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Original Article

Association Between Audiometric Profile and Intraoperative Findings in Patients with Chronic Suppurative Otitis Media

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Abstract

Introduction:
Although the incidence and prevalence of chronic suppurative otitis media (CSOM) has been decreased in recent decades, but it is still a major health problem in both developing and developed countries. CSOM can cause major and life-threatening complications such as hearing loss, meningitis and cerebral abscess. Since hearing loss is the most common complication of CSOM, we aimed to evaluate audiometric profile in patients with CSOM and its relation with intra-operative pathologic findings

Materials and Methods:
Between 2008-2010, 80 patients with CSOM subjected to tympanomastoidectomy or tympanoplasty entered this study.
The detailed patients' history, physical examination, audiometric evaluations and findings during surgeries were collected. Finally, the associations between data were analyzed.

Results:
CSOM had higher prevalence among female (67.5%), but difference was not statically significant. Speech recognition test and air-bone gap were significantly associated with CSOM (P<0.001). While cholesteatoma and granulation significantly associated with air-bone gap (P=0.044) and speech recognition test (P=0.032), respectively, ossicular defects significantly associative with both of them (P=0.001 and P=0.032, respectively). There was not any association between sclerosis and audiometric parameters. Also presence of the cholesteatoma and ossicular defects associated with size of the tympanic perforation (P=0.001).

Conclusion:
The preoperative and surgical findings can predict the patients' conductive hearing loss in chronic otitis media, but this relationship is not significant in all variables.

Keywords:
Audiometry, Cholesteatoma, Chronic, Hearing loss, Otitis media, Sclerosis, Suppurative

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Introduction

Chronic suppurative otitis media (CSOM) defines as chronic inflammation of the middle ear and mastoid mucosa with tympanic membrane perforation or tympanostomy tube accompanied with otorrhea (1,2). Although the incidence and prevalence of CSOM has been decreased in recent decades (3) due to improving hygiene and treatment (4), but it is still a major health problem in both developing and developed countries (5-7). CSOM may result in several major and sometimes life-threatening complications such as hearing loss, meningitis, cerebral abscess, mastoiditis, facial paralysis, cholesteatoma, granulation and subdural empyema (8-11).

Since hearing loss is a common complication of CSOM (1,12) and it may affect the patient's work efficacy, we designed this study to evaluate the relationship between otologic features and pathological characteristics found during operation in patients with CSOM.

Materials and Methods

This study was performed in Imam Khomeini hospital, Tehran University of Medical Sciences. All patients who were diagnosed as CSOM and underwent tympanomastoidectomy or tympanoplasty between December 2008 to March 2010 were enrolled our study. In addition to demographic data, we recorded the following findings and symptoms: (1) pathologic characteristics during operation including sclerosis, cholesteatoma, granulation and ossicular defects, (2) The mobility of ossicle, (3) Clinical findings including otorrhea, presence of TM perforation, type of perforation (central versus peripheral) and size of perforation, (4) Clinical symptoms including otorrhea, hearing loss, vertigo, tinnitus and history of ear trauma. Hearing profile pure tone audiometry (air-bone gap (Gap), air conduction (AC), bone conduction (BC)), speech discrimination score (SDS) and speech recognition test (SRT). Patients with incomplete data were excluded from the study.

All patients underwent complete microscopic ear examination as a routine physical examination before surgery. The report of sclerosis is related to detection of sclerotic plaques in microscopic examination. Also, the size of perforation was estimated by using of the special designed software.

All data gathered from patients' dossiers and analyzed with SPSS software. The present study was reviewed and approved by the ethical committee of Tehran University of Medical Sciences and it was in adherence with the Declaration of Helsinki.

Results

Totally, 80 cases were recruited in the present study. The mean age of cases was 33.5±14 years and 54 (67.5%) of them were female. There was not any associetion between sex and age with audiometry parameters (P>0.5).

