

Case Series

## Auricular Acupuncture Plus Antioxidants in the Treatment of Subjective Tinnitus: A Case Series

Ali Muftah Shaladi, MD,<sup>1</sup> Francesco Crestani, MD,<sup>2</sup> and Rita Saltari, MD<sup>1</sup>

### ABSTRACT

**Background:** Subjective tinnitus is the perception of an acoustic sensation that is not audible by other people, without any external sound stimulus.

**Objective:** To assess the benefit of auricular acupuncture and antioxidants on subjective tinnitus.

**Design:** A prospective questionnaire including an 11-point scale of the subjective volume, an 11-point scale of the severity of tinnitus, and the Zung Self-Rating Anxiety Scale were used to assess the response to acupuncture.

**Patients and Setting:** We recruited 13 patients who reported symptoms of tinnitus for 3 to 5 years. We evaluated the patients at 3 times: at baseline, 1 month, and 4 months. The study was carried out during a 10-month period between November 2007 and August 2008 in an outpatient facility in Italy.

**Intervention:** We treated the patients with oral antioxidants and auricular acupuncture 2 times a week, for 4 weeks; each acupuncture session lasted 30 minutes.

**Main Outcome Measures:** The reduction of the subjective volume, of the severity of the tinnitus, and the improvement of the emotional state.

**Results:** From baseline to 1 month, there was a reduction of 4.25 points ( $t = 0.357$ ;  $P = .76$ ) of the subjective volume of the tinnitus; a reduction of 5 points ( $t = 0.544$ ;  $P = .64$ ) of the severity of the tinnitus; and a reduction of 18.9 points ( $t = 0.387$ ;  $P = .74$ ) on the anxiety scale. No variation was registered between months 1 and 4, but patients reported improved sleep.

**Conclusions:** Auricular acupuncture plus oral antioxidants nonsignificantly reduced the noise and the intensity of subjective tinnitus in this cohort. Larger trials including randomized treatment are needed to confirm this outcome.

**Key Words:** Acupuncture, Antioxidants, Tinnitus

### INTRODUCTION

**S**UBJECTIVE TINNITUS is defined as the perception of sounds without an identifiable environmental source. It is a parasitic noise in the ear; it is maddening in particular in

silence. It may affect only 1 ear and in such cases, the left ear is more involved than the right one. Sometimes patients experience subjective tinnitus in both ears, and sometimes patients feel the dangerous noise coming from the inside of their heads. The patients hear the noise particularly in the

<sup>1</sup>S. Maria Misericordia Hospital, Rovigo, Italy.

<sup>2</sup>S. Luca Hospital, Via Grisetti, 45030 Trecenta, Rovigo, Italy.

morning when they wake up, and in the evening when they go to bed, so that it disturbs sleep. Patients can experience a permanent noise or an occasional and recurrent tinnitus that can disturb the patient's daily life.<sup>1,2</sup>

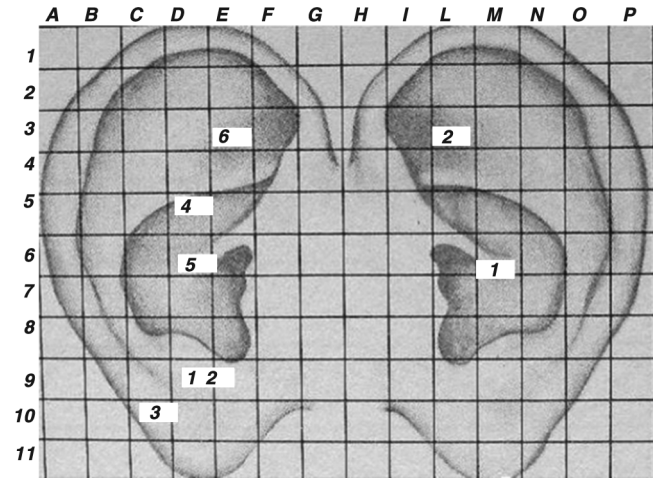
Epidemiological studies report that tinnitus affects about 19% of the population. In 5% of cases, this symptom is reported as particularly annoying, while in 1% of cases, it is intolerable. The most involved age group is between 40–60 years of age, and men are more affected than women after the age of 50 years.<sup>3</sup> Different etiological theories have been proposed, but none has definitively established causation. Any form of ear or nerve disease may be correlated to tinnitus. A damage of normal connections in the central auditory areas or an abnormal signal produced in the auditory system may cause this trouble.<sup>4</sup> The most important causes include the following: in 20%, acoustic traumas; in 9%, cervical traumas; in 7%, inner ear diseases, including otosclerosis and Ménière syndrome; in 2%, the use of ototoxic drugs. In the remaining 60% of cases, it is not possible to find a specific factor accountable for this symptom.<sup>5</sup>

