

# Acupuncture and Herbs Quiet Tinnitus

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Researchers find acupuncture and Traditional Chinese Medicine herbs effective for the treatment of tinnitus (ringing of the ears). Tinnitus is often a pernicious and intractable disorder. In this article, we will review the important research on acupuncture and herbs that demonstrates significant positive patient outcome rates. Take a close look at the results achieved by Dongzhimen Hospital researchers. Their use of electroacupuncture produces significant positive patient outcomes. First, let's go over a few basics about ringing in the ears.

## About Tinnitus

Tinnitus is characterized by the perception of sound that is not caused by external acoustic stimuli. The condition is often accompanied by other disruptive symptoms such as anxiety, insomnia, and lack of concentration. Tinnitus patients may experience hearing loss or dizziness. Tinnitus and related symptoms negatively impact patients' psychological health, sleep, and daily life activities. [1] Research shows that approximately 8% of tinnitus patients suffer from sleep problems, and about 1% experience severe repercussions in their work and everyday life. [2] The sound may be loud or soft, of high or low pitch, and experienced in one or both ears. According to the National Institutes of Health online publication on the topic of tinnitus, in the past year alone, roughly 25 million USA residents—approximately 10% of the adult population—have experienced tinnitus lasting at least 5 minutes.

## Usual Care

Usual care tinnitus treatments often include vasodilator drugs to increase cochlear blood supply and inner ear tissue metabolism. [3] Long term consumption may have adverse effects such as lethargy and anxiety. Drugs for chronic tinnitus, such as lidocaine, demonstrate limited efficacy. [4] The use of glucocorticoids has also been investigated, but results have not been substantiated. [5] This has prompted researchers to explore the therapeutic effect of Traditional Chinese Medicine (TCM) on tinnitus. Specifically, the TCM modalities of acupuncture and herbs have been investigated in multiple research studies.

## Chinese Medicine

Several independent studies were conducted to investigate the various effects of acupuncture on different types of tinnitus based on TCM differential diagnoses. One finds that acupuncture boosts the efficacy of herbs for uprising liver heat tinnitus. Another study demonstrates that acupuncture is effective as a standalone therapeutic modality for treating kidney essence deficient (jing xu) tinnitus. Another study

finds electroacupuncture a more powerful treatment option than conventional acupuncture for excess liver and gallbladder heat tinnitus.

### **Differential Diagnostics**

The researchers provide a theoretical TCM background in their investigations. According to TCM principles, tinnitus results from one or more imbalances. Common excess-type imbalances include rising liver heat, phlegm-fire stagnation, and excessive liver and gallbladder heat. Common deficiency-type imbalances include kidney essence deficiency and blood-qi deficiency. A combination of excess and deficiency is not an unusual presentation in patients.

### **Local Points**

Generally, acupoints located near the ear such as Ermen (TB21), Tinggong (SI19), and Tinghui (GB2) are used to treat tinnitus by licensed acupuncturists. From an anatomical perspective, they are acupoints rich in blood vessels and nerves. The anterior superficial temporal artery, anterior superficial temporal vein, auriculotemporal nerve, and great auricular nerve pass through these acupoints.

Other acupoints are applied based on individual conditions. It is worth noting that abdominal acupuncture has been shown to effectively treat nervous tinnitus (caused or exacerbated by anxiety) and improve quality of life. [6] Electroacupuncture has also shown significant clinical effects. Electrical stimulation of acupoints around the ear stimulates local muscle contractions, increases ear blood supply, and promotes nerve fiber regeneration. [7–8]

### **Excess Heat Acupoints and Herbs**

Rising liver heat tinnitus responds well to treatments that are based on clearing liver heat and unblocking the acupuncture channels innervating the ear. Historically, herbal formulas such as Long Dan Xie Gan Tang are used for this type of tinnitus. The herbal formula Long Dan Xie Gan Tang has been documented to have a 97.6% treatment efficacy rate for rising liver heat tinnitus. [9] This is predominantly for acute cases and subacute flare-ups. Acupuncture point Taichong (LV3) clears liver heat and regulates qi flow (source point and shu-stream point of the liver) and is often used for liver heat related tinnitus. [10]

### **Kidney Deficiency**

In TCM literature, there are many records showing kidney essence (jing) deficiency as a cause of tinnitus. This is closely related to the theory that the ears are the surface openings of the kidneys. Acupuncture on kidney meridian acupoints like Shangqu, Yindu, and Taixi nourish the kidneys and regulate the twelve major meridians. Many abdominal acupoints are also important in treating kidney essence deficiency. For example, Qihai and Guanyuan replenish and strengthen yuanqi, while Zhongwan and Xiawan strengthen the spleen and reinforce qi. These reinforcements fortify the body and increase kidney essence.

