**Original Research Article**

**An association of sensorineural hearing loss in mucosal type of chronic suppurative otitis media**

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**ABSTRACT**

**Background:** Chronic suppurative otitis media of mucosal variety is one of the most common cause of conductive hearing loss worldwide. Sensorineural hearing loss is rare but well established complication of chronic suppurative otitis media of squamosal variety. We made an attempt to view the sensorineural hearing loss in mucosal type of chronic otitis media and keeping objectives and aims as follows occurrence of sensorineural hearing loss in mucosal type of chronic suppurative otitis media; relation of sensorineural component with age, gender and duration in mucosal type of chronic suppurative otitis media.

**Methods:** A total of 105 cases of mucosal type of CSOM were studied retrospectively for the pattern of hearing impairment on the basis of pure tone audiogram in a Tertiary care hospital. Relation of sensorineural hearing loss with with age, gender and duration in mucosal type of CSOM is compared and tabulated with various studies.

**Results:** Out of total 105 cases of CSOM of mucosal variety 30 (28.57%) had sensorinueral hearing loss affecting 13 males and 17 females with males to females ratio of 1:1.3. Mean bone conduction thresholds in males at 1 kh, 2 kh and 4 kh is 30.38%, 38.46% and 46.15% respectively and Mean bone conduction thresholds in females at 1 kh, 2 kh and 4 kh is 30.88%, 35% and 44.41% respectively.

**Conclusions:** Significant sensorineural hearing loss was seen in our study. Age, gender and duration didn’t have any impact on degree of sensorinueral hearing loss.

**Keywords:** CSOM, Mucosal disease, Sensorineural hearing loss

**INTRODUCTION**

Chronic suppurative otitis media of tubotympanic variety (CSOM) is one of the most common conditions encountered by otologist in daily practice. The classic type of hearing loss described for this condition is conductive. However, several investigators have reported sensorineural hearing loss (SNHL) do occur concomitantly or as sequelae of CSOM, despite the absence of symptoms of labyrinthitis.¹ The SNHL has been ascribed due to contribution of the middle ear hearing mechanism by bone conduction and/or cochlear dysfunction resulting from extension of inflammation in the middle ear cleft through the round window membrane.² Sensorineural hearing loss in chronic suppurative otitis media is well documented. It is hypothesised that in CSOM toxins enter through semipermeable round window membrane causing damage to organ of Corti Paparella, Morizona.³,⁴ Chronic suppurative otitis media is fairly common disease in our country especially in rural community.⁵ WHO in 2004 mentioned, the worldwide prevalence of chronic suppurative otitis media is 65-330 million people and 39-200 million (60%) suffer from clinically significant
hearing impairment. It is observed CSOM frequently affects children in developing countries. In a study in our country, it was found 34.56% of school children had different grades of hearing impairment and 16.95% having chronic suppurative otitis media had mild to moderate hearing loss (41-60 dB). Research workers at the National Ear Care Centre, Kaduna, Nigeria, got a hearing impairment frequency of 26.2% (1435 out of 5485 patients), affecting 9 months to 90 years old individuals with a male preponderance of 56.5%. Prevalence of sensorineural hearing loss has been significantly found even in mucosal type of chronic suppurative otitis media, so we studied the relationship of SNHL with mucosal type of chronic suppurative otitis media and which has not been studied extensively. The objectives of our study were to assess the association between SNHL and mucosal COM.

METHODS

A retrospective descriptive case series study was conducted from July 2014 to June 2015 at Department of Otorhinolaryngology and Head Neck Surgery, SNMC and HSK hospital Bagalkot.

A total of 105 cases of unilateral mucosal type of CSOM were studied for the pattern of hearing impairment on the basis of pure tone audiogram. All the patients underwent audiometry tests. Audiometric evaluation of all the patients were done by Amplaid 3100 dual channel diagnostic audiometer and by using TDH 39 headphones in a sound proof audiometric room which is built according to ANSI guidelines (American National standards Institute). The same audiometer was used for all the cases. For each patient, bone conduction (BC) thresholds for the frequencies of 0.25, 0.5, 1.0, 2.0, and 4.0 kHz were considered for this study. SNHL was considered when an intensity of 25 dB or more was required for the BC threshold in two or more frequencies. Statistical analysis was done by ‘t’ test.

Inclusion criteria

Inclusion criteria were all patients of unilateral mucosal type of CSOM between ages 10-50 years.

Exclusion criteria

Exclusion criteria were patients with CSOM of atticostantal type; patients with CSOM with complications; patients with previous history of ear surgery; patients with age less than 10 years; patients with bilateral CSOM of mucosa type.

RESULTS

Out of total 105 cases of CSOM of mucosal variety 30 (28.57%) had sensorineural hearing loss affecting 13 (12%) males and 17 (16%) females with males to females ratio of 1:1.3. The mean age was 31.2 years.