The clinical classification underlines 2 fundamental kinds of tinnitus: subjective or intrinsic tinnitus, and objective or extrinsic tinnitus. In the subjective form, sounds are heard only by the patient (such as whistles or drones without hypoacusia) and there may be dizziness or other audio-vestibular anomalies. This is the most common form. In the objective or extrinsic form, the tinnitus is usually caused by extra auditive disease of the auricular center, for example by vascular, muscular, tubal, or auricular disease. Sounds have pulsating or vibratory tonality and are directly audible by the examiner or by auscultation of the cervical region. For this form, it is possible to specify the exact nature and the specific treatment.<sup>6</sup> Due to the uncertain etiology of tinnitus and the extreme variability of etiological theories, many kinds of pharmacological and nonpharmacological treatments have been tried. The objective of our study was to assess the benefit of a particular kind of acupuncture, auricular acupuncture plus antioxidants, on the symptoms of subjective tinnitus.

## METHODS

The study was carried out during a 10-month period between November 2007 and August 2008 in an outpatient facility in Italy. The aim and methods of the study were explained to the patients; voluntary participation was requested and informed consent was obtained according to local and international guidelines.

We enrolled 13 patients (8 men and 5 women) with an average age of 54 (range, 26–67) years. Two patients had a history of tinnitus within the family and 1 patient had bilateral tinnitus. Patients experienced tinnitus for 3 to 5 years; in 2 patients, this disease appeared in a sudden way;



**FIG. 1.** Left, ear with tinnitus. 1–2, auditory line; 3, inner ear; 4, Kidney; 5, Point Zero; 6, Shenmen. Right, contralateral ear. 1, Point Zero; 2, Shenmen.

in the others, it appeared gradually. Subjective tinnitus was diagnosed by an ear-nose-throat specialist.

The assessment of the subjective volume was numerically based on an 11-point scale, where absence of noise was defined 0 and the greatest noise was defined 10. The assessment of the severity of tinnitus was reported on a visual analog scale (VAS) from 0 to 10, and the emotional state was reported using the Zung Self-Rating Anxiety Scale.<sup>7</sup> All 3 scales were administered at baseline, after 1 month, and after 4 months.

The therapy consisted of auricular acupuncture treatments, twice a week for 4 weeks, for 30 minutes each time. Patients also received antioxidants, equal to 400 mg twice a day: thioctic acid associated with the following vitamins: B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>9</sub>, E, C, and PP. These drugs were administered for 4 weeks too. Participants were allowed to continue their therapy.

During the examination of the ear with the point detector (Pointer Pal), some active points were found in the auditory line, which is a groove under the antitragus at D9 and E9 level (Figure 1). They were treated with 3 needles. We used 0.25×13 mm Hwato sterile, single-use acupuncture needles (Suzhou Medical Appliance Factory, Suzhou, China). Moreover, the Inner Ear point at C 10 level, the Kidney point at D5 level, the Zero point of Nogier at D6 level, and the Shenmen at E3 level were found very active (Figure 1). In the contralateral ear, we have treated the Shenmen point at L3 level and the Zero point of Nogier at M6 level (as can be seen in the map that divides the ear in little squares marked with letters and numbers). The needles were inserted subcutaneously; they were not stimulated at all. The treatment consisted of 8 auricular acupuncture sessions with a frequency of 2 sessions a week; treatment time was 30 minutes. The acupuncturists in the study had completed a 4-year postgraduate training in acupuncture which included

the theory and practice of Traditional Chinese Medicine (TCM) and of modern Western medical acupuncture. The statistical analysis was calculated with the *t* test.