### **Liver-Gallbladder Heat**

Excessive liver-gallbladder heat is another imbalance treatable by acupuncture. The gallbladder meridian is connected to the liver meridian and travels past the ear, therefore excessive liver-gallbladder heat easily traverses the meridian and manifests in the ear. Tinghui is a crucial acupoint for treating this type of tinnitus as it is both part of the gallbladder meridian and located near the ear. Fengchi, another gallbladder meridian acupoint, is also useful as it is connected to the vertebrobasilar arterial system. Electrostimulation of Fengchi stimulates the development of collateral circulation thereby improving

labyrinthine arterial blood flow. Electroacupuncture at Fengchi also stimulates neck muscle contraction, and the resulting pump effect causes an increase in inner ear blood supply. [11]

### **Hubei Huangshi Traditional Chinese Medicine Hospital**

Research conducted at Hubei Huangshi Traditional Chinese Medicine Hospital by Chen Guang finds acupuncture an important and effective complementary treatment modality to Chinese medicinal herbs. [12] The research is specific to rising liver heat type tinnitus patients.

The clinical trial compared two groups of patients, both receiving Long Dan Xie Gan Tang, but one group also received acupuncture. Results document that acupuncture raised the clinical efficacy of TCM herbs in improving patients' hearing acuity, ringing severity, and depression. Three indicators were used to evaluate clinical efficacy: hearing threshold, degree of ringing, depression.

Hearing threshold refers to the lowest level that sound can be heard 50% of the time. Using electroaudiometry, the average hearing threshold for frequencies of 0.25 – 4 kHz was determined. [13] Based on the threshold, hearing acuity was classified into 3 tiers:

- Grade 1: 26 – 40 dB mild deafness.
- Grade 2: 41 – 70 dB moderate deafness.
- Grade 3:  $\geq 71$  dB severe deafness.

The degree of ringing was graded on a 6-tier scale:

- Level 1: Extremely slight ringing, faintly detectable.
- Level 2: Slight ringing, definitely detectable. Only occurs in quiet environment. No impact on daily life and work.
- Level 3: Moderate ringing, detectable in normal environment. No observable impact on daily life and work.
- Level 4: Ringing detectable in any environment. Sleep and concentration are affected. Slight impact on work.
- Level 5: Loud and noisy ringing. Sleep and work are severely affected. Signs of slight anxiety, irritability, depression, or other psychological issues.
- Level 6: Extremely loud ringing. Constantly affected by ringing. Inability to sleep and work. Major signs of anxiety, irritability, depression, or other psychological issues.

Degree of depression was assessed using the Hamilton Depression Rating Scale (HAM-D), a multiple item questionnaire. Scores increase with the severity of depression. A score of  $< 7$  indicates the absence of depression, and a score of  $> 29$  indicates severe depression. [14] In addition to the above three indicators, the overall treatment efficacy was also surveyed. [15] By comparing symptoms before and after treatment, the treatment efficacy for each patient was categorized into 1 of 4 tiers as detailed:

- Clinical recovery: Absence of ringing. Normal hearing acuity. No relapse throughout 1-month follow-up.
- Significantly effective: Ringing no longer affects work and sleep, only occurs at night or in quiet environment. Ringing frequency improved from constant to occasional. No major hearing difficulties.
- Effective: Ringing no longer affects work and sleep, only occurs in noisy environment. Alternatively, ringing no longer occurs in noisy environment, only occurs in quiet environment. Ringing frequency improved from constant to intermittent.
- Ineffective: No improvement, or worsening, of ringing.

### Rising Liver Heat Results

The treatment effective rate for each group was derived with the following formula: [Clinical recovery + Significantly effective + Effective] / [Total number of patients in group] \* 100%. The treatment effective rates were 91.9% for the acupuncture and herbs group and 78.9% for the herbs-only group. The rates are reflective of the overall efficacy of the treatments, and here they show that acupuncture greatly improves treatment response to TCM treatment ( $P < 0.01$ ). The results for the 3 indicators below demonstrate the ways in which acupuncture complements herbs for tinnitus.

The acupuncture with herbs group had a mean pre-treatment hearing threshold of  $50.29 \pm 4.02$  dB, which lowered significantly ( $P < 0.01$ ) to  $26.45 \pm 3.51$  dB after treatment. Similarly, the herbs-only group had a mean pre-treatment hearing threshold of  $49.53 \pm 3.68$  dB and achieved significant improvement ( $P < 0.01$ ) to  $31.26 \pm 2.97$  dB after treatment. This tells us that the two treatments were effective in improving hearing acuity. However, comparing the post-treatment results, acupuncture with herbs outscored herbs-only ( $P < 0.05$ ). As a result, the researchers concluded that acupuncture boosts the efficacy of herbs in improving hearing acuity.

Patients' degree of ringing saw marked improvement with both treatments ( $P < 0.05$ ). For the acupuncture with herbs group, these are the number of patients in each ringing level (from level 1–6) before treatment: 0, 3, 10, 15, 6, 3. After treatment, the respective numbers were: 4, 8, 12, 10, 2, 1. For the herbs group, these are the number of patients in each ringing level (from level 1–6) before treatment: 0, 2, 11, 16, 5, 5. After treatment, the respective numbers were: 1, 8, 15, 10, 2, 2. After treatment, both groups of patients improved—they experienced less frequent and quieter ringing. Acupuncture with herbs patients outperformed herbs-only patients. The researchers conclude that although herbs-only treatment is effective, acupuncture further alleviates the severity of tinnitus.

