were obtained by Macandie¹⁵ who showed more higher frequency loss than at lower frequencies. The hair cells at base of cochlea which are responsible for higher frequency hearing are located closer to the round window and are likely to be affected more as more toxins will reach these hair cells in larger concentrations.¹⁴ Our study also showed that more patients had bone conduction thresholds greater than 25 decibels which is indicative of SNHL at higher frequencies with maximum at highest frequency used 4000 Hz (Table 6).

Some studies have shown SNHL associated with CSOM is more in patients from low socio economic status due to delayed treatments, lack of education, poor hygiene and inadequate follow up.¹⁶ Linder et al.¹⁷ mentioned possible ototoxic side effects of ototopical preparation in continuous use beyond 2 weeks in patients with CSOM as a cause of SNHL in such patients. But other investigators have found little or no evidence that topical drops can cause SNHL.¹⁸ Our study didn't include the parameters of socio economic status and topical drops for assessment of SNHL in safe CSOM.

CONCLUSION

Safe mucosal CSOM can cause significant SNHL. The risk of SNHL increases with increasing age. The risk is more in disease of longer duration and this factor should be considered while managing the patients with CSOM. Early detection and treatment can limit the SNHL in these patients. The risk of SNHL is much more in case of active stage disease with chronic otorrhea. The risk increases with higher speech frequencies. There is no difference in risk in males and females.

So we can conclude that there is an association between unilateral safe CSOM and SNHL. There is scope of further studies also involving the parameters of socio economic status and ototoxic topical ear drops.

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Ethical approval: The study was approved by the institutional ethics committee

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