

## Assessment of the size and site of tympanic membrane perforation and hearing loss

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### ABSTRACT

**Background:** Size and site of tympanic membrane perforation is proportionate to degree of hearing loss, larger the perforation, greater the hearing loss. The present study was conducted to assess the size and site of tympanic membrane perforation and hearing loss.

**Materials & Methods:** 75 patients with tympanic membrane perforation of both genders were divided into 3 groups based on size of perforation such as group I with 0-9mm<sup>2</sup>, group II with 10-30mm<sup>2</sup> and group III with >30mm<sup>2</sup> perforation. Site was anterior, posterior and multiple. Hearing loss was calculated.

**Results:** Group I patients had 28.4 dB, group II had 38.2 dB and group III had 47.5 dB hearing loss. In group I, anterior site was seen in 16, posterior in 5 and multiple in 4 cases, in group II, anterior in 8, posterior in 7 and multiple in 10 cases and in group III, anterior in 8, posterior in 5 and multiple in 12 cases. The difference was significant ( $P < 0.05$ ).

**Conclusion:** As the size of the perforation increased, hearing loss also increased.

**Key words:** Hearing loss, Multiple, tympanic membrane perforation.

### INTRODUCTION

Tympanic membrane is a membranous partition separating the external auditory meatus from the tympanic cavity, measuring 9–10 mm vertically and 8–9 mm horizontally. It plays a major role in middle ear transformer mechanism. Chronic suppurative otitis media has been an important cause of middle ear disease, since prehistoric period and it is the most important cause of hearing loss in developing countries.<sup>1</sup>

Otitis media is an inflammation of a part or all the mucoperiosteal lining of the middle ear cleft. It is a highly prevalent disease of the middle ear.<sup>2</sup> Chronic suppurative otitis media is a serious health problem worldwide and it is more critical in developing countries where large percentage of the population lack specialized medical care, suffer from malnutrition and live in poor hygienic environmental conditions.<sup>3</sup> Chronic suppurative otitis media (CSOM) is probably the commonest disease seen in an ENT clinic. 30% of the patients attending in ENT outpatient department suffer from chronic suppurative otitis media. Middle ear infections are almost universally associated with hearing loss, mostly conductive in nature. Chronic suppurative otitis media (CSOM) was found to be a single major cause responsible for 60.27% cases of conductive deafness.<sup>4</sup>

Size and site of tympanic membrane perforation is proportionate to degree of hearing loss, larger the perforation, greater the hearing loss. The site of perforation in the tympanic membrane and the duration of ear discharge have significant effect on the magnitude of hearing loss. For instance, posterior quadrant perforations are having poorer hearing than the anterior ones, because there is direct exposure of the round window to sound.<sup>5</sup> The present

study was conducted to assess the size and site of tympanic membrane perforation and hearing loss.

## MATERIALS & METHODS

The present study comprised of 75 patients with tympanic membrane perforation of both genders. All were enrolled after they agreed to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 3 groups based on size of perforation such as group I with 0-9mm<sup>2</sup>, group II with 10-30mm<sup>2</sup> and group III with >30mm<sup>2</sup> perforation. Site was anterior, posterior and multiple. Hearing loss was calculated as average of hearing loss at 500, 1000, 2000 Hz. Results thus obtained were recorded and subjected to statistical analysis. P value less than 0.05 was considered significant.