Both patient groups also experienced less depression after treatment ( $P < 0.01$ ). Before treatment, the HAM-D score for the acupuncture with herbs group was  $11.12 \pm 2.04$ , which fell to  $5.54 \pm 1.06$  after treatment. The HAM-D score for the herbs group fell from  $11.64 \pm 1.31$  before treatment to  $7.89 \pm 1.22$  after treatment. As with the previous two indicators, the addition of acupuncture effectively augmented the clinical efficacy of TCM herbs ( $P < 0.05$ ), in this case for lessening depression from tinnitus.

### Design

The study was set up as a double-arm clinical trial. A total of 80 patients from the Neurology Division of Hubei Huangshi Traditional Chinese Medicine Hospital participated in the study. They were diagnosed with tinnitus from rising liver heat. The following selection criteria were applied in choosing trial participants: [16]

- Fulfilled diagnostic criteria for rising liver-heat tinnitus as described in “Otolaryngology – Head and Neck Diagnoses and Differential Diagnoses”. [17]
- TCM clinical presentation of rising liver-heat tinnitus.
- Tinnitus as main symptom, recurring for  $\geq 1$  month or continuously occurring for  $\geq 5$  days.
- Aggravated by exertion or agitation.
- Accompanied by hearing loss, headache, irritability, insomnia, chest/rib fullness, red tongue with yellow coating.
- Eardrum slightly hyperemic or normal.

The following exclusion criteria were applied:

- Organic damage due to external injury or infection.

- Tinnitus due to tumors or systemic diseases.
- Severe cardiac, liver, or renal primary diseases.
- Complete deafness with tinnitus.
- Duration of illness  $\geq 2$  years.
- Failed to complete or comply with prescribed treatment.

Patients were randomly divided into the treatment group and the control group. Both groups had equivalent demographics ( $P > 0.05$ ) to ensure fairness of comparison. Excluding patients who were disqualified during the study, the treatment group recorded 37 patients: 21 males, 19 females, mean age  $32.5 \pm 8.1$  years, mean duration of illness  $8.9 \pm 3.7$  months. The control group recorded 38 patients: 18 males, 22 females, mean age  $31.2 \pm 8.7$  years, mean duration of illness  $8.4 \pm 4.3$  months.

Both groups received a modified Long Dan Xie Gan Tang decoction and the treatment group received acupuncture as an additional therapy. One treatment cycle was administered and a 1-month follow-up was conducted. The following acupoints were selected for the treatment group: [18–19]

- Scalp acupuncture vertigo and hearing area (bilateral insertion)
- Ermen (TB21)
- Tinggong (SI19)
- Tinghui (GB2)
- Yifeng (TB17)
- Hegu (LI4)
- Taichong (LV3)

### Acupuncture Technique

For acupuncture, the needles had a total length of 1.5 inches. For the vertigo and hearing area, a needle was inserted using the Feizhen technique: the needle was rotated rapidly for 1 minute, at a rate of 200 rotations/minute, then retained for 1 hour. During needle retention, the same rotation technique was repeated once every 20 minutes.

For the other acupoints, needles were inserted based on standard protocols and retained for 30 minutes. During needle retention, needles were manipulated once every 10 minutes using lifting, thrusting, and rotation. Attenuation was applied for excess conditions. [20] One treatment cycle comprised 10 consecutive days. One acupuncture session was conducted per day. [21]

From an acupuncture continuing education standpoint, this is important. In the United States, treatment appointments are often 1–3 per week. This is often due to norms of behavior, insurance company limitations, cost, and access to care (including work schedule limitations and transportation issues). However, the research indicates that one robust treatment per day is required. This distinction requires a rethinking of the delegation of acupuncture care in the 1–3 treatments per week protocol.

For modified Long Dan Xie Gan Tang, different ingredients were added according to Traditional Chinese Medicine differential diagnoses. For mood swings, the following herbs were added to the base formula:

- Yujin
- Hehuanpi

For insomnia, the following herbs were added:

- Lingcishi

- Yuanzhi
- Duanlonggu
- Duanmuli

The results indicate that rising liver heat type tinnitus responds well to acupuncture and herbal medicine. However, adding acupuncture to the herbal medicine protocol increases the efficacy over using only herbs. Let's take a look at another investigation.

### **Zhejiang Traditional Chinese Medicine University**

Researchers from Zhejiang Traditional Chinese Medicine University (Zhou et al.) find acupuncture effective for the alleviation of tinnitus due to kidney essence deficiency. [22] A group of patients with tinnitus from kidney jing deficiency were treated with acupuncture for 8 weeks. The results demonstrate that acupuncture produces long-lasting effects.

To confirm clinical efficacy, tinnitus severity was measured using the Tinnitus Handicap Inventory (THI). The THI is a 25-item questionnaire published by Newman et al. (1996). It has a maximum score of 100. The higher the score, the more severe the extent of tinnitus. Patients were evaluated using THI at 3 datapoints: 4 weeks into treatment, at the end of treatment, and 6 months after the end of treatment.

Another questionnaire was used to determine treatment efficacy. The tinnitus severity questionnaire published in 1991 at the 9th Tinnitus Conference in Tokyo classifies tinnitus into 4 tiers of increasing severity as detailed:

- Level 1: Absence of ringing.
- Level 2: Ringing only happens at night or in quiet environment. Work and sleep not affected.
- Level 3: Ringing happens in any environment, but is tolerable. Work and sleep mildly affected.
- Level 4: Ringing happens in any environment and is intolerable. Work and sleep majorly affected.

