

Prospective evaluation of relaxation exercises and sound masking therapy in tinnitus patients

Tinnitus hastalarında gevşeme egzersizlerinin ve maskeleme tedavisinin prospektif değerlendirilmesi

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Abstract

Aim: Prospective evaluation of relaxation exercises and masking in tinnitus patients.

Materials and Methods: Thirty-two patients with a mean age of 54.69 ± 12.68 years who consulted the otolaryngology clinic with chronic tinnitus were included. Patients were randomized into four groups as: 1) Tinnitus masker device and relaxation exercises given, 2) Only tinnitus masker given, 3) Only relaxation exercises given and 4) Neither relaxation exercises implemented nor tinnitus masker given (control group). For the interventions, the Turkish Psychological Association Relaxation Exercises CD and tinnitus masker device were used. Tinnitus Reaction Questionnaire (TRQ), Tinnitus Handicap Questionnaire (THQ), Case Report Form, and Tinnitus / Hyperacusis Initial Assessment Forms were used for evaluation and follow-up. Patients were evaluated at the beginning and at the end of three months.

Results: TRQ scores of groups 1-4 at the beginning of the study were 37.38 ± 19.81 , 21.00 ± 21.82 , 27.25 ± 13.12 and 35.25 ± 24.51 respectively. Mean TRQ scores of groups 1-4 at the third month were 21.50 ± 16.00 , 17.25 ± 17.80 , 37.88 ± 16.18 and 52.13 ± 10.29 respectively. Mean THQ scores of groups 1-4 at the beginning of the study were 979.38 ± 685.79 , 643.5 ± 383.47 , 838.75 ± 530.42 and 1375 ± 652.95 respectively. Mean THQ scores of groups 1-4 at the third month were 741.88 ± 635.24 , 622.75 ± 344 , 1208.13 ± 623.21 and 1958.75 ± 667.46 respectively. A statistically significant difference was found between the THQ-beginning and THQ-end scores of group 1 only.

Conclusion: Using masker device with relaxation exercises significantly reduces the distress and annoyance caused by tinnitus.

Keywords: Tinnitus, relaxation exercises, masking, tinnitus handicap questionnaire.

Öz

Amaç: Tinnitus hastalarında gevşeme egzersizlerinin ve maskeleme tedavisinin prospektif olarak değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntem: Çalışmaya kulak burun boğaz kliniğine konsülte edilen ve ortalama yaşı 54.69 ± 12.68 yıl olan 32 kronik tinnitus hastası alındı. Hastalar randomizasyonla dört gruba ayrılmış olup bunlar sırasıyla: 1) Tinnitus maskeleme cihazı ve gevşeme egzersizleri verilen, 2) Sadece tinnitus maskeleme cihazı verilen, 3) Sadece gevşeme egzersizleri verilen ve 4) Tinnitus maskeleme veya gevşeme egzersizleri verilmeyen (kontrol grubu) hastalardan oluşmaktaydı. Girişimde Türk Psikoloji Derneği gevşeme egzersizleri CD'si ve tinnitus maskeleme cihazı kullanıldı. Hastaların değerlendirilmesinde ve takibinde Tinnitus reaksiyon anketi (TRQ-Tinnitus Reaction Questionnaire), tinnitus handicap anketi (THQ-Tinnitus Handicap Questionnaire), olgu takip formu ve tinnitus/hiperakuzi ilk değerlendirme formundan yararlanıldı. Hastalar ilk başvuruda ve üçüncü ayın sonunda değerlendirildi.

Bulgular: Grup 1-4'teki hastalarında çalışma başındaki TRQ skorları sırasıyla 37.38 ± 19.81 , 21 ± 21.82 , 27.25 ± 13.12 ve 35.25 ± 24.51 ; Grup 1-4'teki hastaların üçüncü ayın sonundaki TRQ skorları sırasıyla 21.5 ± 16 , 17.25 ± 17.8 , 37.88 ± 16.18 ve 52.13 ± 10.29 ; Grup 1-4'teki hastaların üçüncü ayın sonundaki THQ skorları sırasıyla 979.38 ± 685.79 , 643.5 ± 383.47 , 838.75 ± 530.42 ve 1375 ± 652.95 ; Grup 1-4'teki hastaların üçüncü ayın sonundaki THQ skorları ise sırasıyla 741.88 ± 635.24 , 622.75 ± 344 , 1208.13 ± 623.21 ve 1958.75 ± 667.46 olarak bulundu. Sadece Grup 1'in başlangıç ve üçüncü ay sonu THQ skorları arasında istatistiksel anlamlı fark saptandı.

