

# Tympanic Membrane Perforation`s Site affect the Degree of Hearing Difficulty

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## **Abstract:**

### **Background:**

The effect of the site of perforation of tympanic membrane and amplitude of hearing difficulty is discussed in many authors with different results we try to estimate these relationships in our study.

### **Method:**

A cross sectional analytic study off 55 patients with chronic suppurative otitis media. The tympanic membrane was divided into four segments according to the relation of each to handle of malleus, antero-superior, antero-inferior, postero-superior and postero-inferior.

Hearing level of each patient was assessed in decibel with audiometer at frequencies from 250Hz to 8kHz in acoustically treated sound proof room.

**Results:** in our study we found that the highest incidence of csom at age group (15-34) year and highest number and percentage of perforation were in anter-inferior segment of tympanic membrane (34),(66.6%) followed by postero-superior segment (7),(13.7%) then postero inferior (6),(11.7%) and antero-superior one (4),(7.8%).No significant sex difference.

The conclusion was the clear effect of the site of perforation in relation to degree of hearing difficulty.

Key words: Tympanic perforation, hearing loss.

## **Introduction:**

The tympanic membrane play a protective function of the middle ear cleft and round window , with conduction of sound waves across the middle ear , also intact tympanic drum protects the middle ear from infections and shields round window from direct sound energy .<sup>(1)</sup>

The eardrum (TM) acts as a key component of the tympano ossicular system for sound transmission and perforation of the( TM )is common in an otology practice and can be from different causes such as trauma and chronic suppurative otitis media <sup>(2)</sup>

Chronic suppurative otitis media (CSOM) is defined as a state of ear disease in which there is recueernt infection of the middle ear; a perforated tympanic drum and discharge are present. <sup>(2)</sup>

A perforation of the tympanic drum reduces the sur face area of the membrane and lets for sound wave transmission and allows sound to move directly into the middle cleft as a result the pressure gradient between the both surfaces of the drum becomes non significant. The effectiveness with which the tympanic drum transmits sound waves to the ossicles (chain) is impaired along with the of hearing level. <sup>(3)</sup>

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Several clinical studies the recent years, have been conducted in patients of CSOM to correlate the hearing difficulty with the characters of the perforation such as size and site <sup>(4)</sup>. Most authors have generally stated that the hearing loss is dependent on the site and size of perforation but their results were found to be conflicting and inconclusive. <sup>(5,6,7,8)</sup>

## **Method:**

### ***Study design:***

A cross sectional study conducted from January 2016 to October 2016 with a population of both sex and age groups from 15 years and above with perforation of tympanic membrane examined ed in the ear, nose and throat clinic of Al-habbobi teaching hospital.

### ***Study location:***

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Al- habbobi teaching hospital located in Al-Nasiriya city of Thi-qar gavarnorant south of Iraq with population density about 2 million

### ***Sample size and type:***

Fifty five patients with unilateral perforated eardrum was included in the study.

### ***Data collection:***

The participants were interviewed pre tested structural questionnaire and

examined clinically to assess the features of the tympanic membrane.

The eardrum was divided into four segments according to the relation of each to handle of malleus, antero superior, anteroinferior, posterosuperior and postero inferior.

Hearing level of each patient was assessed in decibel with audiometer at different frequencies (250Hz, 500Hz, 1000Hz, 2000Hz, 4000Hz and 8000Hz) in acoustically treated sound proof room..

Air and bone conduction thresholds were determined. the mean hearing threshold was calculated through pure tone mean of 500Hz, 1000Hz and 2000Hz. Bilateral perforation and actively discharging ear to avoid confounding effect. Despite this pure tone audiometry of some patients shown mixed hearing loss.

#### ***Data processing and analysis***

These have been done with version 23 statistical package for social sciences (SPSS) and Kruskal, and the criteria for statistical significance was setup at P. value (<0,05)..