Based on the above tiers, the treatment efficacy for each patient was categorized into 1 of 4 tiers:

- Clinical recovery: Achieved level 1.
- Significantly effective: Ringing reduced by 2 levels.
- Effective: Ringing reduced by 1 level.
- Ineffective: No reduction in ringing level.

### **Results**

The treatment effective rate for each group was derived with the following formula: [Clinical recovery + Significantly effective + Effective] / [Total number of patients in group] \* 100%. The mean THI score before acupuncture was  $50.87 \pm 11.52$ . Four weeks into treatment, the score fell to  $27.63 \pm 9.05$ . At the end of the 8 weeks of treatment, patients achieved a mean THI score of  $25.49 \pm 10.27$ . Compared with the pre-acupuncture scores, the 4-week and 8-week results indicate that acupuncture effectively alleviates tinnitus ( $P < 0.05$  for both datapoints).

Six months after the end of treatment, a follow-up recorded that patients scored  $30.02 \pm 7.45$  on average for the THI. The post-treatment results did not differ significantly from the three datapoints ( $P > 0.05$ ), highlighting the long-lasting effects of acupuncture. The treatment total effective rate after 8 weeks of treatment was 83.3%, indicating that acupuncture has a high efficacy rate for the attenuation of tinnitus.

### **Design**

The study was set up as a single-arm clinical trial. A total of 72 tinnitus patients from the Acupuncture

Division of Zhejiang Chinese Medicine University Affiliated No. 3 Hospital participated in the study. There were 32 males, 40 females, aged between 35–74 years, with a mean age of 54.6 years and had durations of illness between 1 week to 15 years. Diagnoses for tinnitus were made based on both biomedical and Traditional Chinese Medicine (TCM) diagnostic criteria. Biomedical diagnostic criteria for tinnitus were in accordance with the 1st edition of “Practical Otorhinolaryngology” published by People’s Medical Publishing House (1998):

- Main clinical symptoms: Subjective tinnitus, presenting as cricket-like sounds, whistling/ringing, machinery sounds, roaring etc. Occurring in one or both ears. Intermittent or continuous. May be accompanied by hearing loss or dizziness.
- Physical signs: No ear deformities. No inflammation of ear canal. Eardrums functioning well and not damaged. No anomalies detected in nasopharynx. Severe cardiac or nervous system diseases ruled out.
- Clinical examination: Routine audiological tests including acoustic immittance testing and pure tone audiometry. Inner ear and intracranial CT. Inner ear and intracranial MRI.

TCM diagnostic criteria for tinnitus from kidney essence deficiency were in accordance with “Standards of Diagnosis and Therapeutic Effect for Diseases and Patterns in Chinese Medicine” defined by the State Administration of Traditional Chinese Medicine, as well as “Guiding Principles for Clinical Study of New Chinese Medicines” published by the Ministry of Health of China (1993):

- Cricket-like ringing in the ear, gradually increasing in intensity.
- Deafness in severe cases.
- Accompanied by dizziness, lower back pain or soreness, spermatorrhea, thin-taut pulse or thin-weak pulse, red tongue. Alternatively: accompanied by weak limbs, lower back coldness, impotence, premature ejaculation, deep-thin pulse, or pale tongue with thin and white coating.

The following selection criteria were applied in choosing trial participants:

- Fulfilled the above diagnostic criteria comprehensively.
- Between 18 – 80 years of age.
- Main clinical symptom being ringing in ear and ear fullness.
- Constant recurrence of tinnitus for  $\geq 1$  month before consultation, or continuous tinnitus for  $\geq 1$  week.
- No severe cardiac, neurological, renal, hematopoietic or psychological illnesses.
- Complied with prescribed treatment during study.
- Signed informed consent.
- The following exclusion criteria were applied:
- Pregnant or lactating.
- Severe cardiac, neurological, renal, hematopoietic, or psychological illnesses.
- Conductive or objective tinnitus caused by outer or middle ear conditions.
- Tinnitus due to tumors.
- Complete deafness with tinnitus.
- $<18$  or  $>80$  years old.

Patients received acupuncture for 8 weeks. A follow-up was conducted 6 months after the end of treatment. The following abdominal acupoints were selected (bilateral where applicable):

- Zhongwan (CV12)
- Xiawan (CV10)

- Qihai (CV6)
- Guanyuan (CV4)
- Shangqu (KD17)
- Yindu (KD19)

The following body acupoints were selected:

- Tinggong – Afflicted side (SI19)
- Tinghui – Afflicted side (GB2)
- Yifeng – Afflicted side (TB17)
- Waiguan – Both sides (TB5)
- Hegu – Both sides (LI4)
- Taixi – Both sides (KD3)
- Taichong – Both sides (LV3)

Size 0.25 mm x 40 mm acupuncture needles were used. Needle insertion depths for abdominal acupoints were based on the Sancai measuring method, which outlines three insertion depths: <1 inch (Tian area), 1 inch (Ren area), and 1.5 inches (Di area). For Guanyuan, Qihai, Zhongwan, and Xiawan, needles were inserted up to a maximum of 1.5 inches. Shangqu was pierced 1 inch, and Yindu was pierced <1 inch.

