Short Communication

Sleep Quality Assessment in Patients with Tinnitus

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Abstract

Introduction: The ringing in the ears is defined as the presence of one or more sounds in the ear or the head without having an external corresponding sound stimulus. It has been classified in many ways and lots of studies have investigated the origin of the ringing in the ears, though many hypotheses have yet not been proved. The ringing in the ears has an adverse effect upon the quality of daily life and can be accompanied by discomfort of sleep.

Objective: Evaluate the quality of sleep in patients with the ringing in the ears through the application of specific questionnaires.

Methodology: It's a study of the prospective and observational type, which was developed between August 2013 and August 2014 at the otorhinolaryngology. Care Protocol - Tinnitus Handicap Inventory, Epworth Sleepiness Scale and The Pittsburgh Sleep Quality Index (PSQI) were used in the evaluation. The sample of the group which was studied, constituted 93 patients who complained of ringing in the ear, and 30 patients, without ringing in the ear, who constituted the control group.

Results: The analyses revealed the the worst indices of discomfort of ringing in the ear are associated with the highest measures of the Epworth scale, being Statistically significant (P= 0.008). Besides, the highest values of the Pittsburgh scale correlate with the discomfot of ringing and the worst quality of sleep.

Conclusion: The data obtained from this task prove that, the bigger the discomfort of the ringing, the worse the quality of sleep is.

ABBREVIATIONS

HBDF: Hospital de Base do Distrito Federal; THI: Tinnitus Handicap Inventory; ESSE: Escalade de Sonolência de Epworth; IQSP: Índice de Qualidade do Sono de Pittsburgh; GABA: Ácido gama-aminobutírico; NREM: Movimentos Não Rápidos dos Olhos; SDE: Sonolência diurna excessiva; PSG: Polissonografia; OD: Orelha direita; OE: Orelha esquerda; CPAP: Pressão Positiva Contínua Nasal; IMC: Índice de Massa Corpórea; SPSS: Statistical Product and Service Solutions; ANOVA: Análise de Variância

INTRODUCTION

Tinnitus is an auditory sensation in the absence of any external stimulus [1]. Occasionally, the majority of people go through a transitory sensation of tinnitus, which ceases spontaneously within a few seconds. However, when tinnitus becomes permanent, occurring with higher frequency and longer duration, it can be a cause of deterioration in the quality of life [2].

It’s generally considered a symptom of auditory (peripheral) or neurological (central) origin, with acoustic, attention and emotional components that interact with and influence each other [3,4].

Tinnitus has an adverse effect over the daily quality of life, and many researches have been looking into the origin of tinnitus, even though many of the hypothesis have not been proven yet [2,5].

Many approaches have been developed to evaluate the level of discomfort of tinnitus. The Tinnitus Handicap Inventory (THI) is a validated questionnaire and it is broadly utilized to evaluate the impact of tinnitus in the daily life of the patient [6].

Tinnitus can also be accompanied of sleep disorders with high impact on the perception of noises [7,8].

Sleep disorders are the second most frequent comorbidity among tinnitus patients. Insomnia and tinnitus have a tendency to intensify each other, and it's not uncommon for successful tinnitus therapies to improve insomnia [9].
There are methods for the evaluation of sleep and, among them, subjective and objective instruments. The Epworth Sleepiness Scale (ESS) is a subjective method used largely to evaluate excessive diurnal sleepiness. It is a self-applicable questionnaire that checks the probability of falling asleep in eight situations involving daily activities, some of which are known to be highly soporific[10-12]. Another tool is the Pittsburgh Sleep Quality Index (PSQI), from 1989, which received wide acceptance, with good reliability and validity to measure the quality of sleep [13-15]. The following study was developed taking into consideration the great prevalence of sleep disorders on individuals with tinnitus, which has a big impact in their lives. With that in mind, this study evaluated patients with complaints of tinnitus and sleep quality, through validated scales, with the objective of verifying the correlations between these scales and the hypothesis that tinnitus might have a negative impact on sleep.

**MATERIALS AND METHODS**

**Delimitation**

It’s a type of cross-sectional, non-interventional study, accomplished in the Otorhinolaryngology Department of Distrito Federal’s Hospital de Base (HDBF), from August, 2013 to November, 2014. The study was approved by the Comitê de Ética e Pesquisa da FEPECS (protocol number: 40738914.6.0000.5553). The treated patients sign an informed consent form in order to participate in the study. An otorhinolaryngological appointment took place, followed by the application of a treatment protocol and the Tinnitus Handicap Inventory, Epworth Sleepiness Scale and Pittsburgh Sleep Quality Index questionnaires.

