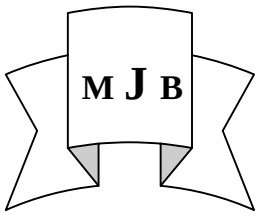
Sensorineural Hearing Loss Associated with Chronic Suppurative Otitis Media (CSOM)

Kassim R. Dekhil

College of Medicine, Al-Qadisiyah University, Iraq.



Abstract

Background: Chronic otitis media is a major global cause of hearing impairment & this may have serious long-term effects on language, auditory & cognitive development, & educational progress.

Objective: To study the sensorineural hearing loss (receptive hearing loss) associated with chronic suppurative otitis media (CSOM).

Methods: 96 patients were clinically diagnosed with chronic suppurative otitis media (CSOM) consulting us in Diwaniyah teaching hospital & my private clinic between September 2006 & April 2009. 66 cases of the total number were unilateral while the bilateral cases were 30. Audiological assessments were done for all cases.

Results: The results showed a significant relationship between CSOM & SNHL mainly at high frequencies, & it had been found that the longer duration at time of diagnosis the more percentage affected & cases of CSOM associated with cholesteatomas were more affected by SNHL & the frequency 8000Hz was the most affected one.

Conclusions: The presence of SNHL with CSOM may be explained by the presence of pus, local or systemic treatment or may be due to labyrinthitis during the course of the disease; therefore, more attention should be paid in the treatment of CSOM.

الخلاصة

تمهيد: التهاب الأذن الوسطى المزمن تعتبر مشكلة عالمية رئيسية لنقص السمع وهذا بدوره يؤدي إلى تأثيرات خطيرة من حيث اللغة والعملية التعليمية وتطور الفرد.

ألهدف: لدراسة نقص السمع الحسي عصبي المرافق لالتهاب الأذن الوسطى القيحي المزمن.

طريقة الدراسة: 96مريضا تم تشخيصهم سريريا بالتهاب الأذن الوسطى القيحي المزمن لدى مراجعتهم مستشفى الديوانية التعليمي وعيادتي الخاصة ما بين شهر أيلول 2006 وشهر نيسان 2009. وكان 66 حالة من العدد الكلي المشخص أحادي الجانب بينما الحالات ثنائية الجانب كان عددها 30 حالة. تقييم السمع تم أجراءه لكافة الحالات.
ألنتائج: الدراسة أظهرت وجود علاقة مهمة ما بين التهاب الأذن الوسطى القيحي المزمن وفقدان السمع الحسي عصبي وخاصة في الترددات العالية كما بينت الدراسة وجود علاقة ما بين طول فترة الإصابة بالمرض وزيادة نسبة الإصابات بفقدان السمع الحسي عصبي كما إن الحالات المترافقة بوجود ورم كولسترولي(كولستيتوما) تكون أكثر تأثرا والتردد 8000 هرتز هو الأكثر تأثرا ما بين الترددات الأخرى.

ألاستنتاجات: وجود نقص سمع حسي عصبي مترافق مع التهاب الأذن الوسطى القيحي المزمن قد يكون بسبب وجود ألقــيح أو العلاج ألجهازي أو الموضعي وقد يكون بسبب التهاب التيه خلال فترة المرض لذا يجب إعطاء الأهمية عند معالجة التهاب الأذن الوسطى المزمن.

Introduction

Chronic suppurative otitis media (CSOM) defined as a long-standing discharge either continuous or intermittent discharge through a non-intact tympanic membrane from either a perforation or a tympanostomy tube or it is an inflammatory process of the middle ear space for more than three months [1, 2]

CSOM can be classified on pathological bases into inactive mucosal chronic otitis media (COM), active mucosal (COM), active squamous epithelial COM (cholesteatoma) & inactive squamous epithelial COM (retraction pocket) [3]. The disease may be active when infection & otorrhea are present or quiescent when they are not present. The length of active & quiescent periods varies from patient to patient. Individuals prone to upper respiratory infection & allergies tend to experience frequent & lengthier episodes of active disease [4].

In fact, neglected acute suppurative otitis media of several months duration may still be essentially a self-limiting process that tends toward complete resolution, whereas epitympanic cholesteatoma from the very first day of otorrhea should be classified as CSOM. Thus it is not the duration of the discharge in days, weeks or months but rather the particular pathologic changes that cause otitis media to be classed as chronic rather than acute & self-limiting [5].

