



Open Journal of Otolaryngology and Rhinology

Research Article

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The correlation between hearing loss and the site of eardrum perforation: about 260 cases

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Received Date: Sep 09, 2019 / Accepted Date: Oct 07, 2019/ Published Date: Oct 09, 2019

Abstract

Introduction: Some authors have assumed that the hearing loss depends on the site and the size of the perforations, but the results were contradictory and inconclusive. The aim of this present study is to find correlation between hearing loss and the location of tympanic membrane perforation after a chronic otitis media.

Materials and Methods: A retrospective study was conducted in our ENT department, university hospital Ibn Rochd Casablanca Morocco. Two hundred sixty patients were enrolled in this study with eardrum perforation and without any neurosensory hearing loss or middle/ inner ear diseases. Data processing and analysis were carried out with computer software SPSS.

Results: Two hundred sixty patients (103 males, 157 females) with age range 8–67 years (mean = 35.9) were studied. Bilateral tympanic membrane perforations were seen in 84 patients (60%), unilateral

perforation in 176 patients (68%). In the 260 patients, 253 eardrum perforations were caused by chronic otitis media. Only 7 cases were due to a traumatism. The tympanic perforation was posterior in 64 cases (24.6%), subtotal in 54 cases (20.8%), central in 49 cases (18.8%), anterior in 44 cases (16.9%), antero-superior in 1 case, antero-inferior in 23 cases (8.8%), postero-superior in 5 cases (1.9%), and postero-inferior in 10 cases (3.8%). The tympanic perforation was inferior in 10 cases (3.8%). Perforation's sites on the tympanic membrane were correlated with the groups of average hearing loss. For anterior perforations the average loss was moderate in 52.3% and severe in 13.6%. For posterior perforations the average loss was moderate in 75%. For subtotal perforation, the percentage was equal for mild and moderate hearing loss. The average loss for anterior perforations was 41.93 dB. The average loss for posterior ones was 42.66 dB.

Conclusion: The current study aimed to correlate the degree of hearing loss to the different site of perforation. From the present study we can tell that Hearing loss in chronic otitis media is independent of the site of eardrum perforation. Nevertheless, further studies are needed with a representative population to confirm our results.

Keywords: Site of eardrum perforation; Hearing loss; Bone conduction

Cite this article as: Iziki O, Ahmadou A, Abdulhakeem B, et al. 2019. The correlation between hearing loss and the site of eardrum perforation: about 260 cases. *Open J Otolaryngol Rhinol.* 1: 18-21.

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Introduction

Chronic otitis media is a chronic inflammation of the middle ear and mastoid cells, on an open or closed tympanic membrane. The presence of eardrum perforation changes the quality of the hearing by affecting the transmission and amplification of the sound waves.

Recently, several studies have been conducted in patients with tympanic perforation in order to correlate hearing loss with the characteristics of the perforation such as its size and location. Some authors have assumed that the hearing loss depends on the site and the size of the perforations, but the results were contradictory and inconclusive. The aim of this present study is to find correlation between hearing loss and the location of tympanic perforation after a chronic otitis media.

Materials and Methods

It was a retrospective study conducted in our ENT department, university hospital Ibn Rochd Casablanca Morocco, from August 2017, to January 2019. Two hundred sixty patients were enrolled in this study and followed-up for simple chronic otitis media. We included in our study, all patients with eardrum perforation. We excluded all patients with neurosensory hearing loss (bone conduction more than 20dB) or mixed ones; patients with lysis or fixation of ossicles or presenting myringosclerosis. we performed a tonal audiometry test for all patients with masking. The hearing levels in decibel were assessed at frequencies 250 KH, 500 KH, 1000 KH, 2000 KH, 4000 KH and 8000 KH respectively in an acoustically treated sound proof boot. Air and bone

conduction thresholds were determined. The average loss was divided into 4 groups according to the International Bureau of audio phonology (BIAP) classification: [0-20db]= normal [20-40] = mild hearing loss [40-70db] = moderate hearing loss [70-90db] =severe hearing loss
Data processing and analysis were carried out with computer software Statistical Package for Social Sciences.