The sample size of the study group was of 93 patients with complaints of tinnitus, and a control group with 30 patients that had no complaints.

**Inclusion criteria**

Patients with complaints of tinnitus lasting over six months, of both genders, with or without hearing loss, and between twenty and sixty years old.

**Exclusion criteria**

Patients under psychotropic medication, CPAP (Continuous Positive Airway Pressure), with neurological or muscular diagnosed diseases, past surgeries on the facial skeleton, BMI (Body Mass Index) over 30, waist circumference above 102cm (40.1in) on males and 88cm (34.6in) on females, patients with age under twenty or over sixty, clinical symptoms of nasal obstruction, night-shift workers, patients with Mallampati classes 3 and 4, and amygdalectomy hypotrophy of 3rd and 4th degrees, following the Brodsky scale.

**Statistical analysis of data**

Statistical analysis was performed using IBM SPSS (Statistical Product and Service Solutions) Statistics, version 21.0. We used the chi-square test to determine differences between the patient groups with and without tinnitus for race variables, gender, education and audiometry results. The Student’s t test was used to compare the mean age of patients between the study and control groups.

We calculated the Pearson correlation coefficient between the THI variables, the scale of Pittsburgh, the Epworth Sleepiness Scale and age globally, separated by case and control group. The THI scale was classified into five categories, ranging from “negligible” to “catastrophic”. The average values of Pittsburgh and Epworth between these five categories were calculated and tested by analysis of variance (ANOVA). In all statistical tests, it adopted the significance level P value less than 0.05, or P-value <0.05

**RESULTS**

The majority of patients were female, both in the study group (66.7%) and the control group (60%), with no discernible difference (P > 0.50). As for the ages, we found a similar average age in both groups, of 40 years old in the study group and 36.2 years old in the control group, thus statistically irrelevant (P > 0.07).

Regarding their background, the most commonly reported symptom by patients with tinnitus was the headache, corresponding to 30.1%. Around 87% of the patients of the study group presented no changes relevant to the physical exam, and only 7% had any kind of perforation of the tympanic membrane.

As for the audiometric findings, 82.8% of the study group patients possess altered exams, considering the presence of at least three frequencies above 25dB, while the other 17.2% presented regular results.

In relation to the tinnitus characteristics, the average existence of the symptom was of 5.7 years, being described as a wheezing sound by 36.6% of them, followed by cricket (19.4%) and cicada (16.1%) sounds. The tinnitus fluctuates in volume in 88.2% of the patients. It is considered a constant sound by 55.9% and intermittent by 44.1% of them. As for the appearance of the symptom, 79.6% noticed it gradually and 20.4% abruptly. Worsening factors were reported, such as noise (14%) and the nocturnal period (14%). The other worsening factors, such as anxiety, prolonged fasting, alcohol, smoking, etc., had less relevant percentages. 49.5% of the patients did not present any factor that could improve tinnitus and 16% said it had gotten better with the use of some kind of medicine.

The majority of patients (49.5%) presented bilateral tinnitus, 16.1% found it in the right ear and 9.7% in the left ear.

The resulting values, following the Tinnitus Handicap Inventory, are identified in Figure (1), and we can see that most of them have moderate tinnitus (28%), followed by the acute (24.7%) and catastrophic (21.5%) levels.

In the study group, for the Pittsburgh Index, 67 (72%) presented altered scores (above 5) and, for the Epworth Scale, 29% of the patients had altered results (above 10). As for the control group, 5 (16%) showed altered results in the Epworth Scale and 12 (40%) in the Pittsburgh Scale (Figure 2).

The end result of the study was obtained after calculation the averages of each scale, which were then compared between themselves. The correlation between tinnitus discomfort (THI) and a bad quality of sleep, with P= 0.008 for the Epworth Scale and P = 0.05 for the Pittsburgh Index showed correlation, with statistically relevant results.
The presented graphics are better understood to visualize the following charts. The values of each scale are presented as averages, and then were correlated with each other.

**DISCUSSION**

Tinnitus is an instigating symptom, because many of the fundamental questions regarding its occurrence have yet to be fully answered, as well as exerting a primordial impact on the quality of life of those who have it.

Sleep is a complex physiological state that requires a complete cerebral integration. Sleep deprivation compromises the performance on cognitive tasks involving memory, learning, logical thinking, arithmetic calculations, pattern recognition, complex verbal processing and decision-making.