After insertion, warm needle acupuncture with moxibustion was applied to Qihai and Guanyuan. Standard acupuncture protocols were followed for body acupoints. Once all needles were inserted and warmed (Qihai and Guanyuan), a 30-minute retention time was observed. One session was administered, three times per week. Two treatment cycles were administered and four weeks comprised one cycle. The 83.3% total effective rate demonstrates that this protocol is effective for the alleviation of tinnitus.

### **Dongzhimen Hospital**

Dongzhimen Hospital researchers (Fang et al.) from a division of Beijing University of Chinese Medicine conclude that electroacupuncture is effective for the treatment of tinnitus due to liver-gallbladder heat. [23] In addition, electroacupuncture outperformed manual acupuncture.

Two groups of patients were compared in an 8-week clinical trial. One group received conventional manual acupuncture and the other received electroacupuncture. The results demonstrate that patients achieved a greater reduction in ringing with electroacupuncture than with conventional acupuncture.

Referring to the clinical efficacy evaluation guidelines set by Liu Peng, treatment efficacy was evaluated. [24] Tinnitus severity was classified into levels based on symptom presentation. The higher the severity, the higher the level. Based on the improvement in tinnitus levels before and after treatment, the treatment efficacy for each patient was categorized into 1 of 4 tiers:

- Clinical recovery: Absence of ringing.
- Significantly effective: Tinnitus severity decreased by  $\geq 2$  levels.
- Effective: Tinnitus severity decreased by 1 level.
- Ineffective: No reduction in tinnitus severity.

### **Calculation**

The overall treatment effective rate for each group was derived with the following formula: [Clinical recovery + Significantly effective + Effective] / [Total number of patients in group] \* 100%. The treatment significantly effective rate for each group was derived with the following formula: [Clinical recovery + Significantly effective] / [Total number of patients in group] \* 100%.



## Results

Electroacupuncture resulted in a significantly higher overall treatment effective rate than manual acupuncture ( $P < 0.05$ ). The electroacupuncture group had an 89.3% overall treatment effective rate and the manual acupuncture group had an 81.4% rate. Further, there were other differences, especially in the treatment significantly effective rate ( $P < 0.01$ ). The electroacupuncture group had a 78.6% treatment significantly effective rate, while the conventional acupuncture group had a 29.6% rate. The above results show that not only did more patients benefit from electroacupuncture than manual acupuncture, but each patient also benefitted to a greater extent. This suggests that electroacupuncture is a stronger treatment option for tinnitus, among the many types of acupuncture methods available.

## Design

The study was set up as a double-arm clinical trial. A total of 60 patients from the Acupuncture Division of Dongzhimen Hospital at Beijing University of Chinese Medicine participated in the study. They were diagnosed with tinnitus from excessive liver-gallbladder heat between September 2014 and August 2016. Diagnoses for tinnitus were made based on both biomedical and TCM diagnostic criteria. Biomedical diagnostic criteria for tinnitus were in accordance with “TCM Otorhinolaryngology”: [25]

- Subjective tinnitus in one or both ears, single or composite sound, intermittent or continuous.
- Sensorineural tinnitus confirmed by audiological tests.

TCM diagnostic criteria for tinnitus from excessive liver-gallbladder heat were in accordance with “Guiding Principles for Clinical Study of New Chinese Medicines”: [26]

- Abrupt onset of tinnitus.
- Short duration of illness.
- Whooshing or roaring sounds perceived.
- Ringing often worsens due to depression or anger.
- Accompanied by rosy complexion, red eyes, bitter taste in mouth, thirst, constipation, yellow urine, red tongue with yellow coating, rapid-taut strong pulse.
- The following selection criteria were applied in choosing trial participants:
- Fulfilled above diagnostic criteria (both western and TCM).
- Did not receive vasodilative drugs, Chinese herbs, or other treatment for tinnitus in the month before the study.
- Signed informed consent.

The following exclusion criteria were applied:

- Underwent other forms of therapy that might influence treatment results, during the study.
- Severe primary cardiac, neurological, renal and hematopoietic diseases.
- Severe psychological illnesses.
- Not receptive to acupuncture or electroacupuncture.

Participating patients were randomly allocated to either the electroacupuncture group or the manual acupuncture group. To ensure a fair comparison, the gender, age, and duration of illness were equivalent for both groups ( $P > 0.05$ ). Excluding patients who were disqualified during the study, the acupuncture group recorded 27 patients, 15 males, 12 females, between 27 to 63 years, mean age  $48.89 \pm 10.22$  years, duration of illness between 0.5 – 48 months, mean duration of illness  $9.45 \pm 11.8$  months. The electroacupuncture group recorded 28 patients, 12 males, 16 females, between 30 to 63 years, mean age  $49.96 \pm 8.34$  years, duration of illness between 0.67 – 44 months, mean duration of illness  $9.67 \pm 9.83$  months.