Results

Two hundred sixty patients (103 males, 157 females) with age range 8–67 years (mean = 35.9) were studied. Bilateral tympanic membrane perforations were seen in 84 patients (60%), unilateral perforation in 176 patients (68%). In the 260 patients, 253 eardrum perforations were caused by chronic otitis media. Only 7 cases were due to a traumatism. The mean clinical symptoms were purulent discharge in 252 cases (97%), hearing loss in 248 patients (95%), as well as otalgia in 148 cases (57%). The tympanic perforation was posterior in 64 cases (24.6%), subtotal in 54 cases (20.8%), central in 49 cases (18.8%), anterior in 44 cases (16.9%), antero-superior in 1 case, antero-inferior in 23 cases (8.8%), postero-superior in 5 cases (1.9%), and postero-inferior in 10 cases (3.8%). The tympanic perforation was inferior in 10 cases (3.8%). Tonal audiometry test was normal in 3 patients. Sixty-nine patients had a mild hearing loss (26,5%), 163 patients had a moderate hearing loss (62,7%) and 25 ones had a severe hearing loss (9,6%). Perforation's sites on the tympanic membrane were correlated with the groups of average hearing loss as shown in table 1 below. For anterior perforations the average loss was moderate in 52.3% and severe in 13.6%. For

posterior perforations the average loss was moderate in 75%. For subtotal perforation, the percentage was equal for mild and moderate hearing loss. The average loss for anterior

perforations was 41.93 dB. The average loss for posterior ones was 42.66 dB (Table 2).

Table 1: Eardrum perforation's sites and different groups of average hearing loss.

Perforation's site	normal	Mild hearing loss	Moderate hearing loss	Severe hearing loss	Total
Anterior:	3	12	23	6	44
	6,8%	27,3%	52,3%	13,6%	100,0%
Posterior:	0	12	48	4	64
	0,0%	18,8%	75,0%	6,3%	100,0%
Subtotal:	0	22	22	10	45
	0,0%	40,7	40,7%	18,5%	100,0%
central:	0	14	33	2	49
	0,0%	28,6%	67,3%	4,1%	100,0%
Antero-inferior:	0	4	17	2	23
	0,0%	17,4%	73,9%	8,7%	100,0%
Antero-superior:	0	0	1	0	1
	0,0%	0,0%	100,0%	0,0%	100,0%
Postero-inferior:	0	2	8	0	10
	0,0%	20,0%	80,0%	0,0%	100,0%
Postero-superior:	0	0	5	0	5
	0,0%	0,0%	100,0%	0,0%	100,0%
inferior:	0	3	6	1	10
	0,0%	30,0%	60,0%	10,0%	100,0%

Table 2: Eardrum perforation's sites and average hearing loss in dB.

Perforation's site	Average hearing loss (dB)	Standard deviation
Anterior	41,93	11,724
posterior	42,66	7,714
central	42,45	7,226
Antero-inferior	43,66	7,629
Postero-inferior	43,50	5,798
Postero-superior	41,00	2,236
Inferior	42,00	8,882
Total	42,63	8,998

Discussion

There are three accepted theories of bone Conduction (BC) hearing: compressional BC, inertial BC, osseotympanic BC. The last one describes sound energy transmitted to the external auditory canal via the skull and para-

auditory structures (jaw, soft tissues) to the Tympanic Membran (TM) [1]. In perforated TM, this mechanism works improperly. Some sound energy may leak. TM perforation works as contrary to occlusion effect. This seems to be the reason of worsening of BC thresholds in patients with TM perforation.

In our study, most patients had moderated hearing loss. This finding was similar to the study of Maharjan et al, but differed from that of Nahata et al who found that most of ears had a mild degree hearing loss [2,3]. In the current study, the statistical analysis of the locations of TM perforation in patients with pure conductive hearing loss showed no correlation with the magnitude of hearing losses. Rather, this phenomenon is dependent on the size of the perforation and state of other factors related to the conductive pathway and the middle ear. This is similar to the reports of Voss et al whose results showed no effect of position of the tympanic membrane perforation on hearing loss [4-6]. Ibekwe and colleagues conducted a cross-sectional prospective study of 62 patients. They have also concluded that the location of the TM perforation has no effect on the degree of hearing loss [7]. However, literature reveals a strong correlation between the site of TM perforation and hearing loss in animals and human [8-10], similar to the study of Teja Deepak Dessai et al. and other authors.

Conclusion

The current study aimed to correlate the degree of hearing loss to the different site of perforation. From the present study we can tell that Hearing loss in chronic otitis media is independent of the site of eardrum perforation. Nevertheless, further studies are needed with a representative population to confirm our results.

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