Table 1: Age distribution (n=105) of unilateral CSOM of mucosal type.

| Age group | Males | Females | Total |
|-----------|-------|---------|-------|
| 10-20     | 15    | 16      | 31    |
| 21-30     | 13    | 13      | 26    |
| 31-40     | 16    | 13      | 29    |
| 41-50     | 13    | 06      | 19    |
|           | 57    | 48      | 105   |

Table 2: Age distribution of unilateral CSOM of mucosal type with sensorineural hearing loss.

| Age groups | Males | Females | Total |
|------------|-------|---------|-------|
| 10-20      | 2     | 6       | 8     |
| 21-30      | 3     | 3       | 6     |
| 31-40      | 5     | 3       | 8     |
| 41-50      | 3     | 5       | 8     |
|            | 13    | 17      | 30    |

Table 3: Audiological profile of diseased ear in males.

| Sl No | Age in years | Duration In years | Bone conduction thresholds (dB) at 1KHz 2KHz 4KHz | Air conduction thresholds (dB) at 1KHz 2KHz 4KHz | Air Bone Gap (dB) at 1KHz 2KHz 4KHz |
|-------|--------------|-------------------|-----------------------------------------------|-----------------------------------------------|-------------------------------------|
| 1     | 47           | 2                 | 40 45 50                                     | 55 60 65                                      | 10 25 15                           |
| 2     | 47           | 1                 | 30 35 45                                     | 65 70 65                                      | 35 40 20                           |
| 3     | 35           | 10                | 25 35 45                                     | 55 65 75                                      | 30 20 30                           |
| 4     | 31           | 12                | 35 40 45                                     | 65 45 70                                      | 20 20 35                           |
| 5     | 35           | 3                 | 25 45 55                                     | 55 75 65                                      | 30 30 40                           |
| 6     | 27           | 6                 | 25 35 45                                     | 50 55 65                                      | 25 15 30                           |
| 7     | 45           | 15                | 35 45 50                                     | 50 65 75                                      | 15 25 35                           |
| 8     | 14           | 6                 | 25 35 45                                     | 50 50 45                                      | 10 20 15                           |
| 9     | 20           | 1                 | 25 35 45                                     | 50 55 50                                      | 5 15 15                            |
| 10    | 20           | 10                | 35 45 45                                     | 55 65 65                                      | 5 20 25                            |
| 11    | 35           | 5                 | 35 45 45                                     | 65 65 65                                      | 20 30 35                           |
| 12    | 31           | 12                | 35 40 45                                     | 25 30 30                                      | 10 10 5                            |
| 13    | 31           | 10                | 35 45 55                                     | 25 30 40                                      | 10 15 15                           |
Table 4: Audiological profile in diseased ear in females.

| Sl. No. | Age In years | Duration In years | Bone conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air bone gap (dB) at 1KHz | 2KHz | 4KHz | Air conduction thresholds (dB) at 1KHz | 2KHz | 4KHz |
|---------|--------------|-------------------|----------------------------------------|-------|------|--------------------------|-------|------|----------------------------------------|-------|------|
| 1       | 18           | 3                 | 40                                      | 45    | 60   | 25                       | 5     | 5    | 65                                      | 50    | 65   |
| 2       | 26           | 2                 | 25                                      | 25    | 30   | 25                       | 25    | 25   | 50                                      | 50    | 55   |
| 3       | 31           | 0.2               | 20                                      | 25    | 25   | 5                        | 30    | 45   | 30                                      | 55    | 55   |
| 4       | 43           | 1                 | 25                                      | 30    | 35   | 20                       | 10    | 25   | 45                                      | 30    | 60   |
| 5       | 21           | 2                 | 25                                      | 30    | 45   | 5                        | 25    | 20   | 30                                      | 55    | 65   |
| 6       | 45           | 2                 | 25                                      | 30    | 40   | 25                       | 25    | 15   | 50                                      | 55    | 55   |
| 7       | 50           | 1                 | 30                                      | 35    | 45   | 10                       | 15    | 10   | 40                                      | 50    | 55   |
| 8       | 18           | 1                 | 25                                      | 35    | 45   | 25                       | 25    | 15   | 50                                      | 55    | 60   |
| 9       | 14           | 4                 | 25                                      | 30    | 35   | 40                       | 40    | 40   | 65                                      | 70    | 65   |
| 10      | 40           | 12                | 25                                      | 35    | 45   | 35                       | 30    | 35   | 60                                      | 55    | 70   |
| 11      | 18           | 10                | 35                                      | 45    | 55   | 30                       | 20    | 15   | 65                                      | 65    | 70   |
| 12      | 18           | 0.8               | 15                                      | 20    | 35   | 35                       | 45    | 55   | 50                                      | 65    | 60   |
| 13      | 15           | 25                | 45                                      | 50    | 55   | 25                       | 25    | 25   | 70                                      | 75    | 80   |
| 14      | 46           | 10                | 45                                      | 40    | 50   | 40                       | 40    | 20   | 85                                      | 80    | 75   |
| 15      | 50           | 12                | 45                                      | 50    | 55   | 5                        | 20    | 20   | 65                                      | 70    | 75   |
| 16      | 35           | 2                 | 30                                      | 30    | 45   | 25                       | 20    | 20   | 55                                      | 50    | 65   |
| 17      | 12           | 1                 | 40                                      | 40    | 55   | 20                       | 10    | 10   | 65                                      | 50    | 55   |