## RESULTS

The evaluation of 2 scales showed that the mean subjective volume of tinnitus at baseline was 7.25, and the mean severity of the tinnitus was 8.50. At 1 month, the mean subjective volume was 3, with a decrease of 4.25 ( $t = 0.357$ ;  $P = .76$ ). The severity of tinnitus was 3.50, with a decrease of 5 points ( $t = 0.544$ ;  $P = .64$ ). At baseline, the Zung Self-Anxiety Scale was 42.7 and at 1 month, it was 23.8, with a decrease of 18.9 ( $t = 0.387$ ;  $P = .74$ ). There was no significant difference between months 1 and 4, but patients stopped using sedatives and experienced improved quality of sleep. None of the patients reported adverse effects.

## DISCUSSION

Subjective tinnitus is not defined as a specific illness but as a symptom. In most cases, the cochlea is the anatomical structure that gives the starting signal to the tinnitus. A light cochlear pain can cause a small lesion and a loss of balance of the nervous nucleus, even if there are no consequences on auditory sensitivity.<sup>8</sup> The mechanism of tinnitus from the inner ear remains uncertain; however, the hydrops of the labyrinth has been suggested. The excess of labyrinthine fluid causes an increased pressure on the labyrinthine structures, on the ciliated cells, and on the nerve fibers.<sup>9</sup> The variation of the volume of the labyrinthine fluid can explain the variability of the symptoms of Mènière syndrome and tinnitus.<sup>10,11</sup> The antidiuretic hormone (ADH) is very important in the regulation of the labyrinthine liquid volume. Many ADH receptors are in the kidney, but there are some in other organs, too, such as in the inner ear. The bond between the hormone and its receptor, in the inner ear, could modify the permeability of the aquaporin, modulating the reabsorption of the liquid.<sup>12,13</sup>

The psychological state of the patients has to be taken into consideration. A state of anxiety is normally associated with this disease. One study has demonstrated that stress and psychic factors increase levels of ADH and of labyrinthine liquids.<sup>14</sup> A genetic predisposition seems possible, but the primary condition is a hydromechanic dysfunction.<sup>15</sup> The relation between stress and the worsening of tinnitus is clear in some studies.<sup>16,17</sup> In the tinnitus metric test, 78% of patients with tinnitus heard sounds at an intensity lower or equal to 10 dB, and 44% of patients heard sounds at an intensity of 1 to 5 dB. If the rustle of leaves produces a sound of 35 dB,<sup>18</sup> it is clear that psychological factors play a role in the amplification of sounds. With auricular acupuncture, we stimulated points of the tinnitus line, which

represents the auditive area on the temporal lobe, regulating in this way the frequency of the sounds.

The Inner Ear point represents the auditive functionality. The Kidney point, between its various functions, is useful for the retention of liquids. For this reason, the 2 points control the labyrinthine liquid's volume with a mechanism that checks or inhibits the action of the vasopressin hormone (ADH). So, the Inner Ear and the Kidney points could have a synergistic mechanism on the regulation of the labyrinthine idrope.<sup>19,20</sup>

Point Zero and Shenmen are 2 main points that are used in the treatment of various pathologies. The Shenmen (or the Chinese Spirit Gate) is situated at the apex of the triangular fossa; it is one of the most well-known auricular points and is used in the treatment of most ailments. Shenmen is known to have a powerful influence in treating various conditions including pain, tension, and inflammation, and it is used to support all other auricular reflex points.

Point Zero and the Shenmen point are useful in the treatment of psychosomatic syndromes like stress, anxiety, nervous tension, and insomnia, which are important factors in tinnitus.<sup>19</sup> Free radicals play an important role in many pathological processes and an implication in inner ear diseases has been observed. Free radicals increase in the serum of patients with idiopathic tinnitus; the administration of antioxidants decreases the number of free radicals in the serum with an amelioration of symptoms.<sup>21</sup>

In this study, we demonstrated that the stimulation of a particular set of acupoints associated with the oral administration of antioxidants could decrease the symptoms of subjective tinnitus. The treatment benefit lasted more than 3 months after the end of the therapy and there were no reported adverse effects.

## CONCLUSIONS

Tinnitus is considered a symptom and not an illness. Auricular acupuncture could be important regulating the liquid in the labyrinth. Some studies suggest that acupuncture may not prove useful in the management of tinnitus<sup>22</sup> without specifying the type of tinnitus (subjective or objective). Moreover, all cases reported involved the use of systemic acupuncture.