Sonuç: Maskeleme cihazıyla birlikte gevşeme egzersizlerinin uygulanması tinnitusun neden olduğu rahatsızlığı anlamlı olarak azaltmaktadır.

Anahtar Sözcükler: Tinnitus, gevşeme egzersizleri, tinnitus, maskeleme, tinnitus handicap anketi.

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Introduction

Tinnitus is defined as the perception of sound without an external acoustic stimulation (1,2). The sound perceived can vary from simple sounds like whistling, sound of a waterfall, humming to complex sounds such as music. Tinnitus is seen in 10-15% of the population while tinnitus is enough to cause discomfort in 2% of the population (3). The incidence of tinnitus increases with age. In a study conducted by Brown et al, the incidence of tinnitus was 4.5% in the US population and the incidence of tinnitus increased three fold to 12.3% over the age of 55 compared to individuals less than 55 years (4).

Virtually any type of pathology involving or arising from the outer, middle, inner ear or the auditory nerve may be associated with tinnitus (1). However, it is possible to have severe tinnitus without an evidence of any otologic disease. On the contrary, tinnitus can even exist with the surgical removal of peripheral auditory system (5). This points the importance of the central auditory pathways and system regardless of a trigger. There are many specific diseases and conditions associated with tinnitus symptoms (1).

There are several theories regarding pathophysiological changes in the auditory system that can cause tinnitus. Damage to the outer hair cells, pathological processes impacting receptor potentials of the inner hair cells, problems in calcium channels within the cochlea and disturbance in cochlear neurotransmission as a result of noise exposure or ototoxic drugs are among them (1). According to the neurophysiological model, it is proposed that tinnitus is a result of the processing of a signal generated in the auditory system at a subcortical level (6). The tinnitus is processed firstly at the limbic system level. If the signal causing tinnitus is deemed to be disturbing, stimulation of the autonomic nervous system is going to cause symptoms of anxiety and stress. This will build a vicious cycle with perception of tinnitus sounding louder and louder creating further annoyance.

The aim of tinnitus treatment is the complete elimination of tinnitus, if this is not possible lowering the disturbance caused by tinnitus (7). Various treatment protocols have been proposed in the management of tinnitus. Pharmacological therapies include steroids, vasodilators, benzodiazepines, lidocaine, antidepressants and Ginkgo biloba (8). But there is no licensed drug available in Europe or North America for the treatment of spontaneous idiopathic tinnitus. Other treatment options are masking therapy, cognitive behavioral therapy, tinnitus retraining therapy, transcranial magnetic stimulation, music therapy, hypnotherapy, hyperbaric oxygen therapy and acupuncture (9,10).

Prolonged symptoms of stress and tinnitus were found

to be related with each other. It is not always clear whether stress causes the onset of tinnitus but commonly tinnitus has a tendency to begin at times of high stress levels. It is also common for existing tinnitus to become worse during periods of high stress and anxiety. Relaxation therapy in conjunction with or without masking therapy can be used in tinnitus therapy to cope with stress and anxiety related to tinnitus (9).

The aim of this study was to assess the therapeutic effect of relaxation exercises with and without masking in tinnitus patients. This is the first study to evaluate the effectiveness of tinnitus masking and relaxation exercises as a combined treatment.

Materials and Methods

This study was carried out at a tertiary referral hospital between May and October 2013 and in concordance with international ethical standards and World Health Organisation's Helsinki Declaration. It was approved by the institutional review board (IRB approval number: B.30.2.EGE.0.20.05.00/OY/871/351). Informed consent was obtained from all of the subjects.

Patient Selection

Thirty-two patients (mean age 54.69±12.68 years, range 27-70, 17 male, 15 female) who had a complaint of tinnitus at least for 3 months and had received no treatment other than pharmacotherapy were included in the study. Pharmacotherapy was discontinued at least one month before the study. They were tested with the routine audiological test battery and retrocochlear pathology was eliminated with magnetic resonance imaging (MRI). Patients with a Tinnitus Reaction Questionnaire (TRQ) test result over 60 points, having a history of chronic otitis media, otologic surgery, severe and profound hearing loss, Meniere's disease, neuropsychiatric disease, otosclerosis, a condition known to cause objective tinnitus, vestibular schwannoma and anatomic malformation of the external or middle ear were excluded from the study.