Table 5: Audiological profile of normal ear in males.

| Sl. No | Age In years | Bone conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air bone gap (dB) at 1KHz | 2KHz | 4KHz |
|---------|--------------|----------------------------------------|-------|------|----------------------------------------|-------|------|--------------------------|-------|------|
| 1       | 47           | 15                                     | 25    | 20   | 20                                     | 25    | 25   | 5                        | 0     | 5    |
| 2       | 47           | 15                                     | 10    | 15   | 25                                     | 25    | 25   | 10                       | 15    | 10   |
| 3       | 35           | 15                                     | 5     | 15   | 20                                     | 25    | 25   | 10                       | 10    | 5    |
| 4       | 31           | 15                                     | 15    | 10   | 20                                     | 25    | 25   | 5                        | 10    | 15   |
| 5       | 35           | 10                                     | 15    | 10   | 10                                     | 25    | 25   | 0                        | 15    | 15   |
| 6       | 27           | 5                                      | 10    | 10   | 20                                     | 25    | 25   | 10                       | 15    | 0    |
| 7       | 45           | 10                                     | 5     | 15   | 20                                     | 25    | 25   | 10                       | 20    | 10   |
| 8       | 14           | 10                                     | 10    | 15   | 25                                     | 25    | 20   | 15                       | 15    | 5    |
| 9       | 20           | 10                                     | 10    | 10   | 25                                     | 25    | 20   | 15                       | 15    | 10   |
| 10      | 20           | 10                                     | 15    | 10   | 25                                     | 10    | 20   | 15                       | 5     | 5    |
| 11      | 35           | 10                                     | 5     | 15   | 20                                     | 10    | 20   | 0                        | 15    | 20   |
| 12      | 31           | 15                                     | 5     | 15   | 25                                     | 15    | 20   | 10                       | 15    | 10   |

Table 6: Audiological profile of normal ear in females.

| Sl. No | Age In years | Bone conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air bone gap (dB) at 1KHz | 2KHz | 4KHz |
|---------|--------------|----------------------------------------|-------|------|----------------------------------------|-------|------|--------------------------|-------|------|
| 1       | 18           | 15                                     | 25    | 20   | 20                                     | 25    | 20   | 5                        | 0     | 0    |
| 2       | 25           | 15                                     | 10    | 10   | 25                                     | 25    | 10   | 10                       | 15    | 15   |
| 3       | 31           | 5                                      | 10    | 10   | 20                                     | 25    | 20   | 15                       | 15    | 10   |
| 4       | 43           | 5                                      | 5     | 0    | 15                                     | 10    | 10   | 10                       | 5     | 15   |
| 5       | 21           | 15                                     | 10    | 15   | 25                                     | 15    | 20   | 10                       | 5     | 5    |
| 6       | 45           | 10                                     | 0     | 0    | 15                                     | 10    | 10   | 5                        | 10    | 10   |
| 7       | 50           | 5                                      | 10    | 15   | 20                                     | 10    | 15   | 15                       | 0     | 0    |
| 8       | 18           | 10                                     | 15    | 10   | 25                                     | 20    | 25   | 15                       | 5     | 0    |
| 9       | 14           | 20                                     | 10    | 15   | 25                                     | 25    | 20   | 15                       | 10    | 5    |
| 10      | 40           | 15                                     | 15    | 20   | 25                                     | 25    | 20   | 10                       | 5     | 0    |

Continued.
Mean bone conduction thresholds in males at 1 and 4 kHz is 30.38%, 38.46% and 41.92% respectively and Mean bone conduction thresholds in females at 1 kHz, 2 kHz and 4 kHz is 30.88%, 35% and 44.41% respectively. The mean air conduction threshold in males at 1 kHz, 2 kHz and 4 kHz is 51.9dB, 57.3dB and 63.4dB. The mean air conduction thresholds in females at 1 kHz, 2 kHz and 4 kHz is 56.17dB, 56.17dB and 63.8 dB. The mean air-bone gap (A-B gap) in males at 1 kHz, 2 kHz and 4 kHz is 23.23dB, 26.17dB and 22.0dB and the mean air-bone gap (A-B gap) in females at 1 kHz, 2 kHz and 4 kHz is 24.4dB, 20.85dB, 22.03dB respectively. There was no

