Original Article

Chronic Suppurative Otitis Media

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Abstract

Problem statement: Chronic suppurative otitis media is one of the most common conditions. Conventionally hearing loss in CSOM is conductive in nature, but it has been observed an additional sensorineural component to their conductive hearing loss. It has been observed that many causes of safe as well as unsafe type of CSOM without complications show a sensorineural element. However, with the advent of antibiotics and sophisticated techniques, the complications of CSOM have tremendously come down. Children with mixed hearing loss invariably suffer from the point of view of education and development of language and therefore it becomes essential to study such cases so that we can prevent sensorineural deafness is CSOM. **Methods:** This study was conducted in the department of ENT, Darbhanga Medical College and Hospital, from Feb 2016 to Jan 2017. Institutional Ethics Committee Clearance was obtained before start of study and written and informed consent for the procedure was obtained from all the patients. A total of 50 patients were divided in 2 groups of 25 each who had unilateral CSOM. **Results:** It was observed that 17% of patients had mixed hearing loss in CSOM, incidence of which increases with advancing age. Higher frequencies were involved in majority of cases. There was no correlation with duration of otorrhoea or duration of topical ear drops with degree of sensorineural hearing loss. Incidence of sensorineural component of hearing loss was more in patients was more in patients with cholesteatoma. **Conclusion:** In our study incidence of sensorineural hearing loss increased with advancing age, showing that age is a risk factor for sensorineural component of hearing loss in CSOM. CSOM is associated with mixed hearing loss mainly >35db, higher frequencies were involved. There was no significant correlation between degree of sensorineural hearing loss and duration of otorrhoea or duration of topical antibiotics.

Key Word: Ear, CSOM, cholesteatoma, otorrhoea

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INTRODUCTION

Pathological changes in middle ear are considered to cause the subtle complications of inner ear, like sensorineural hearing loos. The possible routes of passages of 'harmful substances' to inner ear are described here. The round window membrane is considered the most likely pathway form middle to inner ear. Various substances placed in the middle ear have been seen to pass through the round window membrane. Once toxic substances or inflammatory mediators such as cytokines and nitric oxide enter the inner ear, various inner ear sequelae such as labyrinthitis, endolymphatic hydrops, sensorineural hearing loss or more insidious disease can occur[1]. Different tissue layers within the round window membrane may have different permeabilities. The substances traversing the membrane i.e. water, ions, macromolecules e.g. toxins, antibiotics ma use different pathways and may be affected by different factors, size, configuration, concentration, liposolubility, electrical charge are the factors influencing permeability. Some of these were studied by[2] in experiment on round window membrane of monkeys, chinchillas and cats. Local and topical anaesthetics have been shown to diffuse through round window membrane by Rahm *et al* (1959-61)[3]. Trans tympanic instillation of chloramphenicol in chronic refractory otitis media has been reported b[4] to depress cochlear micro phonics as well as to cause cochlear pathologic changes. Neomycin 9Kohonen et al, 1969) has also been shown to cause hair cell damage, entering inner ear through round window membrane. Neomycin penetration was also seen by Harada *et al*

(1986) in guinea pigs. Being a substance of small molecular weight, it should be passing through the round window membrane quite freely. Trans tympanic instillation of Streptomycin (Ginsberg *et al*1980)[7] and gentamycin have resulted in labyrinthine changes. A case has been reported by Tommerup1984 of profound hearing loos following prolonged use of framycetin ear drops. Podoshin L, Fradis *et al* (1989)[8] reported that local treatment with a mixture of neomycin and polymyxin B appears to contribute to the worsening of the sensorineural hearing loos in patients with chronic otitis media. Suppurative otitis media was induced in guinea pigs using Staphlococcus aureus strain (Nomura, 1984)[6] Presence of serous secretion in tympanic cavity and congestion and oedema of mucosa were considered to be diagnostic. The round window membrane was similarly studied by electron microscopy. The outer layer of round window membrane showed fine precipitate with little degeneration. The middle layer showed fine precipitate with little degeneration. The middle layer showed marked oedema bleeding and polymorphonuclear leukocyte infiltration. Arrangement of fibres was maintained. Inner layer showed no major change. Scala tympani near round window membrane showed bleeding and wandering cells. Later, the round window membrane also showed formation of granulation tissue. Thus the pathological changes in round window membrane appear to be consistent with changes in mucoperiosteum of middle ear cavity. These changes are suggestive of increased permeability especially in early stage of disease (Palomar G, 2001)[5] Conductive hearing loss has normal bone-conduction thresholds, but air-conduction thresholds are poorer than normal by a least 10dB. Conductive hearing loss is secondary to an outer ear or middle ear abnormality which can include abnormalities of the tympanic membrane. The abnormality reduces the effective intensity of the air-conducted signal reaching the cochlea, but it does not affect the bone-conducted signal that does not pass through the outer or middle ear.

