



ORIGINAL ARTICLE

## Objective comparison between perforation and hearing loss<sup>☆,☆☆</sup>



Fernando de Andrade Quintanilha Ribeiro<sup>a,\*</sup>, Verônica Reche Rodrigues Gaudino<sup>b</sup>,  
Caio Dinelli Pinheiro<sup>b</sup>, Gil Junqueira Marçal<sup>b</sup>, Edson Ibrahim Mitre<sup>b</sup>

<sup>a</sup> Department of Otorhinolaryngology, Faculty of Medical Sciences, Santa Casa de São Paulo (FCMSCSP), São Paulo, SP, Brazil

<sup>b</sup> Faculty of Medical Sciences, Santa Casa de São Paulo (FCMSCSP), São Paulo, SP, Brazil

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### KEYWORDS

Evaluation;  
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### Abstract

**Introduction:** There appears to be no relationship between the size of tympanic perforations and hearing loss. Some studies in the literature have assessed this connection, with conflicting data and without proper methodology, especially concerning the measurement of the size of the perforation, which was performed in a subjective manner.

**Objective:** To evaluate the size of tympanic perforations and to relate them to hearing loss in four different sound frequencies through the use of an objective method.

**Methods:** Transversal retrospective study. The present study evaluated 187 perforations through digital imaging, calculated the percentages of the tympanic membrane that was perforated using ImageScope software version 11.1.2.760 and correlated perforations' size with hearing loss at four frequencies.

**Results:** Data were statistically analyzed using Pearson's correlation test.

**Conclusion:** There was no significant relationship between the size of tympanic perforations and hearing loss in the four analyzed frequencies.

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<sup>☆☆</sup> Institution: Faculty of Medical Sciences, Santa Casa de São Paulo, São Paulo, SP, Brazil.

\* Corresponding author.

E-mail: [quintanilha.f@uol.com.br](mailto:quintanilha.f@uol.com.br) (F.A.Q. Ribeiro).

**PALAVRAS-CHAVE**

Avaliação;  
Perfuração da  
membrana timpânica;  
Perda auditiva

**Comparação objetiva entre perfuração timpânica e perda auditiva****Resumo**

*Introdução:* Parece não haver relação entre o tamanho das perfurações timpânicas e a perda auditiva. Alguns trabalhos na literatura estudaram esta relação, com dados conflitantes e sem uso adequado da metodologia empregada, principalmente quanto à medição do tamanho da perfuração que se faz de modo subjetivo.

*Objetivo:* Analisar através de um método objetivo o tamanho dessas perfurações e relacioná-las com perdas auditivas em quatro frequências sonoras.

*Método:* Estudo retrospectivo de corte transversal. Foram avaliadas 187 perfurações timpânicas através de digitalização de imagem, medidas porcentualmente com o uso do software *ImageScope Version 11.1.2.760* e correlacionadas com os limiares auditivos em quatro frequências.

*Resultados:* Os dados foram avaliados estatisticamente pelo teste de correlação de Pearson, que não demonstrou correlação entre o tamanho da perfuração timpânica e o grau de perda auditiva.

*Conclusão:* Não há relação significativa entre o tamanho das perfurações timpânicas e as quatro frequências estudadas.

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**Introduction**

This was a longitudinal retrospective cohort study. It is clear that there appears to be no direct relationship between the size of the tympanic membrane in simple chronic otitis media and hearing loss assessed by pure tone audiometry. This suspicion has been studied and evaluated, but by using subjective methods to measure the size of the perforations.<sup>1-5</sup> With the advent of modern computer programs, the percentage of these perforations in relation to the total area of the membrane can be objectively evaluated. These more accurate data can be used to compare more reliably this finding with each audiometry frequency. Few similar studies were retrieved in the literature.<sup>6,7</sup> This study aimed to analyze the correlation between the percentual size of the perforation and hearing loss in four frequencies.

**Methods**

This was a retrospective cohort trial conducted at the Department of Otorhinolaryngology of a medical teaching institution, approved by the Research Ethics Committee under N° 9228. Images of the tympanic membrane were acquired using a 3 mm diameter rigid fiber optic telescope coupled to a digital camera and with computer digital capture.

Only pictures of simple chronic otitis media (dry perforations as sequelae of necrotizing otitis) were selected, with more than six months without otorrhea reported by the patients. Hearing loss in four frequencies (500 Hz, 1 kHz, 2 kHz, and 4 kHz), with any degree of conductive hearing loss, was considered. The audiometries were performed by phonoaudiologists, using the Katz technique.<sup>8</sup>

*ImageScope*, version 11.1.2.760 by Aperio Technologies®, was used. The selected images were evaluated by circumscribing (by tracking with a mouse) the total area of the tympanic membrane, which was then measured by pixel counting (Fig. 1). The same procedure was applied to the area of the perforation. Both measures were transported to an Excel® (Microsoft) spreadsheet. Since the determination of the area of perforation was then calculated as a percentage of the area of the tympanic membrane, there was no distortion because of the angle of view or the proximity of



**Figure 1** Image obtained through circumscription of the tympanic membrane and of its perforation.

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