

# Correlation between sensorineural hearing loss and chronic otorrhea

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## Abstract

**Background:** Several tests have attempted to associate chronic otorrhea with the sensorineural hearing damage in the affected ear, both in children and adults, but have been finding conflicting findings. This failure may be attributed to the possible toxicity of the involved bacteria, inflammatory cytokine activity, or the excessive use of ototoxic antibiotics. **Aims:** To assess whether there is any correlation between the duration of SNHL in chronic otorrhea cases and whether the duration or aetiology of the disease interferes with that hearing loss. **Materials and methods:** A total of 58 ears with chronic otorrhea and ears of patients with unilateral chronic otorrhea with chronic suppurative otitis media for many years, obtained from the records of the Department of Otorhinolaryngology were selected. Hearing thresholds were evaluated using the frequencies of 500 Hz, 1 kHz, 2 kHz, and 4 kHz in presurgical audiometry. **Results:** In total 58 cases of CSOM around 50 percent of ears had discharge history for less than 2 years and 8.6 percent of ears had discharge history for more than 5 years. Cholesteatoma was found to be present in the CSOM group's 25.8 per cent ears. However, in 17 percent ears of the CSOM group ossicular chain was eroded and in rest it was unchanged at 82.7 percent. Mean air conduction and bone conduction threshold in the CSOM group was significantly elevated (47 dB) as compared to the mean AC threshold of the control group. Mean comparisons of bone conduction thresholds at various frequencies in controls and CSOM group. Higher bone conduction thresholds were observed in the CSOM group. But the difference was statistically significant at 1KHz, 2KHz and 4 Hz of the frequencies tested. There was a difference in SNHL between the normal and affected ears at 1KHz, 2KHz and 4 Hz frequencies, with statistical significance ( $P < .001$ ). **Conclusion:** There is a correlation between CSOM and SN loss, If an early surgery in CSOM will avoid an additional loss of SN or not, should be further studied.

**Key Words:** sensorineural hearing, chronic suppurative otitis media, Air Conduction, Bone Conduction.

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## INTRODUCTION

Causes of SNHL are related to the toxicity of the infectious condition, the resulting inflammatory cytokines or the commonly used local ototoxic drugs. Through the

permeability of the oval and round windows, these would compromise the ciliated cells of the organ of Corti of the cochlea.<sup>1,2</sup> The association between chronic otorrhea and ipsilateral sensorineural hearing loss (SNHL) among large numbers of patients was created mainly in low-purchasing populations where chronic otitis media is endemic. The data are contradictory and there is still no data on this subject, possibly due to insufficient methodologies. Studies found that in the ear with CSOM, the frequency of SNHL was 13%. It is likely that SNHL associated with CSOM is higher in populations of lower socioeconomic status. This may be corroborated by hypothesis that there is a difficulty to access treatment with antibiotics, inadequate follow up and poor hygiene and education in the lower socioeconomic group.<sup>3</sup> If an SNHL truly occurs and is linked to the length of the otorrhea, early diagnosis

and treatment may prevent the need for these patients to use hearing aids to support their hearing even after the disease has been surgically cured.<sup>4,5</sup> The aim of this article is to determine whether there is any correlation between the length of SNHL in cases of chronic otorrhea and whether the length of the condition or its aetiology interferes with this loss of hearing.

### MATERIALS AND METHODS

This was a cross-sectional study in total of 58 ears with chronic otorrhea and ears of patients with unilateral chronic otorrhea with chronic suppurative otitis media with normal contralateral ear. The 50 normal ear was used as a control to cancel out the confounding factors such as presbycusis, noise induced or congenital hearing losses etc. Data obtained from the records of the Department of Otorhinolaryngology were selected. The subjects between 10 and 50 years of age were included in the study. The children below 10 years were excluded as they were expected to be uncooperative for accurate testing.

**Inclusion Criteria:** Patients with unilateral suppurative otitis media for over a year and a contralateral normal ear. The evaluation was performed using otoscopy and the patient’s history.

**Exclusion Criteria:** Previous surgery on ear, Otological or cephalic trauma, Exposure to noise, history suggestive

of systemic diseases like diabetes, meningoencephalitis, head injury, familial hearing loss.