#### ***Limitation of the study:***

The audiometric assessment may be affected by other factors especially in chronic tympanic membrane perforation.

#### **Results:**

Fifty-five patients with unilateral perforated membrane were included in this study.

The age groups included in the study ranged from 15 years and above, and it shown the highest incidence of perforated eardrum due to CS was between (35\_44) years (37%) as shown in table (1) although no significant difference, p.value(0.083).

Which also shown no significant different was seen between types of gender (0.370).

Figure (1) shows that the maximum number and percentage of perforation were in anter-inferior segment of tympanic membrane (34), (66.6%) followed by postero-superior segment (7), (13.7%) then postero inferior (6), (11.7%) and antero-superior one (4), (7.8%) as in figure (1). Hearing loss was mild in most groups of site of perforation (16\_40) decibel (figure 2) with statistically significant p. value (0.0001) as appeared in table (2).

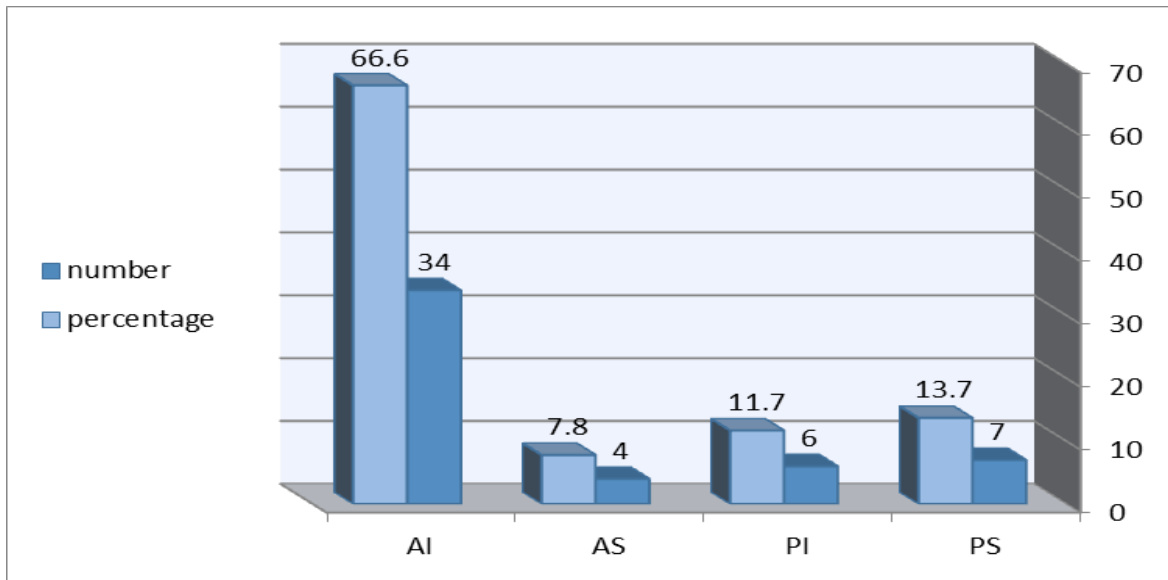


Figure 1 distribution of the position of perforation

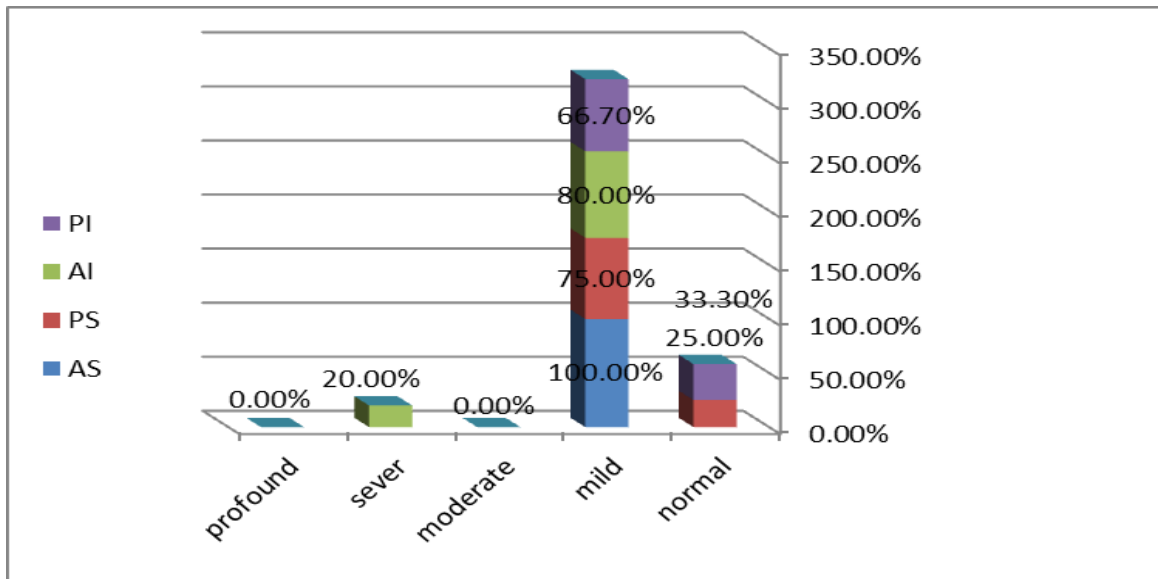


Figure 2 distribution of studied population according to the hearing threshold

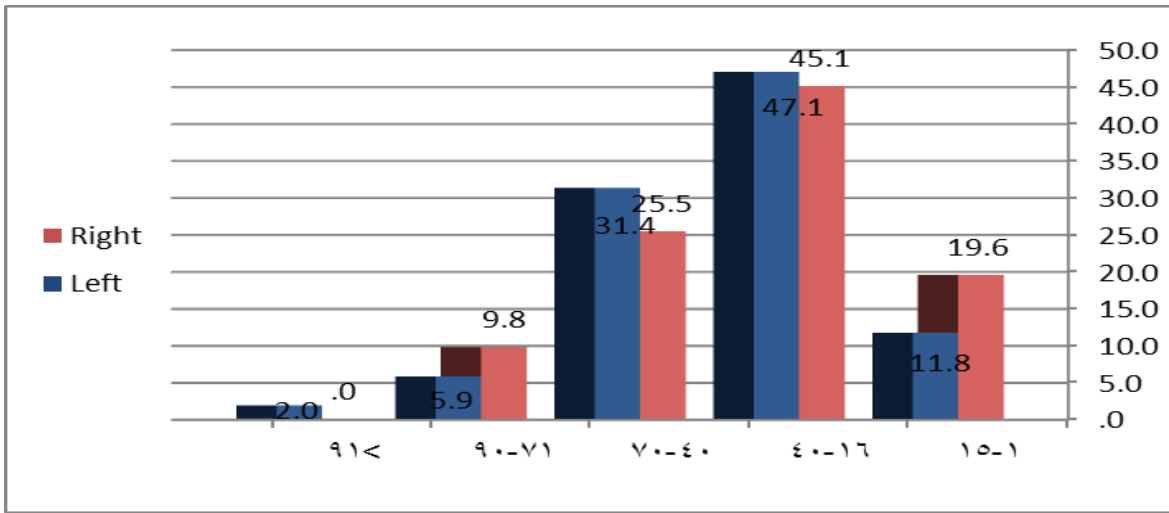


Figure 3: percentage of the side of affected ear

	Total	$X^2$ , P value
<b>Age by years</b>		
15-24	11 21.6%	1.055 ,0.083
25-34	6 11.8%	
35-44	17 ,33.3%	
45-54	12 ,23.5%	
55 and above	5 ,9.8%	
<b>Sex</b>		
Male	30 ,58.8%	0.370,0.1 90
Female	21 ,41.2%	