The acupuncture group received conventional manual acupuncture and the electroacupuncture group received standard electroacupuncture. Identical acupoints were selected for both groups. Both groups received treatment for 8 weeks. The following primary acupoints were selected (both sides for tinnitus in both ears, afflicted side for tinnitus in one ear):

- Ermen (TB21)
- Tinggong (SI19)
- Tinghui (GB2)
- Fengchi (GB20)
- Gongxue (1.5 inches vertically downwards from Fengchi, aligned with the lower lip)

The following secondary acupoints were selected:

- Taichong (LV3)
- Xingjian (LV2)

### **Acupuncture Protocol**

Size 0.25 mm x 40 mm disposable sterile acupuncture needles and 75% alcohol disinfectant were used. Patients were instructed to open their mouth slightly when inserting Ermen, Tinggong, and Tinghui. These three acupoints were needled to a depth of approximately 1.2 – 1.5 cun, until the patient felt a needle sensation diffusing toward the base of the ear or around the ear.

For Fengchi, the needle was inserted approximately 0.8 – 1.0 inches, oriented diagonally towards the direction of the nose tip, until soreness or fullness was felt in the acupoint. For Gongxue, the needle was inserted 0.8 – 1.0 inches deep, towards the direction of the opposite lip, until soreness or fullness was felt in the acupoint. Standard conventional acupuncture protocol was observed for Taichong and Xingjian, and needles were manipulated with the lift-thrust-rotation attenuation technique.

One 20-minute acupuncture session was administered per day, 2 times per week. A total of 2 treatment cycles were administered and 4 weeks comprised one treatment cycle.

For electroacupuncture, a pulse electroacupuncture device (Model: G6805-1A, Shanghai Huayi Medical Supplies Co., Ltd.) was used. After needles were inserted, the electroacupuncture device was connected to two pairs of acupoints, the first being Ermen and Tinghui, and the second being Fengchi and Gongxue. For each pair, the positive electrode was attached to the upper acupoint while the negative electrode was attached to the lower acupoint. Disperse-dense waves were applied. The intensity was adjusted for each patient within tolerance levels and the needles were slightly pulsing.

The electroacupuncture group had a 78.6% treatment significantly effective rate and the manual acupuncture group had a 29.6% rate. This demonstrates that electroacupuncture is an important treatment modality for patients with tinnitus.

### **Herbal Medicine**

Chinese medicinal herbs have been used for the treatment of tinnitus for well over 1,000 years. The following looks at a product that incorporates Chinese medicinal herbs into their formulation. Researchers at the Department of Otolaryngology at the Health Science Center in Brooklyn (New York), along with their colleagues at the The State University of New York (SUNY) Downstate Medical Center and the Martha Entenmann Tinnitus Research Center, conducted a prospective study to test the efficacy of Clear Tinnitus® for the relief of middle-ear pressure in patients with severe, disabling type tinnitus. Of the 11 patients that completed the study, 7 patients reported relief of their symptoms and 4 did not respond. While more extensive research is necessary with a larger sample size for this type of investigation, these outcomes indicate that additional research is warranted.

Tinnitus, named by the Latin term for “ringing”, is the perception of sound when there is no external sound present. [27] Despite its name, there are a range of sounds associated with tinnitus: roaring, clicking, hissing, buzzing, and, of course, ringing. The quality of sound may range from very loud to very soft, of high or low pitch, and it may be perceived unilaterally or bilaterally. In the past year, approximately 25 million people in the USA have experienced tinnitus lasting at least 5 minutes. [28] However, tinnitus may be intractable and may persist for decades.

For some patients, the sounds associated with tinnitus are a mere annoyance, periodically interrupting their routines. For others, however, the sound is constant, and its severity such that it is difficult to hear external stimuli, let alone concentrate or sleep. This may cause problems with memory and fatigue, provoking emotional anguish, anxiety, and depression. Tinnitus is often the first sign of hearing loss among the aging, but it can also affect the young and otherwise healthy individuals. Repeated exposure to loud noises, as experienced by many manual laborers and musicians, can damage the delicate sensory hair cells in the inner ear. [29] “Noise-induced hearing loss (NIHL) is the second most common acquired hearing loss following presbycusis [age-related hearing loss], and is known as an occupational disorder long ago. It was estimated in 1981 that about 9 million workers in the US are exposed to hazardous levels of noise in the workplace.” [30] Tinnitus is also common among veterans who have been exposed to repeated bomb blasts, which damage the areas of the brain that process sound; it is one of the most common service-related disabilities of those returning from the wars in Iraq and Afghanistan. [31]

Tinnitus is broadly grouped into two categories: subjective and objective. Far more common, subjective tinnitus is most likely caused by abnormal neuronal activity, resulting from a disruption or alteration in the input from the auditory pathway to the brain. Sound is received as vibrations in the cochlea, part of the inner ear, within which tiny hairs pick up the vibrations and transmit them as nerve impulses to the brain. Tinnitus associated with conductive hearing loss—caused by ear infections, wax impaction, or a dysfunction of the eustachian tube (which aerates the middle ear and removes debris)—is also considered subjective, because the sound input to the central auditory system is altered. “Loud noise, aging, Meniere’s disease, and drugs are the most common causes of subjective tinnitus”; common pharmaceuticals such as some antibiotics and antidepressants, water pills (diuretics), and aspirin may cause or exacerbate tinnitus symptoms. [32]

Some patients with tinnitus also experience hyperacusis, a discomfort associated with loud noises. Rarely, it is possible for the practitioner to use amplification tools such as a stethoscope to hear the phantom sound; these cases are considered objective tinnitus. Generally, this is caused by turbulent blood flow in the major vessels to the head, as is prevalent in atherosclerosis and conditions characterized by increased vascularization, such as tumors. Spasms of the muscles serving the palate and middle ear may also result in a perceptible noise, primarily a rhythmic clicking.

