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Research Article

Association Between Hearing Loss with Site and Size of Tympanic Membrane Perforation: A Retrospective Study

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Abstract

Background: Perforation of tympanic membrane decreases surface area and allows the sound waves to pass through middle ear directly. Size of perforation and severity of the hearing loss are related.

Aim: The present study was aimed to evaluate association between hearing loss with site and size of tympanic membrane perforation.

Methods: All patients between 15-60 years of age with chronic otitis media safe type attending to outpatient clinic of ENT, Bangalore Medical College over the period of one year were included in this hospital-based retrospective study. The patients with unsafe CSOM, mixed hearing loss, and refusal to participate in the study, were excluded.

Results: 52% patients aged between 21 and 30 years. Male to female ratio was 1.7:1. 53% patients belonged to average socioeconomic class. The most common symptom on presentation was decreased hearing present in all the patients followed by otalgia (38%), and headache (31%). Unilateral ear was affected in 82 patients in our study. In 9 patients, both ears were affected. Among 50% ears, size of perforation was 10-30 mm^2 followed by 0-9 mm^2 in 40% ears, and >30 mm^2 in 10% patients. We also observed that the patients with higher perforation have an increase in hearing loss on PTA examination (P<.0001). Among 100 ears, the most common perforation site was central (70%) followed by antero-superior (19%), antero-inferior (15%), postero-inferior (9%), and postero-superior (3%). We also observed that median PTA frequency on postero-superior site was significantly higher than antero-superior, anterosuperior, and central site (P<0.01).

Conclusion: Hearing loss is directly related to the size of TM perforation, as the size increases hearing loss also increases.

Keywords: Chronic otitis media; tympanic membrane; hearing loss

Introduction

Chronic suppurative otitis media (CSOM) is the persistent inflammation of the middle ear or mastoid cavity. CSOM usually manifests as intermittent or persistent ear discharge through a perforated tympanic membrane [1,2]. Initially, CSOM presents with mucopurulent discharge through perforated tympanic membrane with otalgia; then hearing impairment follows [3]. CSOM is one of main cause of middle ear disease and a major cause for hearing loss in the developing countries [3]. In India, overcrowding and poor hygiene as well nutrition is observed; thereby, adding to the prevalent CSOM. Tympanic membrane (TM) plays a major role in middle ear transformer mechanism. Perforation of TM decreases the total ratio of the surface area and allows the sound waves to pass through middle ear directly. With larger TM perforation size, hearing loss severity increases. In the recent years, several clinical studies have been conducted in patients of CSOM to correlate the hearing loss with the characters of the perforation such as size and site [4]. The present study was aimed to evaluate association between hearing loss with site and size of tympanic membrane perforation.

Patients and Methods

All patients between 15-60 years of age with chronic otitis media safe type attending to outpatient clinic of ENT, Bangalore Medical College over the period of one year were included in this hospital-based retrospective study. The patients with unsafe CSOM,

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mixed hearing loss, and refusal to participate in the study, were excluded. Each of the participants was interviewed with a pretested questionnaire and examined clinically to assess the features of tympanic membrane perforation. Examination included detailed history of the patient, local and systemic examination, detailed examination of the patient including ear, nose examination. Ear examination was done using otoscope, microscope, tuning fork tests using 512 Hz. Tympanic membrane was divided into five segments antero-superior, postero-superior, antero-inferior, postero-inferior and central for the localization of the perforation site, which was assessed using otoscope. Depending upon area, perforation was divided into 3 groups. Group I: Small perforation 0-9 mm^2. Group II: Medium perforation 9-30 mm^2, and Group III: Large perforation >30 mm^2.

Data analysis

Data were recorded into Microsoft® Excel workbook 2019 and exported into SPSS v21.0 (IBM, USA). Categorical data were expressed as frequency and percentages. Normative quantitative variables between multiple groups were expressed as mean and standard deviation and compared using one-way ANOVA followed by Bonferroni's post-hoc correction. Non-normative quantitative variables between multiple groups were expressed as median and compared using Kruskal-Wallis test followed by pairwise comparison. P value <0.05 was considered significant.

Results

General characteristics

Table 1 shows general characteristics of the study participants. Mean age of the study participants was 33.91±13.23 years ranging from 15 years to 60 years. In our study, 52% patients aged between 21 and 30 years. Male to female ratio was 1.7:1. 53% patients belonged to average socioeconomic class. The most common symptom on presentation was decreased hearing present in all the patients followed by otalgia (38%), and headache (31%). Unilateral ear was affected in 82 patients in our study. In 9 patients, both ears were affected. A total of 100 ears were affected.

Table 1: Showing General characteristics (n=100).

	Frequency	Percentage
Age (Years)		
20-Nov	12	12
21-30	52	52
31-40	13	13
41-50	12	12
51-60	11	11
Gender		
Male	63	63
Female	37	37
Socioeconomic class		
Low	53	53
Average	47	47
Symptoms on presentation		
Decreased hearing	100	100
Otalgia	38	38
Vertigo	10	10
Tinnitus	10	10
Headache	31	31
Ear affected		
Right	58	58
Left	33	33
Bilateral	9	9

Duration of disease

Out of 100 affected ears, only 34% (n=18) had duration of disease more than 5 years, 58% had duration between 1-5 years, and remaining <1 year.