### Table 7: Comparison audiological profile in diseased and nondiseased ear in males.

| Sl. No. | Age in years | Bone conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air bone gap (dB) at 1KHz | 2KHz | 4KHz |
|---------|--------------|----------------------------------------|------|------|----------------------------------------|------|------|---------------------------|------|------|
| 11      | 18           | 10                                     | 15   | 25   | 10                                     | 20   | 25   | 5                         | 10   | 5    |
| 12      | 18           | 15                                     | 10   | 15   | 10                                     | 25   | 25   | 5                         | 15   | 10   |
| 13      | 15           | 5                                      | 10   | 15   | 15                                     | 25   | 20   | 10                        | 10   | 5    |
| 14      | 46           | 0                                      | 50   | 5    | 15                                     | 15   | 20   | 15                        | 10   | 5    |
| 15      | 50           | 5                                      | 10   | 15   | 20                                     | 15   | 10   | 5                         | 15   | 0    |
| 16      | 35           | 5                                      | 10   | 20   | 25                                     | 15   | 25   | 20                        | 5    | 5    |
| 17      | 12           | 10                                     | 15   | 10   | 25                                     | 25   | 20   | 10                        | 10   | 15   |

### Table 8: Comparison audiological profile in diseased and non-diseased ear in females.

| Sl. No. | Age in years | Bone conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air conduction thresholds (dB) at 1KHz | 2KHz | 4KHz | Air bone gap (dB) at 1KHz | 2KHz | 4KHz |
|---------|--------------|----------------------------------------|------|------|----------------------------------------|------|------|---------------------------|------|------|
| 11      | 18           | 10                                     | 15   | 25   | 10                                     | 20   | 25   | 5                         | 10   | 5    |
| 12      | 18           | 15                                     | 10   | 15   | 10                                     | 25   | 25   | 5                         | 15   | 10   |
| 13      | 15           | 5                                      | 10   | 15   | 15                                     | 25   | 20   | 10                        | 10   | 5    |
| 14      | 46           | 0                                      | 50   | 5    | 15                                     | 15   | 20   | 15                        | 10   | 5    |
| 15      | 50           | 5                                      | 10   | 15   | 20                                     | 15   | 10   | 5                         | 15   | 0    |
| 16      | 35           | 5                                      | 10   | 20   | 25                                     | 15   | 25   | 20                        | 5    | 5    |
| 17      | 12           | 10                                     | 15   | 10   | 25                                     | 25   | 20   | 10                        | 10   | 15   |

### Table 9: Comparison of SNHL in different studies.

| Percentage | Paperella et al. | Levine | Kaur et al | Sharona | Present study |
|------------|------------------|--------|------------|---------|---------------|
| SNHL       | 43%              | 12%    | 24%        | 9.4%    | 28.57%        |
significant correlation between the age and degree of sensorineural hearing loss.

The bone conduction was observed to be significantly higher in the diseased ears than those in the contralateral healthy ears with p value being less than 0.001 at all frequencies except for air bone gap (dB) in females at 4 kh.

Following tables shows the comparison of bone conduction thresholds diseased males and females ears separately with respect to age and duration of disease.

DISCUSSION

Csm is one of the most common condition encountered by ENT Surgeons in day to day practice. Chronic Suppuratative Otitis media of mucosal variety usually causes conductive type of hearing loss. Papparella et al 1972 believed that SNHL Commonly occurs in patients with this disease.9

The SNHL in CSOM has been variously been calculated to be upto 43% by Papparella et al, 12% by Levine, 24% by Kaur et al and 9.4% by Sharoma.10-13

In our study the SNHL was 28.57% similar to above study with range from 9.4% to 43% with male to female ratio. 1:1.3.

Relevance of SNHL with relation to age was studied.

Papparella et al found SNHL in patients of all age ranges similar to our studies.9

We found that SNHL was 28.57% in affected ear and also SNHL was found to be significant at higher frequencies compared lower frequencies. These results correlates with studies by Papparella et al and Lundaman (that toxins cross the round window membrane to cause irreversible cochlear hair cell damage mostly affecting the basal turn of cochlea.9,14

CONCLUSION

Audiometric evaluation of 105 cases of unilateral mucosal variety of CSOM done and compared with normal control ear. SNHL was found to be associated even with CSOM of mucosal variety also. We emphasis that that it’s very important to council regarding chance of SNHL in CSOM and consequences that causes if patient is treated properly surgically.

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