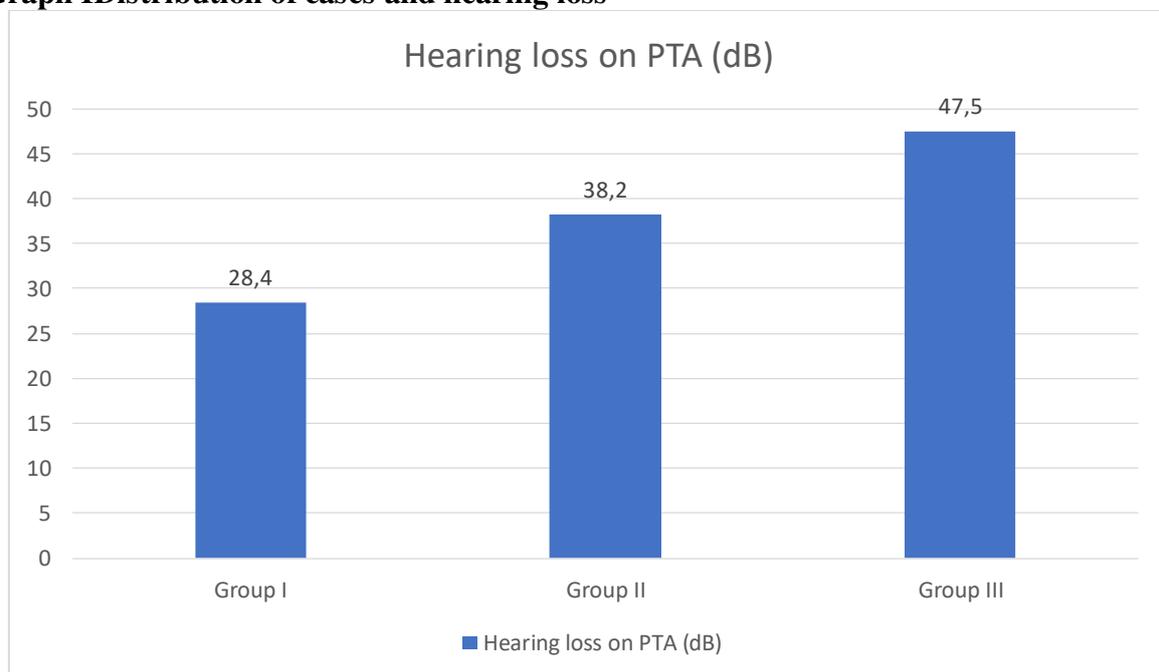
## RESULTS

**Table I Distribution of cases and hearing loss**

| Groups    | Hearing loss on PTA (dB) | P value |
|-----------|--------------------------|---------|
| Group I   | 28.4                     | 0.01    |
| Group II  | 38.2                     |         |
| Group III | 47.5                     |         |

Table I, graph I shows that group I patients had 28.4 dB, group II had 38.2 dB and group III had 47.5 dB hearing loss. The difference was significant (P < 0.05).

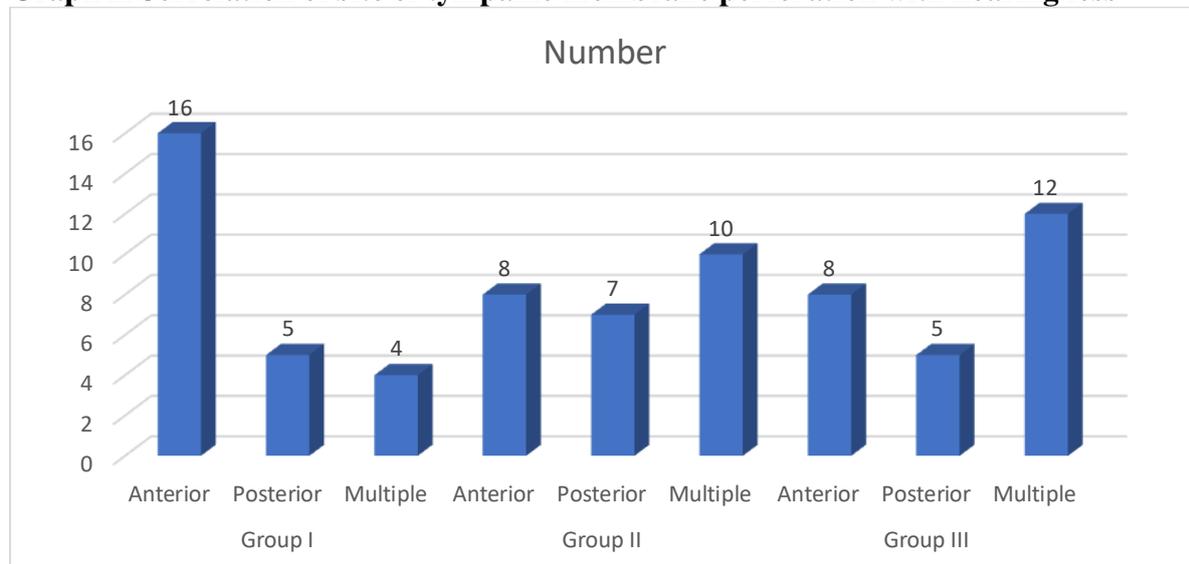
**Graph I Distribution of cases and hearing loss**