Association between size of perforation

Among 50% ears, size of the perforation was 10-30 mm^2 followed by 0-9 mm^2 in 40% ears, and >30 mm^2 in 10% patients. We also observed that the patients with higher perforation have an increase in hearing loss on PTA examination (P<.0001) (Table 2).

Table 2: Showing relation between size of perforation and hearing loss.

Size	PTA	P value	Post-hoc correction
0-9 mm^2	29.5±8.34	<0.001	
10-30 mm^2	34.6±7.4		a vs. b=1.000
>30 mm^2	39.0±6.2		a vs. c<0.0001 b vs. c=0.212

Association between site of perforation

Among 100 ears, the most common site of perforation was central (70%) followed by antero-superior (19%), antero-inferior (15%), postero-inferior (9%), and postero-superior (3%). We also observed that median PTA frequency on postero-superior site was significantly higher than antero-superior, antero-inferior, and central site (P<0.01) (Figure 1).

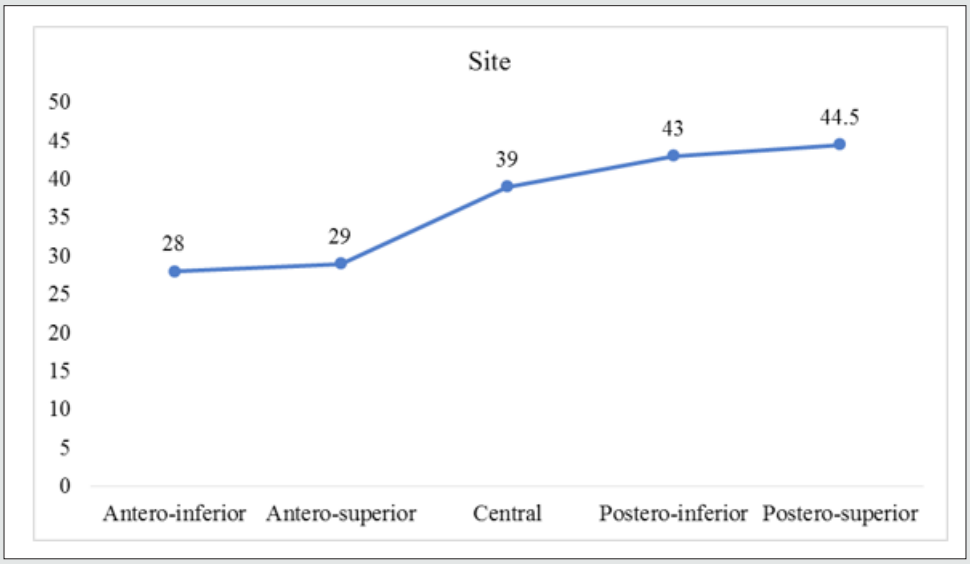

Figure 1: Line diagram showing trend in hearing loss with site of perforation. Values are expressed as median.

Discussion

The present study assessed the effect of size and site of tympanic membrane perforation on degree of hearing loss in patients of CSOM safe. In our study, mean age of the study participants was 33.91±13.23 years ranging from 15 years to 60 years. In our study, 52% patients aged between 21 and 30 years. The possible reason of the group is being more active socially as well as more health conscious. The presence of shorter and straight Eustachian tube predisposes easy passage of infection in this age group could also be a reason. Our findings are in concordance with Dessai et al and Prasansuk et al who reported similar findings [4,5]. In our study, 61.4% of the patients in our study were males. These findings have been supported by various investigators. Aneesa et al reported that the number of males in the study group was higher than the number of females (M:F=1.38:1) [6]. In our study, majority of the patients belonged to low socioeconomic class. Anil and Bayahati reported that safe type (Tubotympanic) of CSOM, is most commonly seen in low socioeconomic class among adolescents and mid-aged group people [7]. In our study, the most common symptom on presentation was decreased hearing in all the patients followed by otalgia, and headache. In a study from Nigeria, the most common presenting symptom was otorrhea (81.5%), followed by otalgia (72.8%) and tinnitus (55.7%) [8]. In our study, among 100 ears, the most common TM perforation site of central. Nahata et al. reported observed that hearing loss was higher in posterior perforation, followed by central perforation, and anterior perforation [9]. Our study observed an increasing trend of hearing loss from anterior to posterior site (P<0.001). In a study by Aneesa et al, there was

significant increase in mean hearing loss from anterior perforation to posterior perforation [6]. This can be associated with the direct exposure to the sound waves, which results in cancellation of phase difference among the oval and round windows. When comparing the severity of hearing loss with various sizes of perforation, increased hearing loss with increased size of perforation was observed. Our results were comparable with Nahata et al, and Pannu et al. [9,10].

Conclusion

Hearing loss is directly related to the size of TM perforation, as the size increases hearing loss also increases. Posterior quadrant TM perforations have more hearing loss as compared to anterior quadrant perforations of TM.

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