In Traditional Chinese Medicine (TCM), tinnitus is categorized by its etiology according to differential diagnostics. “Most recently, tinnitus has been divided into five types at the Third Chinese Zhong Xi Yi Je He Otolaryngology Society Annual Meeting in 2002: Wai Gan Fen Re Xing (related to respiratory infection), Gan Hou Shang Rao Xing (related to abnormal liver function), Tan Re You Jie Xing (related to the ‘hot’ state in TCM), Shen Jing Kui Xu Xing (related to kidney dysfunction) and Pi Xi Xu Ruo Xing (related to abnormal spleen function).” Of these, two can be considered conditions of excess—respiratory infection and heat—and three are associated with deficiencies—of the liver, kidney, or spleen.

A respiratory infection is described by TCM as pathogenic wind attacking the exterior, and is treated by releasing the exterior. Heat conditions associated with tinnitus belong to the liver and gallbladder channels; extreme heat stirs up wind and flames upwards to harass the upper reaches of the channels. To relieve these symptoms, an acupuncturist clears the heat and pacifies the resultant wind. Liver yin deficiency has different symptoms but the same effect: deficient liver yin leads to a preponderance of liver yang (heat), which the relatively deficient yin fails to anchor, so the liver yang, or heat, rises

upwards. In these cases, it is necessary to clear the deficient heat while simultaneously nourishing liver yin, the underlying cause of the deficiency.

Kidney deficiency may produce tinnitus in two ways. Kidney yin deficiency leads to deficient heat rising, and the treatment also requires clearing heat while nourishing the yin of the kidneys. Alternatively, a hypofunction of the kidney denies essential qi the energy necessary to ascend and fill the orifices; in such cases, it is necessary to nourish the kidney essence. While traditional texts do not include the spleen as an etiological factor in the development of tinnitus, spleen deficiency causes phlegm-damp accumulation in the body, which is a factor in the pathogenesis of both atherosclerosis and tumors; thus, this type is most likely associated with the audible sounds of objective tinnitus.

The product Clear Tinnitus® contains a variety of herbs common in homeopathic remedies and Traditional Chinese Medicine. The homeopathic remedies included in Clear Tinnitus® all have specific indications for tinnitus symptoms; some are indicated for ringing in the ears, while others treat the variety of other sound profiles common in tinnitus. A couple also address hearing loss and hyperacusis. Of the eight remedies included, five are traditionally indicated for ringing in the ears: *Cinchona Officinalis*, *Chininum Sulphuricum*, *Kali Carbonicum*, *Kali Iodium*, and *Salicylicum Acidum*. Among these, *Cinchona Officinalis* is also traditionally indicated for hyperacusis, *Kali Iodium* is also traditionally indicated for buzzing, and three—*Chininum Sulphuricum*, *Kali Carbonicum*, *Salicylicum Acidum*—are also traditionally indicated for roaring. *Lycopodium* is traditionally included to treat roaring and deafness, and *Kali Carbonicum* and *Calcarea Carbonica* are indicated for crackling sounds. For hissing sounds, graphites are also included.

The Chinese herbs used in Clear Tinnitus® mostly fall into the category of herbs that release the exterior: *Ge Gen* (*Pueraria* root), *Bai Zhi* (*Angelica* root), *Xin Yi Hua* (*Magnolia* flower), *Qiang Huo* (*Notoptergii* root), *Gui Zhi* (*Cinnamon* bark), and *Sheng Jiang* (*Ginger* root). Among these, *Ge Gen* (*Pueraria* root) is indicated for wind-heat; the rest are indicated for wind cold. *Qiang Huo* (*Notoptergii* root) and *Gui Zhi* (*Cinnamon* bark) are also used to transform dampness and mucus, and *Sheng Jiang* (*Ginger* root) is used to warm the middle jiao.

Another four herbs are used to transform phlegm: *Jie Geng* (*Platycodon* root), *Yi Yi Ren* (*Coix* seed), *Chen Pi* (*Tangerine* peel), *Gan Cao* (*Licorice* root). Of these, *Yi Yi Ren* (*Coix* seed) and *Gan Cao* (*Licorice* root) also tonify the spleen, and *Chen Pi* (*Tangerine* peel) regulates qi. The remaining three herbs are used to subdue wind. *Huang Qin* (*Scutallaria* root) reduces wind by draining fire to calm ascending liver yang, while *Bai Shao* (*Peony* root) and *Chuan Xiong* (*Ligustici* root) subdue wind through their effects on blood, by tonifying and regulating blood respectively. Five also have the effect of lowering blood pressure—*Ge Gen* (*Pueraria* root), *Chuan Xiong* (*Ligustici* root), *Bai Shao* (*Peony* root), *Xin Yi Hua* (*Magnolia* flower), and *Huang Qin* (*Scutallaria* root)—but the mechanisms of action vary.