**Table: 1 Determinants of the tympanic membrane perforation among studied population.**

Impaired hearing				
<b>Present in both ears</b>	18 81.8%	9 31.0%	27 52.9%	13.338 ,0.0001
<b>Absent</b>	0 .0%	3 10.3%	3 5.9%	
<b>Present in one ear</b>	4 18.2%	17 58.6%	21 41.2%	

**Table :2 distribution of hearing impairment among patient`s ears.**

**Discussion:**

Direct impaction of sound wave into the middle ear cleft through perforated tympanic membrane yielding in loss of round window baffle as they suggested may not be the only cause of hearing difficulty bearing in mind the complex effects of sound transmission through the middle ear as shown by recent models on sound transmission through tympanic membrane into the middle ear <sup>(9,10)</sup>.

Statistical analysis of the location of tympanic perforation in patients with pure tone conductive hearing loss showed important correlation with perforation site in our study which was not consonance with Titus S. Ibekwe; et. al, where as in agreement with Ahmed

and Ramani <sup>(11)</sup>. and Bekesy <sup>(12)</sup>. Our study showed the most of the perforations were at antero-inferior quadrant of tympanic perforation in contrary with others who showed postero-superior perforations were most frequent. <sup>(13,14)</sup>.

Our study revealed that there is no significant difference in the incidence of chronic suppurative otitis media was seen among patients age groups {p.value 0.083} which was differ from observation done by Shyumala and Reddy and Agrawal et al, <sup>(15,16)</sup>, and Vijayshere Nahata, et. al, <sup>(17)</sup> which shown higher incidence among age group (5-20)years may be because of high attendance of medical care for children in our society .

No significant difference between gender in our study unlike Vijayshere Nahata, et al,<sup>(17)</sup> where female patients were preponderant. This variation could be arisen due to difference in literacy level in different geographical location to attend hospital.

Our results were conducted with other studies in general that lower frequencies are affected more than higher frequencies.

### **Conclusion:**

Our study showed that there is significant impact between the perforation site and degree of hearing loss.

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## موقع ثقب غشاء طبلة الأذن يؤثر على مدى ضعف السمع

د. مشتاق نعمة المالكي<sup>١</sup> د. ربيع جبار العمار<sup>٢</sup> د. صفاء عبد المحسن البدري<sup>٣</sup>

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### نبذة مختصرة:

#### الخلفية:

وتناقش العلاقة بين موقع ثقب الغشاء الطبلي ودرجة فقدان السمع في العديد من المؤلفين مع نتائج مختلفة نحاول تقدير هذه العلاقات في دراستنا

#### طريقة:

دراسة مقطعية من ٥٥ مريضا بثقب غشاء طبلة الأذن بسبب التهاب الأذن الوسطى تم تقسيم الغشاء الطبلي إلى أربعة أجزاء وفقا لعلاقة كل منها مع عظيم المطرقة الى أمامي علوي وأمامي سفلي و خلفي علوي وخلفي سفلي .

تم قياس درجة الضعف السمعي لكل مريض بواسطة جهاز يقيس درجة فقدان السمع لمختلف الترددات ابتداءً من ٢٥٠ هيرتز الى ٨٠٠٠ هيرتز في غرفة معزولة صوتياً .

النتائج: وجدنا في دراستنا أن العدد الأقصى والنسبة المئوية للانتقاب كانت في الجزء الأمامي السفلي من الغشاء الطبلي (٣٤)، (٦٦.٦%) يليه الجزء الخلفي العلوي (٧)، (١٣.٧%) ثم الخلفي السفلي (٦) (١١.٧%) و(٧.٨%) فقط للأمامي العلوي . إن معظم الضعف السمعي كان من النوع التوصيلي البسيط (١٥-٤٠) وحدة سمعية

ونستنتج أهمية موقع الثقب بالنسبة لدرجة فقدان السمع. فقدان السمع