Examples of abnormalities include occlusion of the external auditory canal by cerumen or a mass, middle ear infection and/or fluid, perforation of the tympanic membrane, or ossicular abnormalities. Pure-tone air-conduction thresholds are poorer than bone-conduction thresholds by more than 10dB.Audiogram depicting a mild rising conductive hearing loss in the left ear. Note the significant air-bone gaps. Sensorineural hearing loss has bone- and air-conduction thresholds within 10dB of each other, and thresholds are higher than 25dB HL. Sensorineural hearing loss is secondary to cochlear abnormalities or an abnormality of the auditory nerve or central auditory pathways. Because is this type of hearing loss, the outer ear and middle ear do not reduce the signal intensity of the air-conducted signal, both air- and bone-conduction thresholds are within 10dB. It results from lesions of the cochlea (sensory type) or 8th nerve and its central connections (neural type). The term retro cochlear is used when hearing loss is due to lesions of 8th nerve, and central deafness, when it is due to lesions of central auditory connections.

METHODS

This study was conducted in the department of ENT, Darbhanga Medical College and Hospital, from Feb 2016 to Jan 2017. Institutional Ethics Committee Clearance was obtained before start of study and written and informed consent for the procedure was obtained from all the patients. A total of 50 patients were divided in 2 groups of 25 each who had unilateral CSOM.

Inclusion criteria

- All CSOM cases with copious ear discharge, central perforation on otoscopy (Safe group).
- All cases with scanty discharge foul smelling, attic or marginal perforation, granulation tissue or cholesteatomaotoscopy (Unsafe group).

Exclusion Criteria

- History of head unjury.
- Acoustic trauma.
- Systemic ototoxic drugs.
- Patients below 10 Years and above 50 Years of age were excluded.

RESULTS

Once hundred patients of chronic suppurative otitis media with sensorineural hearing loss, either alone or more commonly, with mixed loss ere studied in this series. The patients were carefully selected after proper history and careful examination to exclude the above mentioned criteria to rule out the other possible causes of sensorineural loss.

Table 1: Pattern of Hearing Loss

TYPE OF	INCIDENCE	SAFE	UNSAFE

HEARING LOSS	(N 50)	(N 25)	(N 25)
CONDUCTIVE	83%	92%	74%
MIXED	17%	8%	26%

Table 2: Age wise distribution of safe and Unsafe CSOM

AGE GROUP (YEARS)	TYPE OF CSOM	
	SAFE	UNSAFE
10-20	8	9
21-30	7	5
31-40	6	6
41-50	4	5
	25	25

Table 3: correlation of SNHL component with duration of CSOM

	DURATION OF CSOM (IN MONTHS)					
DEAFNESS	Up to 12	13-24	25-36	37-48	49-60	No. of cases
20-25dB	1	0	0	1	0	2
26-30dB	0	1	0	1	1	3
31-35dB	0	0	1	1	0	2
>35	0	2	2	1	0	5

Table 4: degree of sensorineural hearing loss

Bone Conduction Threshold Range	No. of Patients with SN component of hearing loss
5 dB – 10dB	-
10dB – 15dB	-
15dB – 20dB	-
20dB – 25dB	2
25dB – 30dB	3
31dB – 35dB	2
>35dB	5

Table 5: bone threshold at different frequency in safe and unsafe CSOM

BONE CONDUCTION THRESHOLD	CHRONIC SUPPURATIVE OTITIS MEDIA	
	UNSAFE CSOM	SAFE CSOM
≥20dB in 500Hz, 1000Hz	3	1
≥20dB in 2000Hz	6	2
	9	3

Greater sensorineural component was found in CSOM with cholesteatoma.