Detailed otolaryngologic history including hearing impairment, ear discharge, vertigo, tinnitus etc., was taken. Extensive ENT examination was done in all subjects to look for status of otorrhea, site and size of perforation, ossicular disruption. Tuning fork tests (Rinne's, Weber's and Absolute BC test) were carried out in all the cases. Pure tone audiometry (PTA) was done in all subjects using an Elkon Audiometer in a partially sound attenuated room. Air conduction and BC thresholds were tested and plotted by a trained audiologist. Narrow band masking was used whenever appropriate. The surgical findings of all the patients were observed and documented. All these findings were documented as per the study Performa. The statistical analysis was done using the spss package, version 13. In patients with one ear with suppuration and a typical contralateral ear, we used student t test for paired samples to evaluate instances of otorrhea. To examine the neurosensory deficit in patients with otorrhea, we used student t test for independent samples. the statistical analysis was done using the SPSS package, version 13. In patients with one ear with suppuration and a typical contralateral ear, we used student t test for paired samples to evaluate instances of otorrhea. To examine the neurosensory deficit in patients with otorrhea, we used student t test for independent samples.

### RESULTS

58 ears with chronic otorrhea with chronic suppurative otitis media and 50 normal ear was used as a control participated in study. The age of the subjects included in the study ranged from 12-50 years with a mean of 25 years, 40% being males and 60% females. There was no significant difference in the left or right ear.

**Table 1:** Clinical findings of chronic otorrhea with chronic suppurative otitis media

Type of CSOM	Number of cases	Percentages
Atticoantral	15	25.86
<b>Tubotympanic</b>		
Large perforation	9	15.5172414
Medium perforation	13	22.4137931
Small perforation	21	36.2068966
<b>Duration of discharge</b>	<b>0</b>	<b>0</b>
<2 years	29	50
2-5 years	24	41.3793103
>5 years	5	8.62068966
Cholesteatoma present	15	25.862069
Ossicular chain Eroded	10	17.2
Ossicular chain Intact	48	82.7

Atticoantral form of CSOM was found to be in 25.8 per cent. The remaining 74.2 per cent ears showed tubotympanic form of CSOM. Around 50 percent of ears had discharge history for less than 2 years and 8.6 percent of ears had discharge history for more than 5 years. Cholesteatoma was found to be present in the CSOM group's 25.8 per cent ears. However, in 17 percent ears of the CSOM group ossicular chain was eroded and in rest it was unchanged at 82.7 percent.

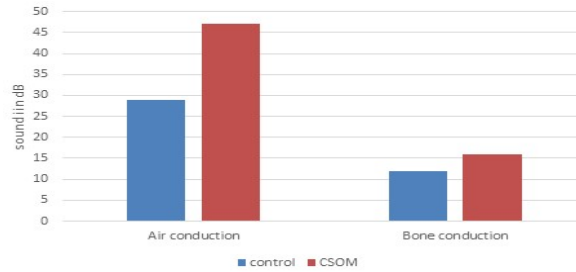


Figure 1: Mean audiometric thresholds

Mean AC (air conduction) threshold in the CSOM group was significantly elevated (47 dB) as compared to the mean AC threshold of the control group. The mean BC threshold in the control group was 12dB and in CSOM group it was observed to be 16 dB. This difference though not large but was statistically significant ( $P < 0.05$ )

Table 2: Comparisons of bone conduction thresholds at various frequencies between controls and CSOM group

Frequency	Bone conduction in control ears	Bone conduction CSOM ears	P-Value
500 Hz	10+ 1.4	20 +1.9	>0.05
1 KHz	9 +1.6	21 + 2.3	<0.05
2 KHz	10+ 1.8	19+ 3.1	<0.05
4 KHz	11+ 1.7	18 +2.5	<0.05

Mean comparisons of bone conduction thresholds at various frequencies in controls and CSOM group. Higher bone conduction thresholds were observed in the CSOM group. But the difference was statistically significant at 1KHz, 2KHz and 4 Hz of the frequencies tested.

