

Effects of tinnitus masking therapy in tinnitus patients with and without hearing loss

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Abstract

Aim: The aim of the study is to determine the effects of tinnitus masking therapy on patients with and without hearing loss.

Material and Methods: This study includes a total 34 of patients with tinnitus, between 27 and 70 years of age, 16 of whom with and 18 of whom without hearing loss. The patients with and above 25 dB were added to the group without hearing loss and those below 25 dB to the group with hearing loss. The patients had one session each day. Previously determined and appropriate for tinnitus mapping, sound was made to be listened through TDH 39-P model earphones for 30 minutes during the therapy. Before and after the ten-sessions therapies, the effects of masking therapy on the patients were assessed through Tinnitus Handicap Inventory.

Result: Tinnitus Handicap Inventory scores were found significantly low in patients with and without hearing loss after tinnitus masking therapy ($p = 0.026$ and $p = 0.023$). And, in comparison made between the groups, Tinnitus Handicap Inventory scores before and after tinnitus masking therapy were found to be similar ($p < 0.05$).

Conclusion: Both groups benefited from masking therapy at similar levels. Tinnitus masking therapy is effective on both patients with and without hearing loss. The success of masking therapy is related to proper patient selection. Regular follow-up is essential.

Keywords: Tinnitus; Tinnitus Masking Therapy; Hearing Loss; Audiometry.

INTRODUCTION

Tinnitus can be described as a sensation of sound without any external or electrical stimulus (1). Tinnitus is not a disease, it is a symptom. We encountered by commonly hearing loss, noise trauma, presbycusis, administration of ototoxic drugs, abnormal changes to the auditory nerve, ear infections, disease of the heart or blood vessels, Meniere's disease, tumors, auditory neuropathy, but more common cause is emotional factors and stress (2). Generally cause of tinnitus is idiopathic (3).

Lack of cause of tinnitus mechanism makes it difficult to assess, treat and manage (3). Medical treatment, tinnitus masking therapy (TMT), tinnitus retraining therapy (TRT), laser, transcutaneous electrical stimulation (TENS), surgery, tinnitus breakers are still used for tinnitus treatment and management (4-7). TMT is gaining acceptances in recent days. It has no side effect and is easy to apply (8).

The aim of the study is to determine the effect of tinnitus masking therapy on the patients with and without hearing loss. With this study, it is aimed to assess which patient group benefit from tinnitus masking therapy more.

MATERIAL and METHODS

Ethics committee approval's date is 25.04.2017, number: 24 at Mustafa Kemal University Ethics Committee. We received informed consent to all participants.

This study includes in total 34 patients with tinnitus, between 27 and 70 ages, 16 of whom with and 18 of whom without hearing loss. The ages of the patients with hearing loss is 49.06 ± 10.32 (average \pm SD); of those without hearing loss is 52.55 ± 14.83 (average \pm SD). The hearing thresholds of the patients were determined applying 125-8000 Hz frequency-range hearing test. The patients with and above 25 db were added to the group without hearing loss and those below 25 db to the group with hearing loss. The patients under any other treatments such as TRT, medical, melatonin, Tens, Laser etc. were excluded.

Tinnitus mapping was assessed by measuring the frequency and intensity of tinnitus patients. Each patient, according to their own mappings, underwent ten-session tinnitus masking therapy in quiet and dark cabins. The patients got one session every day. Previously determined and appropriate for tinnitus mapping, sound was made

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to be listened through TDH 39-P model earphones for 30 minutes during the therapy. Before and after the ten-session therapy, the effect of masking therapy on the patients was assessed through Tinnitus Handicap Inventory (THI).

Statistically Analysis

Statistical analyses were conducted with IBM SPSS software version 20.0 (IBM Corp., Armonk, NY, USA). Data were expressed as mean \pm standard deviation (SD). After checking normal distribution with the Shapiro-Wilk test, independent t-test was used to compare the baseline parameters between the groups. Paired t-tests were used to compare before and after treatment values where appropriate. The results were for those who completed treatment. Statistical significance was accepted as $p < 0.05$.

RESULTS

When compared, two groups were similar on the grounds of their age and sex (gender) ($p < 0.05$). Within group compare, THI scores were found significantly low in patients with and without hearing loss after TMT treatment ($p = 0.026$ and $p = 0.023$). And, in compare between groups, THI scores before and after TMT were found to be similar ($p < 0.05$) (Table 1).