In our 13 cases treated with auricular acupuncture and administration of antioxidants, we had good results on the symptoms of subjective tinnitus and on the amelioration of sleep including the elimination of sedatives. These results suggest that auricular acupuncture acts on the equilibrium of the neurovegetative nervous system, which is disrupted in the case of tinnitus.

Therefore, we think that auricular acupuncture along with administration of antioxidants could be an option for the treatment of subjective tinnitus. Our findings are based on a case series with a small number of patients; future

randomized controlled trials should be conducted, with longer follow-up, to evaluate this approach.

## DISCLOSURE STATEMENT

The authors state that no competing financial interests exist.

## REFERENCES

- Jastreboff PJ. Phantom auditory perception (tinnitus): mechanism of generation and perception. *Neurosci Res.* 1990;8:221–254.
- Hazell JW. Patterns of tinnitus: medical audiological findings. *J Laryngol Otol.* 1981;4(suppl):39–47.
- Lloyd SK, Baguley DM. A patient with tinnitus. *Clin Otolaryngol.* 2008;33:25–28.
- Moller AR. Pathophysiology of tinnitus. *Otolaryngol Clin North Am.* 2003;36:249–266.
- McFerran DJ, Phillips JS. Tinnitus. *J Laryngol Otol.* 2007;121(3):201–208.
- Vesterager V. Tinnitus: investigation and management. *BMJ.* 1997;814:728–731.
- Zung WW. A rating instrument for anxiety disorders. *Psychosomatics.* 1971;12:371–379.
- Norena AJ, Eggermont JJ. Changes in spontaneous neural activity immediately after an acoustic trauma: implications for neural correlates of tinnitus. *Hear Res.* 2003;183:137–153.
- Kozono D, Yasui M, King LS, Agre P. Aquaporin water channels: atomic structure molecular dynamics meet clinical medicine. *J Clin Invest.* 2002;109:1395–1398.
- Hamann K, Arnold W. Meniere's disease. *Adv Otorhinolaryngol.* 1999;55:137–168.
- Zenner HP, Reuter G, Zimmermann U, et al. Transitory endolymph leakage induced hearing loss and tinnitus: depolarization, biphasic shortening and loss of electromotility of outer hair cells. *Eur Arch Otorhinolaryngol.* 1994;251:143–153.
- Beitz E, Zenner HP, et al. Aquaporin-mediated regulation in the inner ear. *Neurobiology.* 2002;23(3):315–328.
- Lim JS, Lange ME, Megerian CA. Serum antidiuretic hormone levels in patients with unilateral Meniere's disease. *Laryngoscope.* 2003;113(8):1321–1326.
- Verkman AS. Physiological importance of aquaporin water channels. *Ann Med.* 2003;34(3):192–200.
- Martin DM, Raphael Y. Gene-based diagnostic and treatment methods for tinnitus. *Int Tinnitus J.* 2003;9(1):3–10.
- Horner KC. The emotional ear in stress. *Neurosci Biobehav Rev.* 2003;27(5):437–446.
- Juhn SK, Li W, Kim JY, et al. Effect of stress-related hormones on inner ear fluid homeostasis and function. *Am J Otol.* 1999;20(6):800–806.
- Veron JA, Meikl MB. Tinnitus: clinical measurement. *Otolaryngol Clin North Am.* 2003;36:293–305.
- Oleson T. *Auriculotherapy Manual: Chinese and Western Systems of Ear Acupuncture.* 2nd ed. London, UK: Churchill Livingstone; 2003.
- Takeda T, Takeda S, Kitano H, et al. Endolymphatic hydrops induced by chronic administration of vasopressin. *Hear Res.* 2000;140:1–6.
- Savastano M, Brescia G, Marioni G. Antioxidant therapy in idiopathic tinnitus: preliminary outcomes. *Arch Med Res.* 2007;38(4):456–459.
- Park J, White AR, Ernst E. Efficacy of acupuncture as a treatment for tinnitus: a systemic review. *Arch Otolaryngol Head Neck Surg.* 2000;4:489–492.

Address correspondence to:  
 Francesco Crestani, MD  
 Pain Unit and Palliative Care  
 S. Maria Misericordia Hospital  
 Rovigo, Italy  
 E-mail: crestanifrancesco@libero.it