So far, it is not known at which level of intensity tinnitus starts interfering on sleep, and what mechanisms are responsible for this interference. Thus, this study wanted to verify the influence of tinnitus over the quality of sleep of the selected patients. For that, 93 individuals with tinnitus were evaluated and compared to a control group composed of 30 patients without tinnitus.

There is no consensus between authors over the occurrence of tinnitus related to gender. Either way, women are more likely to report the symptom and complain about a more severe discomfort. Even so, Axelsson and Ringdah reported a bigger occurrence of tinnitus in males.

In this study, 62 patients (66.7%) were female and 31 (33.3%) were male. The control group was composed of 18 female patients (60%) and 12 male patients (40%). This gender distribution showed greater prevalence for women, perhaps due to the higher demand of women in regards of health services to treat their complaints, though there was no significance.

The average age was of 40 years old on the study group and 36.2 years old on the control group, with a variation between 20 and 60 years old in both groups. Studies described by Gonçalves at. al, (2005) and Gonçalves et. al (2006) [16] say that, regardless of the variation of the age of incidence, it is possible to see that the incidence of tinnitus is higher in individuals over fifty years old.
In regards to the results of the audiometry, 82.8% had altered exams, considering the presence of at least three frequencies over 25 dB. The other 17.2% had normal results. The relationship between tinnitus and hearing loss has already been well described and, following different reports, 85 to 96% of patients with tinnitus show some degree of hearing loss, and only 8 to 10% have normal audiometry. This shows that the audiometry data found in this study is consistent with the data of current literature [17].

Evaluating the Tinnitus Handicap Inventory scale, we can observe that the patients classify their tinnitus as moderate (28%), acute (24.7%) or catastrophic (21.5%), totaling 74.2%. The minority have negligible (11.8%) or light (14%) tinnitus.

Classical studies of Axelsson and Ringdahl (20) relate a prevalence of tinnitus as frequent or constant in 15% of the population, and a bigger appearance on the left ear, though there is no consensus regarding the unilateral localization of the affected ear. 2.4% of patients with tinnitus have acute tinnitus, which significantly compromises quality of life. As for the descriptive characteristics of tinnitus, 52% report a bilateral localization, 10% in the head, and less than 1% outside it.

Taking under consideration the data exposed above related to the characteristic of tinnitus, the data collected on the treatment protocol showed some similarities as well as differences. 55.9% described it as a constant sound, 49.5% as bilateral and only 9.7% said that it’s located in the left ear. As for the severity, a considerable amount described it as moderate (28%), acute (24.7%) or catastrophic (21.5%), perhaps due to the fact that the majority of patients with more intense levels of tinnitus looked for treatment, and also due to it being a clinic of excellence when it comes to otological complaints.

In the study group, 70% reported a sudden appearance, 52% described it as fluctuating in intensity and 80% with constant frequency.

Finally, we evaluated the correlation between the discomfort of tinnitus and the scales of quality of sleep, as can be seen in Figures (3,4). The analyses revealed that the higher the scale of severity of the tinnitus, the bigger the average numbers on the Epworth Scale, with an statistical significance (P = 0.008). The same thing occurred in the Pittsburgh Index, in which the higher values also correlated to the tinnitus, from the light level, considering it also presented statistical significance (P = 0.05).

Great importance can be given to the fact that two sleep evaluation scales were used, Epworth and Pittsburgh, and that both are well known and validated and in the scientific community. It’s worth remembering that, in the majority of studies, only one scale is chosen to present their correlations.

Another relevant aspect for the study is that this as a prospective study that tried, in a simple way, to collect data through questionnaires applied during the treatment of patients. Should this tinnitus complaint be reported during the consultation and if the patient fulfilled the inclusion criteria, he/she was then invited to answer the questionnaires.

Though there are many studies evaluating tinnitus and its probable interferences in the quality of life, there was no study that correlated the presented scales – Tinnitus Handicap Inventory, Epworth and Pittsburgh.

CONCLUSION

The study showed correlation between tinnitus discomfort and quality of sleep, evaluated through the THI, Epworth and Pittsburgh questionnaires.

There, we can conclude that the bigger the tinnitus discomfort, the worse the quality of sleep in patients, which could lead to a reduced quality of life. Confronted with that, we reinforce the importance of the inclusion of sleep evaluation instruments to identify sleep disturbances in the diagnostic process and treatment of tinnitus patients.

REFERENCES