The most common symptom was hearing loss (90%) and the most common sign was TM perforation (87.5%). More than three-fourths of perforations were central type. Although about 90% of cases complained from ear discharge, otorrhea was detected in about one-fourths.

TM perforation was the only finding to be associated with SDS changes (P=0.008) (Table 1)

There was not significant relation between perforation type of TM (central versus peripheral) and audiometry parameters. The size of TM perforation in 39 cases measured and its mean was 4.5±2.6 mm. We did not find any relationship between sizes of TM perforation with audiometry parameters (Table 2).

While there was significant relationship between SRT (P<0.001) and Gap (P<0.001) in the operated ear in comparison with opposite normal ear, there was not any relationship in case of SDS

between operated ear and opposite normal one (Table 3).

Table 1: Frequency of signs and symptoms and their relation with audiometry parameters

Signs & symptoms	Frequency (%)	Significant relation
Hearing loss	90 (72)	-
TM*	70 (87.5)	SDS†
perforation	55 (78.6)	-
Central		
Peripheral	15 (21.4)	-
Ear discharge	68 (85)	
Tinnitus	35 (43.8)	-
Otorrhea	18 (22.5)	-
Vertigo	17(21.3)	-
Ear trauma history	7 (8.8)	-

*** Tympanic membrane**
† Speech discrimination score

Table 2: Correlation between size of tympanic membrane perforation and audiometry parameters

Audiometry parameter	Pearson	P
SRT*	0.229	0.156
SDS†	0.086	0.597
Gap‡	0.096	0.558

*** Speech recognition test**
† Speech discrimination score
‡ Air-bone gap

Table 3: Mean and standard deviation of audiometry parameters in operated and opposite ear

Audiometry parameter	Operated ear	Opposite ear	P
SRT*	36±16	27±18	<0.001
SDS†	98±11	99±2	0.278
Gap‡	25±13	17±13	<0.001

*** Speech recognition test**
† Speech discrimination score
‡ Air-bone gap

75% of the existing ossicles were mobile. Absence of an ossicle significantly increased the SRT and air bone Gap (P=0.031 and 0.001 respectively). Cholesteatoma increased Gap, which was statistically significant (P=0.044). Granulation was in associated with abnormality in SRT (P=0.032) (Table 4).

Table 4: Frequency of intra-operation findings and their relation with audiometry parameters

Findings	Frequency (%)	Significant relation
Existence of ossicle	58 (72.5%)	-
Mobile ossicle	44 (55%)	-
Fixed ossicle	14 (17.5%)	-
Ossicle defects	22 (27.5%)	SRT* - Gap†
Sclerosis	26 (32.5%)	-
Cholesteatoma	20 (25%)	Gap
Granulation	4 (5%)	SRT

***Speech recognition test**
† Air-bone gap

Sclerosis did not have any effect on audiometric parameters. The only audiometric parameter that was irrelevant to intra-operating findings was SDS (Table 5).

The most common pathologic finding in patients with otorrhea was sclerosis, but it was not significantly associated with otorrhea ($P \simeq 1$). Also, the most common pathologic finding in patient with TM perforation was cholesteatoma. Both cholesteatoma and absence of ossicle were significantly associated with TM perforation (Table 6).

Discussion

The demographic results showed a higher prevalence of CSOM among females (67.5%). The male: female ratio was 1: 2. This result is in agreement with previous studies. Lin et al (3) analyzed data of more than 2000 patients with CSOM in 10-year period. They found the sex rate of 1: 1.6 (male: female). Van der Veen et al (13) showed no sex differences in patients with

CSOM. This difference could due to sampling limitation. They enrolled children under 12, while we did not set an age limit. Children were not the only population deal with CSOM. We showed that a broad spectrum of age including teenager and adult could develop CSOM (33.5±14 year). It is in agreement with other studies (3,9, 13,14). Unlike the sex, age had a near to significant relation with SRT (P=0.54). Accordingly, older age may result in increasing of the SRT in affected ear with CSOM. It is incompatible with Papp *et al* (15) study. They found that patients with older age and CSOM are more vulnerable for sensorineural hearing loss.

