

Effect of acupuncture on tinnitus severity index in the elderly with non-pulsating tinnitus

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Abstract

Introduction. Idiopathic subjective non-pulsating tinnitus (ISNPT) is a frustrating diagnosis to physicians owing to the limited effectiveness of traditional pharmacological approaches. This study aimed to investigate the effect of acupuncture on quality of life in elderly people with ISNPT.

Methods. Overall, 40 patients of both sexes with ISNPT lasting for > 3 consecutive months and aged ≥ 65 years participated in this study. They were assigned into the study and the control groups, 20 patients each. The study group received the prescribed medications in addition to manual acupuncture on the following acupoints: SJ 3, SJ 5, SJ 17, SJ 18, SJ 19, SJ 20, SJ 21, SJ 22, GB 2, GB 8, GB 20, LI 4, KI 3, and ST 36, for 30 minutes, 3 times/week for 4 weeks, while the control group received their prescribed medications only. All participants in both groups were assessed with the visual analogue score of tinnitus loudness (VASTL) and tinnitus severity index (TSI).

Results. No statistically significant changes were reported in VASTL or TSI in the control group, while in the study group, VASTL showed a high statistically significant decrease from 8.27 ± 1.45 to 3.20 ± 1.36 ($p < 0.001$) and TSI revealed a decrease from 44.30 ± 3.40 to 27.95 ± 4.18 ($p < 0.001$).

Conclusions. Acupuncture is a good adjunctive complementary therapy to ISNPT in the elderly.

Key words: acupuncture, subjective non-pulsating tinnitus, tinnitus severity index questionnaire, geriatrics

Introduction

Tinnitus is a consciously perceived auditory sensation without external stimuli. Subjective tinnitus – the usual form of tinnitus – is experienced only by the patient, while objective tinnitus is the less habitual type and can be heard by the patient and/or by an observer. The sensation is generally subjective tinnitus, described by many patients as hissing and ringing in one or both ears [1].

Vascular pulsatile tinnitus is usually synchronous with the heart beats [2], originating from either increased flow volume or stenosis of the vascular lumen. Vascular pulsatile tinnitus can be classified as arterial or venous, depending on the vessel of origin [3]. It mainly originates from a vascular lesion [4], while non-pulsating subjective tinnitus is commonly idiopathic: the complaints are associated with an unknown mechanism [5]. Idiopathic subjective non-pulsating tinnitus (ISNPT) may be constant or intermittent, localized in one or both ears [6].

Tinnitus is more prevalent in older men than women [6]. It is an uncomfortable and unpleasant symptom [7] affecting 33% of elderly people [5], with many negative consequences, like frustration, annoyance, irritability, anxiety, depression, hearing difficulties, hyperacusis, insomnia, concentration difficulties, lifestyle detriment, emotional difficulties, work hindrance, and interference with social interaction [8–11]. These symptoms are highly relevant to determine tinnitus severity [8]. Tinnitus places a huge burden on patients and substantially impairs their quality of life (QoL) [12]. If left uncured, it may

cause hearing loss, so efforts should be made to treat tinnitus [13].

Tinnitus is often a frustrating diagnosis for physicians owing to the limited effectiveness of the available treatments [7]. Complementary and alternative medicine is very popular and appreciated by many individuals with chronic diseases in most countries [14], so its use is preferred in non-pulsating tinnitus patients, who become more relaxed and less agitated after complementary and alternative medicine interventions [1].

Despite the lack of evidence to support the therapeutic effectiveness of acupuncture, it is one of the most often applied options in complementary and alternative medicine [15]. Besides the improvement of QoL, studies show that acupuncture enhances non-pulsating tinnitus perception and decreases its loudness [14]. According to traditional Chinese medicine, acupoints adjacent and/or distal to a disease area can be utilized in acupuncture to treat the disease [16]. To our knowledge, very limited studies investigated the effect of acupuncture in elderly individuals with ISNPT, so the aim of this study was to examine the impact of acupuncture on QoL in elderly ISNPT patients.

Subject and methods

Subjects

A total of 40 patients aged ≥ 65 years of both sexes were recruited from the otorhinolaryngology outpatient clinic,

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Al-Iman Charitable Hospital in Benha City. The included patients had complained about ISNPT for > 3 consecutive months. Any participant was excluded by a physician if at least one of the following criteria was present: objective pulsating, acute and intermittent tinnitus, history of Ménière's disease, tinnitus induced by an ear tumour, otitis media, tympanic membrane perforation, Eustachian tube function obstacle, acoustic neuroma, intracranial damage, post cochlear lesion, hearing loss, or use of ototoxic drugs or antidepressants. Mentally ill, diabetic, hypertensive, illiterate patients, and those who had received complementary or alternative treatment within 3 months before the study were also excluded.

