

Tympanogenic Labyrinthitis (Cochlear Deafness) due to chronic suppurative otitis media (CSOM)

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Abstract

Background: It has been accepted that in patients with CSOM, conductive deafness results from mechanical break-down of sound conduction, whilst the cochlea remains unaffected.

Objectives: Our study aims to prove a sensorineural component in hearing loss in patients suffering from CSOM, which necessitates early detection as it increases in severity with time.

Methods: A prospective study was done on 64 patients, all were diagnosed as having unilateral CSOM, their ages ranged from 18-40 years to exclude presbycusis as a cause of sensorineural deafness. These patients were divided into 4 groups according to the duration of discharge and further divided into 3 groups according to the pathology (simple perforation, granulation tissue or cholesteatoma).

Results: 62 patients showed some degree of sensorineural deafness in the affected ear accounting for 96.8% of the total number of patients,

While only 2 patients escaped the phenomenon. Worsening of bone conduction thresholds was noticed with increased duration of the disease.

The highest loss was in patients with severe pathology (cholesteatoma) and least in those with simple perforation.

Conclusion: This study indicates that the degree of sensorineural hearing loss in patients with CSOM relates with the duration and complications of the disease which is contrary to the traditionally accepted belief of the physicians that cochlea remains unaffected in CSOM.

Key words: Cochlea, sensorineural deafness, CSOM.

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Introduction:

Otitis media is an inflammation of part or all of the mucoperiosteal lining of the middle ear and it is of 2 types (1):

1.safe type (tubotympanic)

2.unsafe type (attico-antral)

Hearing loss usually results from impairment of tympanic membrane function by perforation and of the round window mobility and also from ossicular chain discontinuity resulting in severe deafness.

On the other hand, sensorineural deafness includes all cases of deafness due to impairment of function of the "Organ of Corti" in the cochlea or its central connections.

Otitis media, specially suppurative types including both acute and chronic, can by passage of inflammatory agents through the round window causes temporary threshold shifts (TTS) or permanent threshold shifts(PTS) limited to the cochlear basal turn, which can spread apically and become measurable on routine audiometry⁽²⁾.Temporary threshold shifts result from serous(toxic) labyrinthitis, while permanent threshold shifts from permanent dysfunction of the Organ of Corti^(3,4).

The round window membrane is the only soft tissue barrier between the middle and inner ear which is located inferiorly in the medial wall of the middle ear, lies in a niche and it is also proximal to the sinus

tympani, all these factors, make it susceptible to exposure to infected materials^(2,5,6).

Methods:

A prospective study was done on 64 patients attending ENT clinics in Al-Kindy Teaching Hospital, all have chronic suppurative otitis media and only unilateral cases were taken so that, the normal ear served as a control.

The age of the patients ranged from 18-40 years, therefore almost practically excluding presbycusis as a cause of sensorineural deafness.

In addition, all patients didn't have the following:

1. Previous otological surgery.
- 2.Familial history of hearing loss.
- 3.Exposure to ototoxic drugs.
- 4.Positive fistula test.
- 5.Frank labyrinthitis.
- 6.Habitual exposure to hazardous noises.
- 7.Any apparent factor which can result in sensorineural deafness.

After being examined clinically, they were evaluated audiometrically and the analysis was made of the bone conduction thresholds.

Patients were divided into 4 groups according to the duration of discharge. Further grouping into 3 groups according to the pathology:

Group A included patients with uncomplicated perforation.

Group B included patients with granulation tissue or polyp.
 Group C included patients with cholesteatoma which is diagnosed clinically, by x-ray or during surgery.
 Again audiograms of these groups were taken into the study and bone conduction thresholds studied.

Results:

The distribution of patients according to duration as follows :

	Duration (in years)	No. of patients
1	0-5	26
11	6 – 10	18
111	11 – 15	10
1V	16 – 20	10
	Total	64

The distribution of patients according to the pathology as follows :

Pathology	No. of patients
A- Simple perforation	32
B- Polyp or granulation tissue	20
C- Cholesteatoma	12
Total	64

62 patients showed some degree of sensorineural deafness in the affected ear accounting for 96.8 % of the total number of patients, while Only 2 patients didn't show deafness by showing no difference in the bone conduction thresholds between the affected and

normal ear and so accounting for only 3.2 % of the total. The average loss was concluded by comparing the bone conduction thresholds in the normal and the affected ear for each frequency (in all age groups) as shown :

Frequency in Hz	500	1000	2000	4000	8000
Threshold Normal	10.15	13.90	15.45	19.20	22.35
In dB Diseased	21.25	26.40	28.60	33.75	40.15
Loss in dB	11.10	12.50	13.15	14.55	17.80

So, the sensorineural loss was rising with increasing frequency.

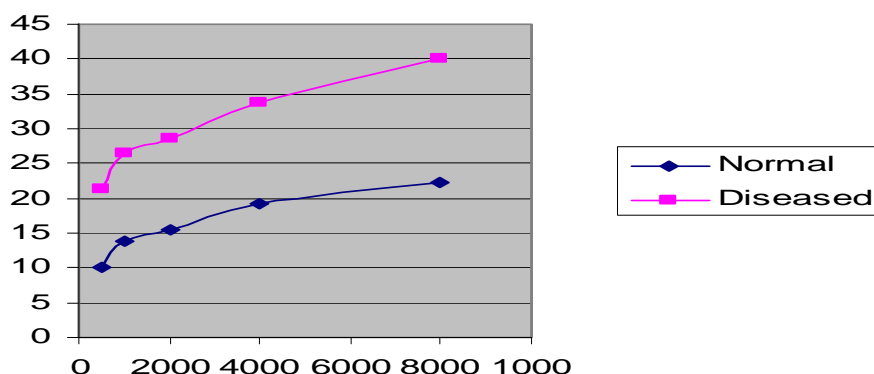


Figure 1 shows the difference between normal and diseased ear with rising frequency :