Procedure and Instrumentation

Pure tone audiometry was obtained for both ears and the average thresholds of 500, 1000, 2000 and 4000 Hz frequencies were calculated. In order to determine if the patients were psychologically affected before the treatment, patients were evaluated with TRQ test developed by Wilson et al (11). TRQ investigates psychosomatic perception related to tinnitus. The questionnaire consists of twenty-six questions, each question scored as 0-4 points. Patients with test scores over 60 points were evaluated with significant stress and consulted to the psychiatry clinic (12).

Patients were prospectively evaluated with tinnitus reaction questionnaire (TRQ), tinnitus handicap questionnaire (THQ), case report form, and tinnitus/hyperacusis initial assessment form. Audiological

evaluation was carried out with Interacoustic AC40 clinical audiometer (Interacoustics AS, Denmark).

THQ consists of 27 questions on the effects of tinnitus on hearing, lifestyle, general health and emotional state. Each question is scored between 0-100 points and the maximum achievable score is 2700 points. Validity and reliability study of the Turkish version of THQ was done by Aksoy et al. from Hacettepe University (13).

The interventions consisted of a Relaxation Exercises CD and tinnitus masking device. The Relaxation Exercises CD was prepared by the Turkish Psychological Association with the aim of preventing harmful effects of stress and stress-related disorders. The CD is composed of three parts. The first part is 10 minutes long and information about deep relaxation and the aspects on which attention should be given during the exercises is presented. The second part is 30 minutes long and presents relaxation exercises with verbal and visual instructions. The third part is also 30 minutes long and only consists of relaxation music. The patients were asked to apply the CD twice daily on a regular basis, in a comfortable environment.

Earnet Nano (Ear-Teknik Hearing Aids, Istanbul, Turkey) tinnitus masking device and Earfit version 1.0.83.2 software were used in the study. Tinnitus was masked with white noise and the masking level was achieved with increases of 5 dB. Minimal masking level was defined by the answers given by the subjects.

Patients were divided into four groups and randomised consecutively. Group 1: Tinnitus masking device has been applied, and relaxation exercises given. Group 2: Tinnitus masking device applied, relaxation exercises not given. Group 3: Relaxation exercises performed, tinnitus masking device not given. Group 4: Relaxation exercises not implemented, tinnitus masking device not given (control group). All of the subjects were evaluated at the beginning and at the end of the third month with the afore-mentioned tests and questionnaires.

Outcome Measures

Mean TRQ scores were measured at the beginning of the study (TRQ-BEG) and at the end of the third month (TRQ-END).

Statistical Analysis

Statistical analysis was made using computer software (SPSS version 17.0, SPSS Inc. Chicago, IL, USA). Chi-square (X^2) exact tests were used for the comparison of categorical data while the Wilcoxon test was used for the analysis of non-parametric variables based on the distribution pattern of the data. Correlation analysis was performed via Spearman or Pearson correlation analysis depending on the type of variable. Data were presented as mean±standard deviation (SD). $p < 0.05$ was considered statistically significant.

Results

Mean pure tone thresholds of groups 1,2,3 and 4 for right ear was 18.75 ± 13.42 , 33.38 ± 15.17 , 33.25 ± 23.41 and 41 ± 34.6 dB respectively. Mean pure tone thresholds of groups 1,2,3 and 4 for the left ear was 21.75 ± 10.62 , 37.25 ± 12.38 , 32 ± 23.11 and 32 ± 25.11 dB respectively. Mean TRQ scores of groups 1-4 at the beginning of the study were 37.38 ± 19.81 , 21.00 ± 21.82 , 27.25 ± 13.12 and 35.25 ± 24.51 respectively. Mean TRQ scores of groups 1-4 at the third month were 21.50 ± 16.00 , 17.25 ± 17.80 , 37.88 ± 16.18 and 52.13 ± 10.29 respectively (Figure-1). Mean THQ scores of groups 1-4 at the beginning of the study were 979.38 ± 685.79 , 643.5 ± 383.47 , 838.75 ± 530.42 and 1375 ± 652.95 respectively. Mean THQ scores of groups 1-4 at the third month were 741.88 ± 635.24 , 622.75 ± 344 , 1208.13 ± 623.21 and 1958.75 ± 667.46 respectively (Figure-2). A statistically significant difference ($p < 0.05$) was found between THQ-BEG and THQ-END scores of group 1 only.