Intervention

The participants were randomly divided into a study and a control group, 20 patients for each group. Each group included 19 patients with a unilateral ISNPT and 1 patient with a bilateral ISNPT. Beside the administration of the prescribed pharmacological agents for ISNPT in both groups, the study group received 30-minute manual acupuncture (MAC), 3 times/week for 4 weeks on acupoints selected in accordance with the previous studies [17–20]. The punctured acupoints were: SJ 3, SJ 5, SJ 17, SJ 18, SJ 19, SJ 20, SJ 21, SJ 22, GB 2, GB 8, GB 20, LI 4, KI 3, and ST 36. The treated side depended on the tinnitus side (i.e., the MAC treatment was handled ipsilaterally in all one-sided ISNPT patients and bilaterally in the 2-sided tinnitus patient).

Pure sterile stainless-steel metal acupuncture needles for single use (CE 0197 size 0.25 × 25 cm; China) were utilized to apply the MAC treatment. The acupuncture point skin was swabbed with 70–80% alcohol to disinfect the penetration site by a rotary scrubbing motion starting at the centre of the site. The depth of needling was nearly 5–10 mm, depending on the anatomical structure differences of the patients and the individual features of acupoints.

The acupuncture needles were inserted perpendicularly in all above-mentioned acupoints except the GB 20 acupoint (in this case, with the tip of the acupuncture needle slightly downwards, the needle was inserted obliquely towards the tip of the nose). With a quick rotatory counterclockwise insertion, the needles were angled opposite to the course of energy flow on the punctured meridian [21]. By piercing the skin, quick twirling, lifting, and thrusting were manipulated for de qi. De qi is a collection of sensations including soreness, numbness, distention, heaviness, and others, which is believed to be an essential component for acupuncture efficacy. Ten-second quick counterclockwise manual rotations were applied every 5 minutes of the 30-minute acupuncture session to maximize the effectiveness of acupuncture treatment.

Outcome measures

Baseline and post-treatment values of visual analogue score of tinnitus loudness (VASTL) and tinnitus severity index (TSI) were assessed. The participants were asked to rate their ISNPT loudness subjectively on a 0–10 VASTL scale. The TSI questionnaire contained 12 questions and the participants are asked to answer each question with 1 of 5 possible answers: never (1 point), rarely (2), sometimes (3), usually (4), and always (5). Possible scores range from 12 to 60, and they reflect the patient's subjective assessment of the impact of tinnitus on their QoL [22].

Statistical analysis

The collected data were analysed by using the SPSS program, version 18 (IBM Corp., Chicago, USA). With the Kolmogorov-Smirnov test, all data showed normal distribution. Paired and unpaired *t*-tests were applied to compare the results within and among groups, respectively. Data were expressed as mean ± standard deviation, and the statistical significance was set at $p < 0.05$.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Ethics Committee of Scientific Research, Faculty of Physical Therapy, Cairo University (approval No.: P.T./REC/012/002603).

Informed consent

Informed consent has been obtained from all individuals included in this study.

Results

According to the unpaired *t*-test, no statistically significant difference was shown between the values of pre-treatment ages in the study and control groups; these values equalled 68.00 ± 1.74 and 67.80 ± 2.01 years, respectively ($p = 0.738$). In the study and control groups, the number of males was 13 and 11, respectively, while the number of females was 7 and 9, respectively. As demonstrated by the chi-square test, there was no statistically significant difference in the sex distribution between the groups ($p = 0.492$). No statistically significant difference was found between the baseline values of VASLT and TSI for the 2 groups ($p > 0.05$).

Figure 1 represents the pre- and post-treatment means of VASTL within each group. In the study group, the paired *t*-test showed a high statistically significant difference between pre- and post-treatment VASTL values: 8.27 ± 1.45 and 3.20 ± 1.36 , respectively ($p < 0.001$). In the control group, the paired *t*-test revealed no statistically significant difference between pre- and post-treatment VASTL values: 8.30 ± 1.36 and 7.25 ± 2.69 , respectively ($p > 0.05$).

Figure 2 depicts the pre- and post-treatment means of TSI within each group. In the study group, the paired *t*-test showed a very high statistically significant difference between pre- and post-treatment TSI values: 44.30 ± 3.40 and 27.95 ± 4.18 ,

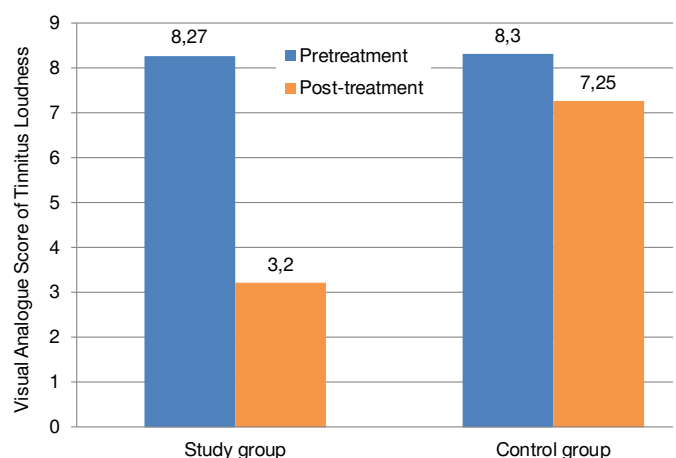


Figure 1. Mean pre- and post-treatment values of visual analogue score of tinnitus loudness in the investigated groups