Table 6: Type of Pathology

PATHOLOGY	NO. OF CASES
SAFE CSOM	**25**
Perforation:	
Small	6
Medium	9
Subtotal	10
UNSAFE CSOM	**25**
Marginal perforation	10
Attic pouch/perforation	15

Table 7: Causes of SNHL in unsafe CSOM

Causes of SNHL in unsafe CSOM	No. of Pts	%(n=25)
Cholesteatoma extending up to round window	1	4%
Labyrinthine fistula	3	12%
Granulations over oval window	2	8%

Use of Ear drops and sensorineural Hearing Loss Though cases with use of ototoxic systemic drugs were rejected, cases with use of topical ear drops were included as their use was found to be common in chronic otitis media. The different

ear drops used by patients sowed large variety of nature of contents and varying period of use. Many patients could not inform the name of the drops they used in past.

Table 8: Correlation between SNHL and duration of ear drops

USE OF EAR DROPS (NO. OF DAYS)	NO. OF CASES USING EAR DROPS	NO. OF CASES WITH HEARING LOSS
0-7	3	0
8-14	9	0
15-21	18	0
22-38	8	0
>4 weeks	12	1

DISCUSSION

In our study the pattern of hearing loss was 83% conductive and 17% mixed. Patients of 10 to 50 years of age are included in the series. Patients less than 10 years were excluded to avoid the audio logical misinterpretations, by improving patient reliability. Patients more than 50 years were excluded. The following table 2: Shown the incidence of sensorineural hearing loss increases with advancing age, shoeing that age is risk factor in evaluation of sensorineural hearing loss. As mentioned earlier, otorrhoea was criteria used for onset of disease. In the cases of otitis media with effusion or few other cases not reporting complaint of otorrhoea, onset of deafness was considered. Mean bone conduction thresholds were deduced at different frequencies and tabulated against duration of CSOM. This study found grater incidence of hearing loss with increasing duration of disease. Hence, the incidence of SNHL component has correlation with duration of disease. In our study the degree of sensorineural component of hearing loss was >35dB in majority of the cases. Greater sensorineural component was found in CSOM with cholesteatoma. In our study, 12% cases of unsafe chronic suppurative otitis media were found to be associated with labyrinthine fistula. This proved to be the commonest cause of sensorineural component in unsafe chronic suppurative otitis media followed by granulation over oval window (8%) cholesteatoma extending to round window in 4% of cases. There were 4 cases with sensorineural hearing loss in safe CSOM group, the cause of which could not be ascertained. Though cases with use of ototoxic systemic drugs were rejected, cases with use of topical ear drops were included as their use was found to be common in chronic otitis media. The different ear drops used by patients sowed large variety of nature of contents and varying period of use. Many patients could not inform the name of the drops they used in past. In our study, use of topical antibiotic ear drops for long duration as a cause of sensorineural hearing loss was not statistically significant. Culture sensitivity was carried out in cases of chronic otitis media, especially with non-healing perforation. Swab from the middle ear discharge was taken. Cultures showed mainly the mixed flora in some cases where as staphylococci or streptococci were in safe disease. Cases of cholesteatoma and some cases of even safe disease, demonstrated presence of Pseudomonas aeruginosa or Proteus mirabilis organism. Cases showed variation in sensitivity of micro-organism to antibiotics. The presence of mixed flora or the development of resistance of organisms may again be due to use of topical ear drops and prolonged antibiotic treatment received by patient especially in young age.

CONCLUSION

In our study, the incidence of sensorineural hearing loss increased with advancing age, indicating that increasing age was risk factor in evolution of sensorineural hearing loss in patient with chronic suppurative otitis media. Chronic suppurative otitis media is associated with mixed hearing loss with degree of sensorineural hearing loss being 35dB in majority of patients. Higher speech frequencies were affected more in majority of patients. This study found significant correlation between the degree of sensorineural hearing loss and duration of otorrhoea. Greater sensorineural component was found in patients suffering from chronic suppurative otitis media with cholesteatoma. Thus it is emphasized that the cases of chronic suppurative otitis media should be diagnosed early, and managed effectively so as to prevent the chances of developing sensorineural hearing loss.

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