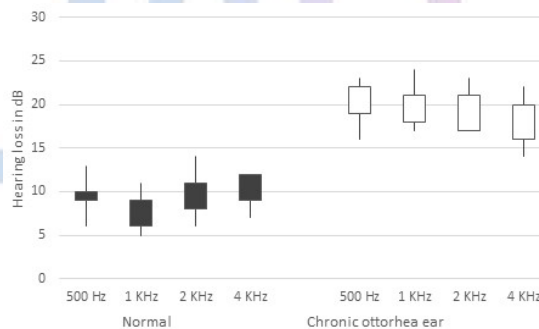


Figure 2: Hearing loss in decibels versus frequencies in normal ears and ears with chronic otorrhea

There was a difference in SNHL between the normal and affected ears at 1KHz, 2KHz and 4 Hz frequencies, with statistical significance ( $P < .001$ ).

## DISCUSSION

The association between chronic otorrhea and SNHL is described a few times in a complicated, not well-defined manner in other studies found in the worldwide literature. It is not well known whether the duration of the otorrhea interferes with hearing loss and its etiology, and whether the aetiology is derived from cholesteatoma and aggravates the sensorineural damage. A significant number of patients (58) were examined in the present study, first comparing the ear with chronic otorrhea with the normal contralateral ear, as was the majority of previous authors, and then investigating the association between suppurated ears of these patients with 50 ears of dry membrane patients per patient per patient. The duration of the otorrhea as well as

whether it was continuous were also taken into account. If it was not continuous, we summed up the length of time this condition (suppurative chronic otitis media) was present throughout. In order to exclude potential bilateral sensorineural deficits in older patients with presbycusis, values of the respective contralateral ears were subtracted from the values in the affected ears at each frequency, thereby specifying the actual loss. Atticoantral form of CSOM was found to be in 25.8 per cent. The remaining 74.2 per cent ears showed tubotympanic form of CSOM. 50 percent of ears had discharge history for less than 2 years and 8.6 percent of ears had discharge history for more than 5 years, and relationship between discharge duration and mean BC thresholds in the CSOM

group.(table-1) The BC thresholds showed no increase when comparing ears of various ranges of discharge duration. In a parallel study, in patients with ear discharge, de Azavedo *et al.* found no substantial variation in the BC thresholds.<sup>1</sup> Handa *et al.*, by comparison, observed that the relative loss of SN differed considerably with the period of the disease.<sup>6</sup> MacAndie and O'Reilly observed the same lack of correlation, however they did not report on the mean duration of the ear disease in their patients.<sup>7</sup> Mean AC (air conduction) and mean BC threshold in the CSOM group was significantly elevated (47 dB),(16dB) as compared to the mean AC threshold of the control group. ( $P<0.05$ ) (figure-2) Papp *et al.* in their study concluded that BC threshold shift was more accentuated as the age increased.<sup>8</sup> In Rohit sharma study, there was a gradual elevation of BC thresholds from 13.40dB in 10-20 years age group to 19.16dB in 40-50 years age group.<sup>9</sup> Comparison of bone conduction thresholds at various frequencies in controls and CSOM group. Higher bone conduction thresholds were observed in the CSOM group. But the difference was statistically significant at 1KHz, 2KHz and 4 Hz of the frequencies tested.(Table-2) A number of authors have studied the BC thresholds in CSOM across various frequency ranges. Redaelli *et al.* stated that differences in mean BC thresholds varied from 0.6dB at 500Hz to 3.7dB at 4KHz.<sup>10</sup> In the series by Noordzig *et al.* it was found that these values were small. They were -0.5dB at 500Hz, 0.9dB at 1KHz, 4.4dB at 2KHz and 3.6dB at 4KHz.<sup>11</sup> Paperella *et al.* came to conclusion that SN hearing loss does occur in CSOM, especially at higher frequencies.<sup>12</sup> BC thresholds were also elevated in the CSOM group in our study. The mean differences across the various frequency ranges were 2.6dB at 500 Hz, 3.4dB at 1 KHz, 4.4dB at 2 KHz and 1.8 at 4 KHz. The differences in mid frequencies i.e., 1 and 2 KHz were statistically significant but not at 500 Hz and 4 KHz. a threshold of approximately 10 dB can be seen in the normal ears, compared with a hearing loss of 20 dB in the suppurated ears. It is important to highlight that at the frequencies evaluated, there was no progressive loss for the higher pitches, which would have been expected if this loss had been due to continuity of the infected middle ear, through the oval and round windows, with the base of the cochlea, where these sounds are processed. The correlation between SNHL and SCOM was previously shown by many authors.<sup>10,13</sup> Considering all the studies evaluated, including the one hereby presented, it is plausible to speculate that the disease duration time variation, socio-economic status and cholesteatoma present could explain the different results found. The association observed between SNHL and adjusted age reinforces the idea that time-related variables could influence the tendency for SNHL in patients with SCOM. Paparella *et al.* showed, in