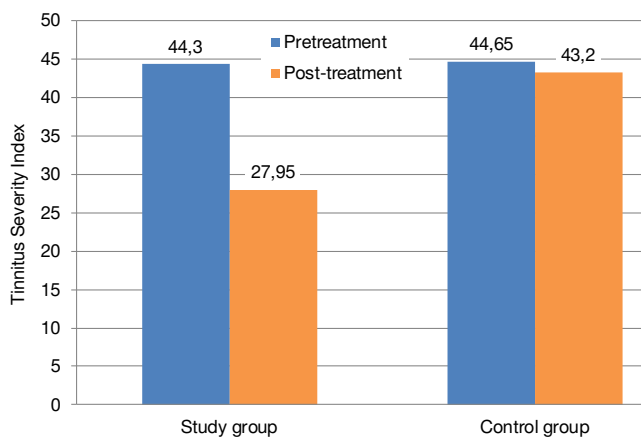


Figure 2. Mean pre- and post-treatment values of tinnitus severity index in the investigated groups

respectively ($p < 0.001$). In the control group, the paired *t*-test revealed no statistically significant difference between pre- and post-treatment TSI values: 44.65 ± 3.09 and 43.20 ± 4.43 , respectively ($p > 0.05$).

The comparison of post-treatment values of VASTL and TSI between the groups showed a very high statistically significant difference in favour of the study group ($p = 0.0001$).

Discussion

The present study investigated the impact of MAC on QoL in the elderly with ISNPT. The results revealed that 4 weeks of 30-minute MAC (3 times weekly) enhanced VASTL and TSI, with an improvement percentage of 61.30% and 36.90%, respectively.

Owing to the limited studies of acupuncture effect on tinnitus, the acupuncture mechanism in tinnitus improvement is not fully explained [23] but the systemic effect of MAC on the meridian system, autonomic nervous system modulation, balancing mind and body [24], and MAC-induced somatosensory stimulation may be considered [23]. The added olivocochlear nucleus stimulation to the serotonergic effect – induced by MAC – on the limbic system of the brain leads to modulation of depression-related emotional tinnitus distress. The gained subjective improvements in tinnitus disturbance, tinnitus loudness, tension, insomnia, and hence the QoL may be explained by the induced effects of MAC, such as reduced co-existing pericranial muscle tension, increased endogenous opioids release, high threshold of pain, relaxed local muscle tenderness, and improved local circulation [25].

For treating ear diseases in accordance with the meridian theory of traditional Chinese medicine, previous studies reported that frequent local periauricular, distal (in upper and lower limbs), and proximal (in scalp) acupoints might be used together to maximize the positive response of chronic tinnitus to MAC intervention. The ST 36 acupoint stimulates some mechanisms that regulate the control of the autonomic nervous system, modulate whole-body energy balance, and repair the imbalance between the body and mind [19]. According to the traditional Asian medicine theory, tinnitus is greatly related to yin-yang imbalance of meridians found around the ear area, such as kidney and gallbladder meridians. The ability of acupuncture to improve this imbalance is broadly reported in many studies [26].

The results of this study were supported by 2 studies that assessed the response of subjective chronic tinnitus to MAC applied on periauricular and body acupoints. Both studies re-

ported a significant improvement of TSI and VASTL [17, 20]. Consistently, with the application of MAC on periauricular and distal acupoints, another 2 studies demonstrated more VASTL improvement (with a high statistically significant difference) [18, 19] than with the application of MAC on periauricular acupoints only [27]. Again, in another research that compared acupuncture, western medicine, and Chinese herbs, acupuncture produced the greatest positive significant effect on tinnitus [28]. Furugård et al. [29] reported a temporal relief of tinnitus after 15 sessions of acupuncture (applied within 3 months) but the improvement of QoL was not maintained within 1-year follow-up.

Opposite to the results of this study, application of MAC on bilateral local and distal acupoints did not improve VASTL in tinnitus patients in a study by Wang et al. [25]. In addition, a systematic review by Kim et al. [30] reported no response of senile tinnitus to acupuncture. Despite the positive response of stress, tinnitus did not respond to acupuncture intervention [31]. Another former study demonstrated no statistically significant changes in unilateral tinnitus symptoms after acupuncture stimulation to 5 acupoints in the scalp, feet, and hands [32].

Limitations

The limitations of the present study include a small number of investigated patients and the absence of follow-up.

Conclusions

Tinnitus – the perceived sensation of sound in the absence of acoustic stimulation – is a common disorder in the elderly, with large negative consequences in many aspects of their QoL. The available pharmacological treatments for the most common, rarely treatable chronic tinnitus are not efficient in elderly patients. Acupuncture is an optional complementary treatment for improving the QoL among elderly individuals with chronic tinnitus. According to the results of this study, adding acupuncture to the available pharmacological therapies increases the improvement of QoL in elderly patients with ISNPT. An investigation of tinnitus response to acupuncture (or different acupuncture techniques) in a large sample with different age categories should be performed in future studies.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

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