Sensorineural hearing loss (SNHL) is indicated by air & bone thresholds that are or at least very close to one another. Sensorineural losses can be caused by a disorder of the cochlea or auditory nerve or both. The combined term (sensorineural) is used to highlight the fact that we cannot distinguish between cochlear (sensory) & eight nerve (neural) disorders from the audiogram [6]. However, it is better to use the terms cochlear & retrocochlear hearing loss if we use other audiological tests.

The SNHL associated with CSOM may be sudden onset, progressive or fluctuating. Disequilibrium or vertigo may or may not be present [7]. It has long been accepted that CSOM is often accompanied by SNHL related to the CSOM but not due to effect of conductive deafness on bone conduction [8].

Patients and Methods

The study was conducted in Diwaniyah teaching hospital & my private clinic. 96 patients were clinically diagnosed with chronic suppurative otitis media (CSOM) between September 2006 & April 2009. 66 cases of the total number were unilateral while the bilateral cases were 30. 16 cases of unilateral group had cholesteatomas while 7 cases excluded because it was difficult clinically to decide if there was a cholesteatoma or not.

The reviewed data in the questionnaire form were age, sex, residence, discharge, duration of the disease, offensive odor, headache, tinnitus, pain & vertigo. Age of the patients in the study ranged from 8-65

years old. A control group of 42 years age & gender-matched healthy persons were chosen randomly. Diagnosis was relying on symptoms, clinical examination by using otoscope & microscope (the microscope used in our study is Hallpike Blackmore ear microscope & Carl Zeiss ear microscope) & pure tone audiometer.

Results

Age of the patients in our study ranged from 8-65 years old, the total number were 96 patients, 66 of total were with unilateral CSOM while the bilateral cases were 30 & so the total number were 162 ears. Ear discharge & hearing impairment were the most common symptoms seen in CSOM. Hearing impairment complained more in bilateral rather than unilateral cases. Other symptoms were documented as in table (1).

Table 1 Distribution of patients with CSOM according to complaints

complain	No. of unilateral cases	% of unilateral cases	No. of bilateral cases	% of bilateral cases	Total No. of cases	% of total cases
Discharge	56	%85	22	73%	78	81%
Hearing impairment	44	67%	28	93%	72	75%
Offensive odor	12	18%	4	13%	16	17%
Headache	8	12%	7	23%	15	16%
Tinnitus	4	6%	2	6%	6	6%
Pain	7	11%	4	13%	11	11%
Vertigo	6	9%	2	6%	8	8%

Regarding the study of the percentage of bone conduction threshold shift in the unilateral cases of CSOM, the study was conducted on unilateral cases only to compare the bone conduction threshold of the affected side with normal ear (the total number of unilateral cases were 66).There were bone conduction threshold shifts in all frequencies measured & more seen in high frequencies, the most affected frequency was 8000 Hz, table (2).

Table 2 Number & percentage of frequencies affected

Frequency	No. of pts. with bone conduction threshold shift	Percentage
250 HZ	41	62%
500 HZ	39	59%
1000HZ	42	63%
2000HZ	43	65%
4000HZ	46	69%
8000HZ	49	74%

Concerning the relation between the duration of CSOM (at time of diagnosis) & the percentage of shift of bone conduction thresholds according to the frequency in the unilateral cases, the list classified into 3 subgroups (less than one year, 1-10 years & more than 10 years). It had been found that the longer duration at time of diagnosis the more percentage affected & the high frequencies were the most affected ones, table (3).

Table 3 relation between duration & percentage of shift

Duration of disease or infection	No. of pts	shift (+) in 250 Hz	percentage	shift (+) in 500 Hz	percentage	shift (+) in 1000 Hz	percentage	shift in (+) 2000 Hz	percentage	shift (+) in 4000 Hz	percentage	shift (+) in 8000 Hz	percentage
One year or less	6	4	66%	4	66%	3	50%	3	50%	2	33%	4	66%
1-10 years	27	16	59%	15	56%	16	59%	17	63%	17	63%	19	71%
More than 10 years	33	21	65%	22	69%	24	74%	25	77%	27	82%	27	82%

Regarding the relation between the presence of cholesteatoma & the percentage of bone conduction threshold shift according to the frequency, the study conducted on unilateral cases only. The total numbers of unilateral cases were 66 patients. 7 cases were excluded because it was difficult clinically to decide if there was a cholesteatoma or not by using auriscope or microscope.

The other cases (59) were classified into 2 groups, one group, CSOM with cholesteatoma which were 16 cases & the other group without cholesteatoma (43 cases). It had been found that cases of CSOM associated with cholesteatomas were more affected by bone conduction threshold shift & the frequency 8000Hz was the most affected one, table (4).