Considering clinical signs, about 90% of cases had TM perforation, and the central type is the most common (78.5%). Less than one-fourth of cases (22.5%) had otorrhea while about at the time surgery 90% of them had ear discharge in their history. It could be due to physician's advising to keep the ear dry before operation. The two most common symptoms were hearing loss (90%) and discharge (85%). It is in agreement with other studies (16,17). Also, the existence of TM perforation, type and size of perforation did not have any significant relationship with audiometry parameters.

Also, there was not a significant relationship between sclerosis finding in otoscopic examination and conductive hearing loss, which can be explained by differences between otoscopic findings and surgical presence of sclerosis around the ossicles.

Two audiometric parameters that related with CSOM were SRT and Gap. Siampara et al (18) throughout a study, showed sensorineural hearing loss of 40 dB or more at 4 KHz and 8 KHz. Also they found that difference between the mean bone conduction threshold of affected ear and the non-affected ear was statistically significant at 4 KHz and above. The result of this study may be compatible with ours, because of the fact that bone conduction reduction didn't evaluate exclusively in this study. It shows that the SRT and Gap are more impressible from CSOM than SDS and suggests a higher value of SRT and Gap in diagnosis of CSOM.

We found that the sclerosis was the most common intra-operation finding but it did not have an effect on the hearing. Unlike sclerosis, the cholesteatoma and granulation were associated with Gap and SRT respectively. Existence of cholesteatoma significantly increased Gap in both ears. It could endorse bilateralism of CSOM in patients with cholesteatoma.

In those with ossicular defects, both the Gap was and SRT increased significantly. The decreasing of SDS in ossicular defects was not significant (P=0.061). Feng et al (19) evaluated the correlation between ossicular conditions and pure tone audiogram in 251 patients (288 ears) with CSOM. They found that the air-conduction threshold and air-bone gap in patients with ossicular defects are higher than in patients who did not have ossicular defects. They concluded that the air-conduction threshold and air-bone gap are reliable indicators of ossicular profiles in patients with CSOM. This study is in agreement with ours. Our findings showed that the ossicle defect could result in abnormalitic in all audiometric parameters, especially in SRT and Gap.

Intact TM in COM was more prevalent in the ears with the cholesteatoma and ossicular defects. This relation was statistically significant. There was not any significant relation between intra-operation findings and otorrhea.

Conclusion

The present study showed that the preoperative and surgical findings can predict the patients' conductive hearing loss in chronic otitis media, but this relationship is not significant in all variables.

Table 5: Mean and standard deviation of audiometry parameters and intra-operation findings

Parameter	Sclerosis		P-value	Cholesteatoma		P-value	Granulation		P-value	Ossicle		P-value
	Absent	Present		Absent	Present		Absent	Present		Absence	Present	
SRT*	37±17	34±12	0.445	35±15	40±17	0.185	35±15	52±15	0.032	42±18	34±14	0.032
SDS†	97±14	99±2	0.364	98±13	99±2	0.092	98±11	97±6	0.0854	94±21	99±2	0.061
Gap‡	26±14	24±10	0.558	24±11	30±16	0.044	25±12	35±8	0.105	34±14	22±10	0.001

*** Speech recognition test**
† Speech discrimination score
‡ Air-bone gap

Table 6: Relation between intra-operation findings with otorrhea and tympanic membrane perforation

Finding	Otorrhea		P-value	Perforation		P-value
	Present (%)	Absence (%)		Present (%)	Absence (%)	
Sclerosis	33 (6)	32 (20)	0.932	25 (10)	1 (36)	0.104
Cholesteatoma	5 (28)	15 (24)	0.757	91 (16)	9 (90)	0.001
Granulation	1 (6)	3 (5)	0.902	3 (4)	1 (10)	0.438
Absence of ossicle	5 (28)	17 (27)	0.976	13 (90)	9 (19)	0.001

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