INTRODUCTION

Tinnitus is a sound perceived in one or both ears even in the absence of a sound stimulus, which directly affects the quality of life of individuals.1–3

The annoyance caused by tinnitus has negative impacts on the life of affected individuals, reducing concentration and sleep and compromising emotional balance and social life. About 20% of patients with tinnitus report significant annoyance associated with major impairment of quality of life.4–6

Several lines of research have been proposed to better understand the auditory pathway in tinnitus patients with normal hearing. One of these lines advocates that changes at central levels of the auditory system, in the efferent pathway, more specifically in the superior olivary complex, are one of the causes of tinnitus in normal-hearing individuals, although the role of the efferent system in the etiology of tinnitus remains unclear.4–6

The otoacoustic emission (OAE) Suppression may be absent in cases of tinnitus, but its association with possible dysfunction in the medial efferent tract has not been confirmed.

There are no studies in the literature establishing a correlation between the level of annoyance reported by tinnitus patients and the OAE suppression test. Therefore, the aim of the present study was to investigate the occurrence of this association.

METHODS AND MATERIALS

This case-control study was approved by the institutional Research Ethics Committee (Protocol No. 453.379).

20 subjects with normal hearing determined by a hearing test and normal results for distortion product otoacoustic emissions (DPOAEs) and transient evoked otoacoustic emissions (TEOAEs) were included in the study (tinnitus group ). A control group was formed, which consisted of 17 subjects with normal hearing and no tinnitus complaints. They were also submitted to the following assessments: anamnesis and evaluation of tinnitus annoyance by the Tinnitus Handicap Inventory (THI) and on the Visual Analog Scale (VAS).

Patients with normal OAE test results were submitted to OAE suppression test. For analysis of the suppression effect, an linear click presented at an intensity of 65 dB NPS was used as the evoking stimulus. The suppressor noise consisted of white tonal noise stimulation at intensity of 60 dB NPS.

The data were analyzed and correlated using the SPSS 21.0 for Windows software. The following analyses were performed: comparison of DPOAEs and TEOAEs and of the suppression effect of TEOAEs between the tinnitus and control groups; analysis of tinnitus annoyance and comparison with the TEOAE suppression test result, and trend analysis (ANOVA). A level of significance of p ≤ 0.05 was adopted.

RESULTS

TEOAE analysis showed higher amplitudes (SIR) in the control group compared to tinnitus group at all frequency bands tested.

No significant differences in the overall suppression effect or in the values according to frequency band were observed between the two groups.

Regarding the discomfort caused by tinnitus and assessed by the THI, 38.2% (n=13) of the participants were classified as having minimal or mild tinnitus and 61.8% (n=21) as having moderate or severe tinnitus. There was no case of catastrophic tinnitus. Analysis of the discomfort caused by tinnitus on a VAS showed mild discomfort in 8.8% (n=3) of the subjects, moderate discomfort in 41.2% (n=14), and severe discomfort in 50% (n=17).

The correlation between the discomfort caused by tinnitus and the level of TEOAE suppression was also analyzed. Among subjects who reported minimal/mild discomfort, 38.5% (n=5) exhibited no suppression effect of TEOAEs. Among subjects with mild/severe tinnitus, 61.9% (n=13) exhibited no suppression effect of TEOAEs. The difference between these two groups was not statistically significant.

Although no significant correlation was found between the discomfort caused by tinnitus and OAE suppression effects, the results were analyzed using tests for homogeneity of variances and trends. As can be seen in Figure 1, the absolute values of the suppression effect decreased with increasing discomfort caused by tinnitus.

DISCUSSION

Alterations in OAEs are more common in individuals with tinnitus compared to those without the symptom. Granjeiro2, studying a group of subjects with tinnitus and normal hearing, observed altered TEOAEs and DPOAEs in 61.8% of this group, while this percentage was 23.9% in the control group. In a similar study, Pagialonga et al9 found altered DPOAE tests in 78% of subjects with tinnitus. The authors emphasized that these findings were more sensitive in detecting outer hair cell dysfunction in individuals with tinnitus than TEOAEs.

The participants in the present study exhibited no changes in the DPOAE and TEOAE tests according to the protocol established in the methods section. Thus, the cochlear mechanism was completely or partly intact in this population.

Although the presence of normal OAEs was used as an inclusion criterion in the present study, the OAE response amplitudes were lower in tinnitus patients than in the control group; however, this difference was not statistically significant in the DPOAE or TEOAE test.

Tinnitus patients exhibited a lower overall suppression effect and suppression according to frequency band of tinnitus subjects. However, the difference between the overall results showed no significant association. The value of OAE suppression tended to decrease as the level of annoyance caused by tinnitus increased. This finding provides further evidence of involvement of the efferent system in the generation of tinnitus.

CONCLUSIONS

The present study suggest that the annoyance caused by tinnitus is not associated with outer hair cell function, and also does not seem to be related to dysfunction of the medial efferent system.

Suppression effects were absent in a considerable proportion of the tinnitus patients studied. However, this finding was also common in control subjects, with no significant difference between groups. The OAE suppression test only evaluates a small part of the efferent system, i.e., the medial olivocochlear system. The present study suggests that, although dysfunction of the medial efferent system is one of the theories accepted as an etiology of tinnitus, the changes found in this system do not seem to be related to the annoyance reported by the patients of this study.

REFERENCES