The threshold rises with the duration of the disease as shown :

		Frequency in Hz				
Duration (in years)		500	1000	2000	4000	8000
Threshold In dB	0 – 5 y	20	23	26	28	32
	6 – 10 y	22	25	28	30	35
	11 – 15 y	25	28	29	34	42
	16 – 20 y	25	32	41	47	53

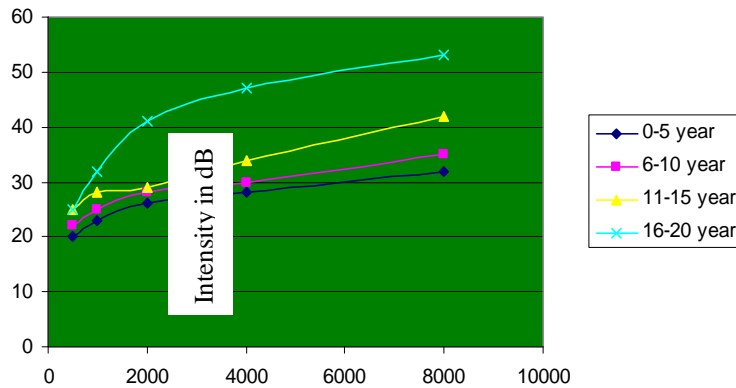


Figure 2 shows the worsening of bone conduction thresholds with increased duration of the disease :

The highest loss was found to be in patients with cholesteatoma and least in those with simple perforation whereas patients with granulation tissue or polyps lie between the two groups as shown :

		Frequency in Hz				
Pathology		500	1000	2000	4000	8000
Loss In dB	A- Simple perforation	12	14	15	17	20
	B- Granulation tissue	14	17	19	21	25
	C- Cholesteatoma	26	28	30	32	33

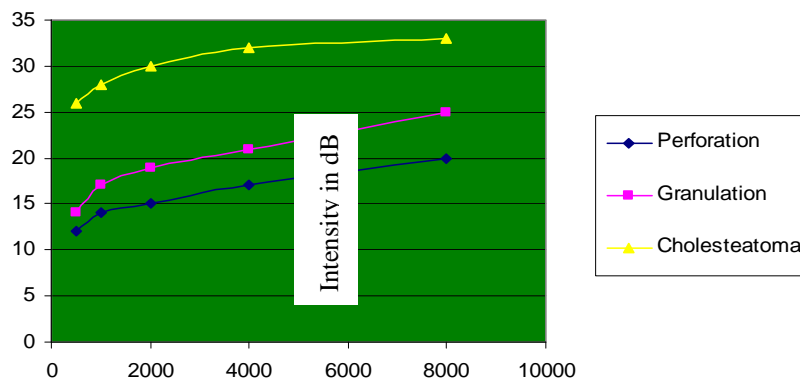


Figure 3 : Bone conduction thresholds related to pathology .

Discussion

The results of this study show that cochlear deafness or tympanogenic labyrinthitis can occur with minimal or no vestibular abnormalities⁽⁷⁾.

- The longer the disease process, the greater the damage to the round window membrane and possibly to the inner ear, therefore, we must detect it early and treat otitis media early either medically or surgically^(8,9,10,11)

- The findings of this study are similar to the majority of studies done on this issue except perhaps for that done by Dumich et al.(1983) who stated that "although extensive middle ear disease was found to cause significant loss of cochlear function in a small group of patients, chronic suppurative otitis media has little effect on cochlear function in the majority"⁽¹²⁾.
- Our results show more significant loss than that noted by studies like :
 - ˆ Gardenghi in 1955 who noted a loss in 22 out of 30 patients⁽¹³⁾.
 - ˆ Bluvshstein in 1963 found normal bone conduction in 65 out of his 300 patients⁽¹³⁾.
 - Morrison study in 1969, reveals that ears with cholesteatoma exhibit sensorineural hearing loss significantly more than other chronically infected ears ,this agrees with results obtained by Vartiainen in 1987 who studied 874 ears⁽¹⁴⁾ . A possible explanation is that most of studied cholesteatomatous ears have suffered from prolonged periods of discharge.
 - ˆ Kirtan had obtained the same results in 2005⁽¹⁵⁾.
 - Surgical intervention in children in the form of microsuction and adenoidectomy seems to have good results as shown by Best et al study (1980) where improvement in 44% of cases⁽³⁾.This implies the importance of early detection and prompt treatment.

Conclusion :

We concluded that the degree of sensorineural hearing loss in patients with chronic suppurative otitis media relates with the duration and complication of the disease.

- The mechanism by which sensorineural hearing loss and specially high tone loss occurs in otitis media:
Because of chemical contamination by absorption of toxins through the round window membrane where there are no ciliated cells in the region of the window, also pus can be pooled in the adjacent sinus tympani space specially when the patient is in an upright position.
- All these factors encourage pus or infected tissue to be concentrated at the round window thereby encouraging absorption through it⁽¹⁶⁾.
- In a pathologically affected membrane, there is alteration of the cell junctions or endocytosis of molecules by the cells lining the round window membrane, thus allowing macromolecules to diffuse into the perilymph.
- ˆ Another possibility is that of an increased rate of absorption by lymphatics and / or blood vessels of the diseased membrane and / or mucoperiosteum⁽⁵⁾.
- Too many physicians consider chronic suppurative otitis media to be an innocuous process unless obvious complications develop, but our

Observations stress for continual assessment of sensorineural function in patients with otitis media and active surgical or medical intervention should be considered if not already done.

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