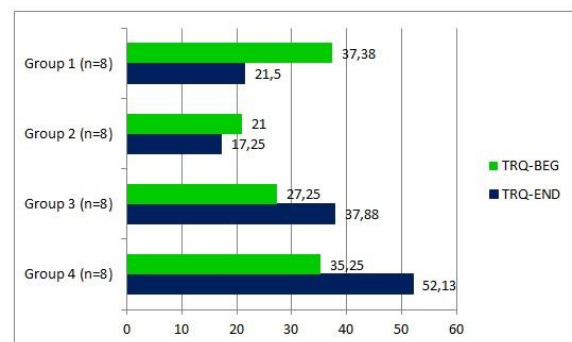


Figure-1. TRQ score averages. TRQ (Tinnitus Reaction Questionnaire), TRQ-BEG=TRQ scores at the beginning of the study, TRQ-END=TRQ scores at the end of 3rd month.

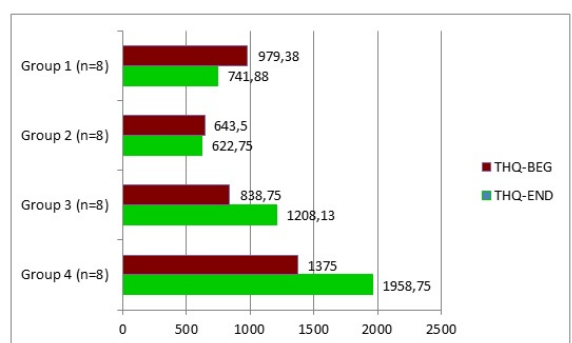


Figure-2. THQ score averages. THQ (Tinnitus Handicap Questionnaire), THQ-BEG=THQ scores at the beginning of the study, THQ-END=THQ score at the end of 3rd month.

Discussion

Most tinnitus patients can cope with their disease. Tinnitus can have negative consequences on the quality of life and may restrict daily activities in a small portion of the patients. The effect of tinnitus on a patient's life varies according to the quality of the tinnitus such as the

severity, frequency and negative psychological effects of tinnitus. Psychological disorders such as anxiety, depression, nervousness and sleep disturbances frequently accompany patients with tinnitus.

Gender and prevalence of tinnitus were found to be related in a study conducted by Heller AJ (14). According to Hazell et al the prevalence of tinnitus was found to be equal among women and men. In another series by Stouffer and Tyler, the prevalence of tinnitus was 44% in males and 49% in females (15). In our study 15 of the patients (46.9%) were female and 17 of the patients (53.1%) were male.

Stress is one of the most important reasons of tinnitus and it was stated that reducing stress levels could help tinnitus patients with their complaints (16). Davies et al. (17) found that relaxation exercises significantly lowered annoyance ratings at one month follow-up despite having no significant changes in the loudness of tinnitus. In a recent study muscle relaxation therapies were found to significantly reduce both short and long-term tinnitus related distress (18). When the TRQ and THQ scores of patients that carried out only relaxation exercises were interpreted, no statistically significant difference was found among them. Because relaxation exercises had to be done in a quiet and comfortable place in order to achieve maximum efficiency, either the patients did not apply the exercises regularly at home or the environment where the exercises were done was not comfortable and quiet. Every patient has his or her own exercise place and this shows a huge variability. Further studies with

larger patient groups and a more standardized exercise setting are warranted.

Tinnitus can be masked in up to 90% of tinnitus patients (19). In a systematic review it was shown that studies failed to show strong evidence of the efficacy of sound therapy in the management of tinnitus (20). However they concluded that the absence of conclusive evidence should not imply a lack of effectiveness (20). In our study masking therapy showed improvements in TRQ and THQ scores in both of the masking groups. This improvement reached statistical significance in only group 1. The effect of masking and relaxation exercises could be better evaluated with larger sample sizes. It is thought that the combination of masking therapy and relaxation exercises in the management of tinnitus is a more effective treatment option in the management of chronic tinnitus.

Conclusion

In our study it is suggested that using tinnitus masking device together with relaxation exercises is associated with significantly better test scores and lowers the distress and annoyance caused by tinnitus. This combined treatment changes perception of tinnitus by lowering distress levels. Further studies are warranted with larger patient groups and longer duration of follow-up.

Conflict of Interest and Financial Disclosure: Authors of this study have no conflict of interest and financial disclosure to declare.

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