

A New Cure with a Mixed Solution for the Treatment of Sensorineural Hearing Loss: Prospective Clinical Study

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Background: Sensorineural hearing loss (SNHL) is commonly seen worldwide and affects the quality life of people. In this study, we aimed to decrease the degree of hearing the loss in patients with SNHL. We also wanted to reduce the treatment cost and duration of the disease.

Materials and Methods: Newly diagnosed 30 patients with sensorineural hearing loss were included in the study. We applied a new solution to all patients for treatment. Before and after the treatment, the patients were asked about tinnitus. Also, PTA (pure tone audiometry) and SDS (speech discrimination score) were performed to all patients. We compared pre and post-treatment audiological findings and tinnitus of the patients.

Results: Post-treatment PTA values of the patients' right and left ears were significantly lower than pre-treatment ones ($p < 0.05$). Post-treatment SDS scores of the patients' right and left ears were higher than pre-treatment ones ($p < 0.05$). The rate of patients with tinnitus was significantly lower after treatment ($p < 0.05$). The results showed that the severity of SNHL and tinnitus decreased statistically and clinically after our treatment ($p < 0.05$).

Conclusion: This new solution significantly indicates superior to other treatment approaches such as corticosteroids, hearing aids, or hyperbaric oxygen for treating SNHL.

Keywords: Sensorineural hearing loss, treatment, tinnitus

Introduction

Sensorineural hearing loss (SNHL) is a disease that affects people's quality of life. This disease is commonly seen in the population, and the treatment of SNHL is quite difficult. Progression of the patient's age causes the exacerbation of hearing loss and emergence of tinnitus. This situation also affects the social life of the individuals and disrupts their psychology.

Psychological problems like anxiety, insomnia, inattentiveness, tension-type headache may occur (1). There are many causes of SNHL. The most common causes are congenital factors, presbycusis, sudden hearing loss, otosclerosis, barotrauma, mechanical trauma, acoustic trauma, Meniere disease, infections, vitamin deficiency, and drug toxicity (2,3). The most common reasons for admission to the oto-

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laryngology clinics in adults are bacterial and viral infections, presbycusis, sudden hearing loss, and traumatic hearing loss.

Presbycusis is a condition with bilateral hearing loss. In this pathology, firstly, the symmetrical hearing loss starts at high-frequency sounds. Later, it is seen at middle and low-frequency sounds (4). Metabolic diseases, stress, reduction of cochlear blood flow, the destruction of hairy cells as a result of daily loud sound exposure are responsible for the pathophysiology of the disease (5). Some treatment options are depending on the type and severity of this disease. With the use of various hearing aids, patients' hearing levels can be increased. These devices can be used in three different ways; outer ear canal, middle ear, and inner ear (3). However, the adaptation of patients and high treatment costs prevent to use of this method.

Idiopathic suddenly sensorineural hearing loss (ISSNHL) is described as a hearing loss of 30 dB or more in three consecutive frequencies in the last three days. The cause of this disease has not been elucidated yet. Different treatments are committed without a widely obtained standard system. Corticosteroids, anti-viral treatments, vasodilator drugs, hyperbaric oxygen, anti-coagulants, anti-inflammatory drugs, and other techniques have been suggested alone or combined therapy (6).

This study aimed to decrease the degree of hearing the loss in patients with SNHL. We also wanted to reduce the treatment cost and duration and increase the quality of life of the patients. On the other hand, we wanted to eliminate bacterial and viral infections and to increase cochlear microcirculation and neural repair. We prepared a solution for this purpose. We applied the solution to the middle ear of rats with SNHL by intratympanic injection. Thus,

the side effects of systemic medical treatment can be eliminated. We applied the solution to rats once a day for three days. Then, the auditory brainstem response (ABR) was used to measure the hearing degree of rats. We found that the hear degree of the rats improved after intratympanic injection. There weren't seen any complications on rats. So, we decided to use this mixed solution on voluntary patients.

Materials and Methods

The ethical approval was obtained from the ethics committee of Adana City Hospital in Adana in Turkey. The patent of our treatment has also been approved with the patent number 2018/16475. The nature and purpose of the study were explained to all patients, and informed consent was obtained from patients.

Study Design

This study was conducted as a prospective study. We included newly diagnosed 30 patients with SNHL and tinnitus (buzzing, ringing, hissing, chirping, whistling, or other sounds) in our study. SNHL occurred due to exposure to loud sound, trauma, presbycusis, chronic bacterial and viral infections. We excluded other diseases causing hearing loss like conductive and mix type pathologies.

Preparation of the solution

Three different substances were mixed at different rates (Under cover of the Turk patent Institute). We cannot share the ingredients as a part of the product rights.

Application of the Solution

Before and after the treatment, the patients were asked about tinnitus. Besides, we applied PTA (pure tone audiometry) and SDS (speech discrimination score) to all patients. These two

tests were performed by an experienced audiometrist.