Table 1. Demographic and clinical findings tinnitus patients with or without hearing loss

	'Hearing loss'		p values
	with (n=16)	without (n=18)	
THI			
Before treatment	57.62 \pm 19.58	66.55 \pm 23.64	0.243
After treatment	42.37 \pm 22.53	51.77 \pm 26.88	0.281
p values	0.026	0.023	
Age, y	49.06 \pm 10.82	52.55 \pm 14.83	0.661
Sex (M/F)	9/7	9/9	0.744

THI=Tinnitus handicap inventory.
Bold p values, statistically significance

DISCUSSION

Lack of cause of tinnitus mechanism makes it difficult to assess, treat and manage (3). Medical treatment, TMT, TRT, laser, TENS, surgery, tinnitus breakers are still used for tinnitus treatment and management (4-7). We found that TMT is a treatment method in all tinnitus patients either with normal hearing or sensorineural hearing loss.

Ogut et al. said that the success rates, cost-effectiveness and absence of side effects makes TMT first choice treatment method in all tinnitus patients either with normal hearing or sensorineural hearing loss (8).

TRT is applied firstly by Pawel Jastreboff in 1990 (9). Tinnitus is taken as an otonomic and limbic problem in this approach. Aim of TRT is habituating tinnitus. It has two strategies. First strategy is breaking up tinnitus fear by consulting. Second strategy is breaking up tinnitus with sound therapy (1-4).

Shell Drake et al. provided positive 83.7% improvement with TRT (10). Similarly Skarzynski et al. applied TRT 1000 tinnitus patients during 18-24 months. They achieved 80% recovery (11). Herraiz et al. found a relief rate of 80% in patients undergoing TRT (12).

Hazell et al. reported a minor difference in moderate tinnitus, comparing TRT and TMT. Both of them provide similar success, and have similar advantages because they are easy to conduct and cost-effective. TMT is more popular nowadays, because it is a noninvasive and cost-effective method for breaking tinnitus (13).

There are researches that local anesthetics agents injection with IV (intravenous injection) methods for example lidocaine and procaine provide partial or complete recovery (7-11).

Local anesthetics may be valuable because they decrease cochlear activity. Local anesthetics effects on tinnitus breaking is found by Barany in 1935. When the doctor did concha infiltration with procaine, in being tinnitus broken (3).

Local anesthetics can cause decrement in cochlear activity and effect neural conducting positively. Because of these reasons local anesthetics is useful for tinnitus patients. Using tinnitus treatment IV lidocaine effect time is short, transient and depend on dose. So using high dose is not offered. Effective plasma concentration is approximately 1.5-2.5 $\mu\text{g/ml}$ more plasma concentration than cause this side effects (dizziness, imbalance, parasthesia at tongue, speech problems) (3).

In addition to these approaches, TENS increases dorsal cochlear nucleus activation and inhibition task of this nucleus on central nervous system. TENS is applied C2 level. Therefore TENS stimulates facial and trigeminal nerves, dorsal cochlear nucleus and inferior colliculus one by one. This stimulation causes tinnitus inhibition. It applied 25-30 minutes in a day. It used 1000-1000 Hz frequency, continuous or module. Even if tinnitus is unilateral, TENS must be applied bilateral (3).

Steenerson et al. applied TENS to 500 tinnitus patients. They had a successful result. Tinnitus decreased at the rate of 53% (3).

Low power laser is applied to ear. It is stimulated tympanic membrane, malleus, incus, stapes, round window and promontorium one by one. But there is no standard methods for applying laser to decrease the tinnitus. There is not a treatment protocol for low power laser.

Low power laser stimulates mitochondria without any damage. It reduces compound action potential of the nerve indirectly. Thus, it has been postulated that low power laser might lessen tinnitus by suppressing the abnormal excitation of the 8. th nerve or the organ of Corti (3).

CONCLUSION

There are a lot of etiologies for tinnitus and etiology is

unclear. Because of this there is no certain treatment methods for tinnitus. TMT treatment is effective on both patients with and without hearing loss. Both groups benefited from masking therapy at similar levels. TMT is effective treatment methods for tinnitus patients. The success of masking therapy is related to proper patient selection.

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