an elegant experimental study this association between SNHL and SCOM.<sup>12</sup> Thus, our study's detailed statistical analysis together with the review of available literature on the topic, it is concluded that CSOM can cause variable degree of loss of hearing with SN. In comparison, a larger percentage of patients presenting with mixed results can be avoided if definitive treatment is done earlier.

## CONCLUSION

The following findings were taken in CSOM's study of the sensorineural hearing loss. Chronic otitis media tends to be associated with sensorineural hearing loss but in most cases the degree of SNHL is minimal. The degree of SNHL showed no correlation with the discharge length. Greater loss of SN happens in ears of cholesteatoma suffering from CSOM, but it is not significant. While we have hypothesised that there is a correlation between CSOM and SN loss, a study with a broad sample size is still required to determine the function of cholesteatoma. If an early surgery in CSOM will avoid an additional loss of SN or not, should be further studied.

## REFERENCES

1. Costa SS, Rosito LP, Dornelles C. Sensorineural hearing loss in patients with chronic otitis media. *Eur Arch Otorhinolaryngol.* 2009;266(2):221-224.
2. Papp Z, Rezes S, Jo'kay I, Sziklai I. Sensorineural hearing loss in chronic otitis media. *Otol Neurotol.* 2003;24(2):141-144
3. de Azevedo AF, Pinto DC, de Souza NJ, Greco DB, Gonçalves DU. Sensorineural hearing loss in chronic suppurative otitis media with and without cholesteatoma. *Braz J Otorhinolaryngol* 2007;73:671-4
4. Yehudai N, Most T, Luntz M. Risk factors for sensorineural hearing loss in pediatric chronic otitis media. *Int J Pediatr Otorhinolaryngol.* 2015;79(1):26-30.
5. Luntz M, Yehudai N, Haifler M, Sigal G, Most T. Risk factors for sensorineural hearing loss in chronic otitis media. *Acta Otolaryngol.* 2013;133(11):1173-1180.
6. Handa KK, Mann SBS, Gupta AK, Handa A. Sensorineural loss in unsafe chronic suppurative otitis media in paediatric age group. *Indian J Otolaryngol Head Neck Surg* 1996;48:125-9.
7. MacAndie C, O'Reilly BF Sensorineural hearing loss in chronic otitis media *Clin Otolaryngol*, 24 (1999), pp. 220-222.
8. Papp Z, Rezes S, Jókay I, Sziklai I. Sensorineural hearing loss in chronic otitis media. *Otol Neurotol* 2003;24:141-4.
9. Sharma R, Sharma VK. Analysis of sensorineural hearing loss in chronic suppurative otitis media with and without cholesteatoma. *Indian J Otol* 2012;18:65-8.
10. Redaelli de Zinis LO, Capovecchi C, Parrinello G, Antonelli AR. Predisposing factors for inner ear hearing loss association with chronic otitis media. *Int J Audiol* 2005;44:593-8.
11. Noordzig JP, Dodson EE, Ruth RA, Arts HA, Lambert PR. Chronic otitis media and sensorineural hearing loss: Is

- there a clinically significant relation? Am J Otol 1995;16:420-3.
12. Paparella MM, Morizono T, Le CT, Mancini F, Sipilä P, Choo YB, *et al.*. Sensorineural hearing loss in otitis media. Ann Otol Rhinol Laryngol 1984;93:623-9.
  13. Cusimano F, Cocita VL, D' Amico A. Sensorineural hearing loss in chronic otitis media: J Otolaryngol Otol, 103 (1989), pp. 158-163

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