Table 4 comparison in bone conduction threshold shift between CSOM with & without cholesteatomas.

Presence of cholesteatoma	Total number of cases	Bone conduction threshold shift in 250 Hz	percentage	Bone conduction threshold shift in 500 Hz	percentage	Bone conduction threshold shift in 1000 Hz	percentage	Bone conduction threshold shift in 2000 Hz	percentage	Bone conduction threshold shift in 4000 Hz	percentage	Bone conduction threshold shift in 8000 Hz	percentage
+	16	12	74 %	11	69 %	11	69 %	12	76 %	13	78 %	15	92 %
-	43	27	63 %	28	66 %	27	63 %	29	67 %	30	70 %	31	72 %

In study the relation between active chronic otitis media & inactive chronic OM & the percentage of shift in bone conduction threshold according to frequency, the study conducted on unilateral cases only, & the total number were 66 cases. The number of active cases at time of diagnosis were 56 & 10 cases were inactive at time of diagnosis. The active cases were slightly more affected in most frequencies, table (5).

Table 5 comparison in bone conduction threshold shift between active & inactive COM

percentage of active disease	250 HZ		500 HZ		1000 HZ		2000 HZ		4000 HZ		8000 HZ	
	No.	%	No.	%	No	%	No	%	No	%	No	%
+	35	62 %	36	64 %	38	68 %	38	68	40	72	43	76 %
-	6	60 %	5	50 %	7	70 %	7	70 %	7	70 %	7	70 %

In studying the severity of SNHL in patients of CSOM according to frequency, unilateral cases were studied only so as to compare the bone conduction threshold of diseased ear with that of healthy one & then find the average of bone conduction threshold in each frequency of all cases. We found that the severity of bone conduction threshold shift increases with increase of frequency & the maximum shift at the frequency of 8000 Hz, table (6).

Table 6 shows the severity of bone conduction threshold shift according to frequency

frequency	250HZ	500HZ	1000HZ	2000HZ	4000HZ	8000HZ
Severity	8.4dB	9.2dB	9.3dB	11dB	12.6	15.2

In comparison with above results, after performing pure tone audiogram in healthy individuals (control group) showed that the average of air conduction threshold was 11 dB & the average of bone conduction threshold was 8 dB.

Discussion

For purpose of comparison, we divided our patients into two groups, unilateral & bilateral CSOM. There are many controversies regarding pathogenesis & audiological changes associated with CSOM. Cases of CSOM with history of surgery or a history of sensorineural hearing loss due to any cause were excluded from the study. In general a patient with CSOM may have many potential reasons to be affected by a mixed rather than a purely conductive deafness & of these causes, the disease process itself may affect the cochlea & this is the aim of our study, potentially ototoxic ear drops are often given, surgery itself may cause damage or the patient might have an unrelated sensorineural hearing impairment. Our study showed that CSOM is commonly associated with SNHL.

The causes of SNHL in CSOM is considered to be due to increased permeability of round window membrane to toxic substances resulting from acute or chronic inflammatory process of middle ear cleft[8-16], other authors suggest that SNHL associated with CSOM is due to mechanical occlusion to the oval window resulting from granulation tissues, cholesteatoma or due to pus or may be due to stiffness of the ossicular chain resulting from chronic inflammatory process (Carhart's effect) that is seen in otosclerosis [17], or may be due to cholesteatoma-induced fistula, results in sensorineural hearing loss & vertigo with nystagmus [18].

In comparison with other studies, Macandie study showed that 75% of cases of CSOM between 1-10 years, 21 % of cases of less than one year & 4% of cases were of more than 10 years while in our study, 50% of cases were of more than 10 years, 41% of cases between 1-10 years, & 9% of cases less than one year, the difference between the two studies may be due to the development of medical care in western communities & early medical consultation. In our study, SNHL was found in all frequencies between 59-74% & the highest percentage was found in 8000Hz, while in study of Macandie, SNHL was found in 45-54% on frequencies between 250Hz-2000Hz, 66% on frequency 4000Hz,

and 69% on frequency 6000Hz. According to the severity of SNHL in each frequency, the average of bone conduction threshold shifts were 8.4 dB, 9.2 dB, 9.3 dB, 11dB, 12.6 dB &15.2 dB to the frequencies 250Hz, 500Hz, 1000Hz, 2000Hz, 4000Hz, & 8000Hz respectively while in study of Macandie, the threshold shifts in bone conduction were between 5.24-9.02 dB & this is less than our study. In our study, we found mild difference in bone conduction shifts between active & inactive disease & this is near to the results of study of Dr. Levine.

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