Traditionally, two herbs directly effects the ear: *Ge Gen* (*Pueraria* root) is indicated for the treatment of tinnitus and *Qiang Huo* (*Notoptergii* root) alleviates any type of ear congestion. Consequently, this combination is likely beneficial for patients whose tinnitus has an etiology of wind. Although some of the herbs regulate blood to subdue deficiency-type wind, the largest single category represented is for herbs of excess-type (exterior) wind conditions.

The eustachian tube is the part of the middle ear that links the ear to the nasopharynx. The tubes help drain fluid from the ears to the back of the throat, and help regulate the pressure in the ears. Swelling, which can be caused by exterior conditions such as a cold, allergies, or a sinus infection, can prevent the eustachian tubes from opening and closing, resulting in a change in middle ear pressure. Herbal medicines benefitting the ear, including dissolving dampness and alleviating congestion, are included in the product and may significantly contribute to its function.

In this study, Goldstein, Shulman and Avitable identified that the clinical type of tinnitus for each of the patients chosen was “predominantly cochlear, with a central and middle-ear component bilaterally.” [33]

Based on physical examinations and tympanometry, the researchers identified a fluctuation in middle-ear pressure (MEP) as a factor in the course of the tinnitus in each of the patients, and examined the effect that Clear Tinnitus® had on this aspect of their symptoms. They found that those who reported tinnitus relief also had an improvement in, or maintenance of, MEP.

To test the hypothesis that Clear Tinnitus® could alleviate tinnitus symptoms by relieving MEP, the researchers conducted a small investigative study. They focused on a single variable—the fluctuation of aeration of the middle ears and eustachian tube dysfunction—and thus chose 15 patients with severe, disabling idiopathic tinnitus, predominantly cochlear in nature with central and middle-ear components bilaterally. [34]

They identified multiple risk dimensions for each patient known to influence the clinical course of subjective tinnitus. “Risk dimensions for each tinnitus patient included noise exposure; stress; associated cochleovestibular complaints of hearing loss; vertigo; ear blockage; hyperacusis; metabolic-cardiovascular complaints; central nervous system complaints highlighting interference in speech expression or memory (or both), headache, nausea, and gait; and affect behavioral alterations of anxiety and depression. Such an analysis provided information of both the sensory and affect components of the tinnitus complaint.” [35]

On each patient they conducted a variety of tests to determine the specific effects of the Clear Tinnitus® remedy. Of the original 15 patients chosen, 11 completed the study trials, with 7 responding on the tinnitus reaction questionnaire (TRQ) that they experienced relief of their tinnitus symptoms, and 4 failing to respond. [36]

The other tests conducted to gauge the subjective experience of the patients were the tinnitus intensity index (TII), the tinnitus annoyance index (TAI), the tinnitus handicap inventory (THI), and the tinnitus stress test (TST). The tests of objective symptoms included quantitative electroencephalography (QEEG), to monitor changes in the electrical activity of the brain, as well tests of audiology to measure hearing loss, audiometry to measure hyperacusis, tympanometry to measure air pressure in the ears (MEP) and the movement of the eardrum, pitch and loudness matching, and minimum masking levels (MML) to evaluate the qualities of the subjective experience of tinnitus. [37]

Seven of the eleven patients completing the study reported relief of their tinnitus symptoms; among them, one completed the study with no tinnitus. [38] All 11 patients who completed the study recorded a negative bilateral MEP. [39] Through tympanometry and physical examination, the researchers established improvement of aeration of the middle ear in 8 patients; the remaining 3 patients had normal (or borderline-normal) MEPs at both the first and last examinations. [40] Of the 7 patients who reported subjective relief of their tinnitus, 5 had improved MEPs and 2 were normal both before and after treatment. Of the 4 patients who did not record tinnitus relief, 3 had MEP improvement, but the TII and THI indicated no significant change. Only one patient reported significant improvement on the TAI. [41]

All 11 patients had similar QEEG patterns; no significant main effects arose, although the delta band displayed an observable drop over the course of the trial. There were no clinically or statistically significant trends discovered in response to audiologic or audiometric tests, and there was no clear trend for LDLs. [42] None of the 11 patients completing the study had adverse reactions, though 3 of the 4 patients who dropped left due to adverse gastrointestinal effects.

Based on the findings, a larger scale study of Clear Tinnitus® is warranted. One reason for lack of research into this type of product is that it is very rare. Chinese medicinal herbs and homeopathy are ordinarily separate treatment modalities. This formula is a hybrid combination, which is a novel approach to the treatment of tinnitus.

## **Summary**

The aforementioned research indicates that acupuncture and herbal medicine are effective modalities for

the alleviation of tinnitus. An intractable disorder, the treatment of tinnitus has long been a challenge for all medical practitioners, including licensed acupuncturists. The research demonstrates important protocols that may bring significant relief to patients with tinnitus. Patients with tinnitus are encouraged to consult with their local licensed acupuncturists to discuss treatment options.

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