The solution is applied to the patient in the supine position under a biomicroscope. The solution is applied to the upper posterior quadrant of the tympanic membrane with a dental injector. The patient is asked to wait for 15 minutes without swallowing and talking. These were applied to keep the solution in the middle ear and to be effective. We applied the solution once a day for three consecutive days. Two weeks after the treatment, PTA and SDS were applied to all patients. We compared pre- and post-treatment audiological findings and tinnitus of the patients. During and after the treatment, the patient did not complain of pain or any adverse reactions. The patients' life standards did not change after treatment.

Statistical Analysis

Standard deviation, mean, median, the lowest, the highest, frequency and ratio values were utilized in the descriptive statistics of the data. The distribution of the variables was assessed with the Kolmogorov Smirnov Test. Paired Samples T-Test and Wilcoxon Signed Rank Test were used for the analysis. The analyzes of data are made use of SPSS 21.0 program.

Results

The mean age of the patients was 57.7 ± 2.9 (range: 23-82). Gender rates were as: female (17;56,7%) and male (13;43,3%). Comparison of pre and post-treatment audiological findings and tinnitus of the patients was shown in the table-1. Pre and post-treatment PTA values of the patients' right and left ears were significantly different ($p < 0.05$). Pre and post-treatment SDS scores of the patients' right and left ears differed meaningfully ($p < 0.05$). The

rate of patients with tinnitus was significantly lower after treatment ($p < 0.05$).

Table-1. The comparison of pre and post-treatment audiological findings and tinnitus of the patients.

Condition	Mean $\pm$ SD/N%	P* value
BT PTA right AT PTA right	58.47 $\pm$ 13.2 42.47 $\pm$ 12.4	0.008
BT PTA left AT PTA left	61.1 $\pm$ 19.6 45.23 $\pm$ 15.7	0.011
BT SDS right AT SDS right	72.83 $\pm$ 11.9 86.33 $\pm$ 8.89	0.035
BT SDS left AT SDS left	69.17 $\pm$ 17.9 83.17 $\pm$ 13.8	0.020
	Number (%)	P** value
BT Tinnitus (+) AT Tinnitus (+)	26 (86.7%) 4 (13.3%)	0.0001

BT: Before treatment, AT: After treatment, PTA: Pure tone audiometry, SDS: Speech discrimination score. *Paired Sample T-Test was used. ** Wilcoxon Signed Rank Test was used.

Discussion

Approximately %33 of the world's population has hearing loss, and this situation affects people's daily lives. The life standards of patients are affected, and many problems arise in family, work and social life. On the other hand, hearing loss and tinnitus also cause financial losses and psychological problems (8,9). Hearing loss may develop slowly in many years or may occur suddenly. Hearing loss that develops slowly may be noticed late by The patients and this may cause delayed intervention for treatment. Speaking loudly, watching TV with high volume, and having difficulty understanding conversations can be

early signs of hearing loss. However, early intervention for hearing loss is very important. Hearing loss may cause memory difficulties, inattentiveness, irritability, depression, stress, anxiety, work, and social problems (8,9,12).

Hearing problems can be caused by an abnormality in every region of the ears. The loss of function of the external or middle ear is usually treated with medications or surgery. However, 90% of hearing problems are caused by loss of brain functions or damage to the inner ear (7). Lin FR et al. argues that reduced cognitive activity may cause the development of hearing loss (15).

For adults with mild, moderate or high hearing loss, hearing devices that can be applied to the external auditory canal are recommended as a remedy by physicians. Besides, in patients with advanced and a total hearing loss, the cochlear implant can be applied (8). Busby et al. in 1993 and Zwolan et al. in 1996 suggested that in adults with congenital hearing loss, cochlear implant impulses usually do not allow them to understand speech, because they do not develop transmission pathways (16,17).

The patients with hearing loss do not want to use an in external auditory canal or behind-the-ear hearing aids, because the patients often complain that these hearing aids make excessive humming in the ear and head. They complain that these aids are not comfortable. Additionally, they do not like the appearance of these hearing aids and these devices negatively affect their psychological states (9,10).

In another aspect, the patients with a low sociocultural level in their society do not usually change the battery of these aids when they are run out of battery. The patients cannot clean it when the channel of the hearing aid is blocked.

These devices, which are taken with high costs, are lost or broken. In this case, patients with low incomes cannot restore these hearing aids. As a result, these methods are not a definitive and continuous treatment method. Our treatment method provides very reasonable opportunities for these patients.

Surgical procedures are required for the placement of devices to the middle and inner ear. For example, cochlear implant application is one of them (8). However, patients with adult post-lingual hearing loss may not accept these surgical methods. Our treatment method is also a very suitable option for this patient group. Besides, cochlear implant surgery is known to cause various complications.

A rehabilitation process, device failures, various infections, facial nerve palsy, cerebrospinal fluid leak, meningitis, tinnitus, dizziness can be encountered (11). Another issue is that the costs of cochlear implant devices are very high, which is a significant disadvantage for both the patient and the state. These methods are temporary and do not provide a permanent solution, Therefore; these methods do not satisfy the patients and doctors adequately.