**Table II Correlation of site of tympanic membrane perforation with hearing loss**

| Groups    | Site      | Number | P value |
|-----------|-----------|--------|---------|
| Group I   | Anterior  | 16     | 0.01    |
|           | Posterior | 5      |         |
|           | Multiple  | 4      |         |
| Group II  | Anterior  | 8      | 0.05    |
|           | Posterior | 7      |         |
|           | Multiple  | 10     |         |
| Group III | Anterior  | 8      | 0.04    |
|           | Posterior | 5      |         |
|           | Multiple  | 12     |         |

Table II, graph II shows that in group I, anterior site was seen in 16, posterior in 5 and multiple in 4 cases, in group II, anterior in 8, posterior in 7 and multiple in 10 cases and in group III, anterior in 8, posterior in 5 and multiple in 12 cases. The difference was significant ( $P < 0.05$ ).

**Graph II Correlation of site of tympanic membrane perforation with hearing loss**

## DISCUSSION

A perforation on the TM reduces the surface area of the membrane available for sound pressure transmission and allows sound to pass directly into the middle ear. As a result, the pressure gradient between the “inner” and “outer” surfaces of the membrane virtually becomes insignificant. The effectiveness with which the TM transmits motion to the ossicular chain is thus impaired along with the level of hearing.<sup>6</sup> It has been established that, the larger the perforation of the TM, the greater is the decibel loss in sound perception. A total absence of the TM would lead to a loss in the transformer action of the middle ear. The location of the perforation is believed by some schools of thought to have a significant effect on the magnitude of hearing loss.<sup>7</sup> As posterior-quadrant perforations are believed to be worse than the anterior ones because of the direct exposure of the round window to sound waves, perforations at or near the site of TM attachment to manubrium have more severe effects than those of comparable size at different sites. It has been a general view that the hearing loss increases with the size of the perforation, more so if it is in the postero-inferior quadrant.<sup>8</sup> It was found that the maximum average loss occurred at 250 Hz, the loss being less in small

perforations (<2 mm diameter) than in larger ones; less in perforations away from manubrium than those touching the manubrium, and also less in perforations of the antero-inferior quadrant than in those on the postero-inferior quadrant.<sup>9</sup> The present study was conducted to assess the size and site of tympanic membrane perforation and hearing loss.

In present study, group I patients had 28.4 dB, group II had 38.2 dB and group III had 47.5 dB hearing loss. Ibekweet al<sup>10</sup> took 120 patients, 80 males and 40 females. Amongst these 82 patients belonged to the below poverty line (BPL). Low socioeconomic strata. There were 40 patients each belonging to 30-39 years, 40-49 years, 50-59 years age group. The various perforations included 30 small, 35 medium, 40 large, 15 subtotal perforations. Posteroinferior quadrant perforations showed maximum degree of hearing loss. Also larger the size of perforation, the greater was the degree of hearing impairment. The perforations involving the posteroinferior quadrant had a more pronounced hearing impairment compared to anteroinferior perforations. Study showed a greater hearing loss at lower frequencies.

We found that in group I, anterior site was seen in 16, posterior in 5 and multiple in 4 cases, in group II, anterior in 8, posterior in 7 and multiple in 10 cases and in group III, anterior in 8, posterior in 5 and multiple in 12 cases. Vaidya et al<sup>11</sup> in their study a significant relationship was observed between size and site of tympanic membrane perforation with hearing loss. Perforations which were involving all four quadrants (AS + AI + PS + PI) are having maximum residual perforations after the surgery. In relation with size, subtotal perforation were having more residual perforations postoperatively, followed by medium sized perforations. An inherent relationship noted between ossicular involvement and hearing loss, maximum average hearing loss was observed in those cases, where all three ossicles (malleus, incus & stapes) were involved, also more hearing loss was noted in posterior perforations.

Bhusalet al<sup>12</sup> noted that large perforations with 4 quadrant involvements had a hearing loss of 49 dBHL and those in the anterior quadrants had hearing loss of at least 31 dBHL. Ahmed<sup>13</sup> also noted a greater hearing loss in posterior based perforations. He noted a hearing loss of 29 dB and in anterior perforations noted a hearing loss of 18.5.

## CONCLUSION

Authors found that as the size of the perforation increased, hearing loss also increased.

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