Another treatment modality is hyperbaric oxygen therapy for sudden hearing loss. Hyperbaric oxygen therapy is also quite costly. On the other hand, the patients often do not benefit from this treatment. Steroids can also be used in sudden hearing loss. However, it is unlikely to be helpful in sudden hearing loss. Because this treatment needs to be applied within ten days, if they can be administered within this period, the patients may benefit more than 50%. However, the success rate of treatment is low, since the patients are usually admitted to the clinic after 15 days (12-14).

Tinnitus is the perception of a sound that has no external source. Common sounds are ringing, humming, buzzing, whistling, or combination of these sounds. There are many causes of tinnitus, but often the cause is unknown. Tinnitus is almost accompanied by hearing loss. Anything that can cause hearing loss can also cause tinnitus.

The most known reasons are aging, noise exposure, head injury, and side effects of medications. Tinnitus may have negative effects on hearing, sleep, thoughts, and emotions. Counseling, sound therapy, hearing aids can be helpful. However, there is no medication or surgery that has been shown to eliminate tinnitus (18). In this context, it can be said that our treatment method is also useful for tinnitus.

These problems lead us to search for a new method that can treat SNHL and tinnitus in a short time with low cost. We want to increase the satisfaction of the patients and doctors. The study results show that we are successful in achieving this. The patients with SNHL and tinnitus benefited from our treatment method. However, our findings should be supported by future studies.

Conflict of Interests

The authors declare that there is no conflict of interests regarding publication of this paper.

Reference

1. Betlejewski S. Age connected hearing disorders (presbycusis) as a social problem. *Otolaryngol Pol*. 2006;60(6):883-6.
2. Hauser R. Presbycusis. *Ther Umsch*. 1993 Sep;50(9):627-32
3. Smith, R. J., Bale, J. F., & White, K. R. (2005). Sensorineural hearing loss in children. *The Lancet*, 365(9462), 879–890.
4. Gates GA, Mills JH: Presbycusis. *Lancet* 2005; 366:1111–1119.
5. Schuknecht HF: Pathology of the Cochlea. Cambridge, Harvard University Press, 1974.
6. Covelli, E., Altabaa, K., Verillaud, B., Camous, D., Hautefort, C., Barbara, M., Kania, R. (2018). Intratympanic steroids as salvage therapy for severe to profound idiopathic sudden sensorineural hearing loss. *Acta Oto-Laryngologica*, 1–6.
7. Lin FR, Yaffe K, Xia J, Xue Q, Harris TB, Purchase-Helzner E, Health ABC Study Group. Hearing loss and cognitive decline in older adults. *JAMA Intern Med* 2013 Feb 25;173(4):293-299
8. Doucet ME, Bergeron F, Lassonde M, Ferron P, Lepore F. Cross-modal reorganization and speech perception in cochlear implant users. *Brain* 2006 Dec;129(Pt 12):3376-3383.
9. Davis A, Smith P, Ferguson M, Stephens D, Gianopoulos I. Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models. *Health Technol Assess* 2007 Oct;11(42):1-294
10. Lustig TA, Olson S. Hearing Loss, and Healthy Aging: Workshop Summary. Washington DC: National Academies Press; 2014.
11. Farinetti A, Ben Gharbia D, Mancini J, Roman S, Nicollas R, Triglia JM. Cochlear implant complications in 403 patients: a comparative study of adults and children and review of the literature. *Eur Ann Otorhinolaryngol Head Neck Dis*. 2014 Jun;131(3):177-82.
12. Edoardo Covelli, Khaled Altabaa, Benjamin Verillaud, Domitille Camous, Charlotte Hautefort, Maurizio Barbara, Philippe Herman & Romain Kania (2018): Intratympanic steroids as a salvage therapy for severe to profound idiopathic sudden sensorineural hearing loss, *Acta Oto-Laryngologica*,
13. Filipo R, Attanasio G, Russo FY, et al. Intratympanic steroid therapy in moderate sudden hearing loss: a randomized, tripleblind, placebo-controlled trial. *Laryngoscope*. 2013; 123:774–778
14. Cho I, Lee HM, Choi SW, Kong SK, Lee IW, Goh EK, Oh SJ. Comparison of Two Different Treatment Protocols Using Systemic and Intratympanic Steroids with and without Hyperbaric Oxygen Therapy in Patients with Severe to Profound Idiopathic Sudden Sensorineural Hearing Loss: A Randomized Controlled Trial. *Audiol Neurotol*. 2018 Oct 31;23(4):199-207.
15. Lin FR Hearing loss and cognition among older adults in the United States. *J Gerontol a Biol Sci Med Sci*. 2011 Oct; 66(10):1131-6.
16. Busby PA, Tong YC, Clark GM. Electrode position, repetition rate, and speech perception by early- and late-deafened cochlear implant patients. *J Acoust Soc Am* 1993;93:1058–67.

17. Zwolan TA, Kileny PR, Telian SA. Self-report of cochlear implant use and satisfaction by prelingually deafened adults. *Ear Hear* 1996; 17: 198–210.
18. Tyler R. *Tinnitus Treatments; Clinical Protocols*, Thieme, 2006.

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