

Progress in Research on the Treatment of Idiopathic Tinnitus

Jiahui Wu^{1*}, Guoli Hu¹, Yewen Huang¹, Ting Wei¹, Cheng Lu¹, Lixia Luo¹, Meiqing Lu¹, Jin Liu²

¹Graduate School of Youjiang Medical University for Nationalities, Baise, China

²Department of Otorhinolaryngology, Longhua District Central Hospital, Shenzhen, China

Email: *wujiahui1999gy@163.com

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Abstract

Idiopathic tinnitus refers to tinnitus with no clear etiology, typically manifesting as a subjective perception of sound in the ear, which may be accompanied by hearing loss, aural fullness, etc. It is a clinical manifestation of functional disorders or dysregulation of the auditory system. In recent years, with improvements in quality of life and social development, studies have found that the incidence of tinnitus is increasing, severely affecting patients' quality of life. Thus, the treatment of tinnitus has become a focus of public attention. In clinical medicine, treatment mainly targets hypothetical pathological mechanisms for symptomatic relief, while traditional Chinese medicine (TCM) emphasizes regulation and balance of Yin and Yang, using different decoctions and acupuncture based on clinical patterns. This article reviews the research progress in the treatment of idiopathic tinnitus.

Keywords

Tinnitus, Treatment, Integrated Chinese and Western Medicine, Review

1. Introduction

Tinnitus is the subjective perception of abnormal sounds in the ear without external acoustic stimulation. It is a common clinical symptom in otolaryngology-head and neck surgery, presenting either as an independent disease or a symptom accompanying other conditions. When no clear etiology is identified, it is termed idiopathic tinnitus. With the rapid industrialization and urbanization of modern society, exposure to noise from daily life, entertainment, or occupation has significantly increased, leading to a rising incidence of noise-induced tinnitus. Tinnitus can cause anxiety, stress, depression, insomnia, cognitive impairment, and social isolation, thereby reducing patients' quality of life. Currently, the risk factors for

the occurrence and persistence of tinnitus remain incompletely understood, and clinical treatment methods and efficacy are unclear. Thus, tinnitus has become one of the most urgent yet challenging refractory conditions in clinical practice. In Western medicine, treatment is primarily drug-based, including hormone pulse therapy, Ginkgo biloba for improving circulation, and neurotrophic agents, supplemented by hyperbaric oxygen therapy, psychological therapy, neuromodulation techniques, sound therapy, and habituation therapy, with limited efficacy. In TCM, the core approach is “syndrome differentiation and treatment + holistic regulation,” which posits that tinnitus arises from “dysfunction of Zang-Fu organs, stagnation of Qi and blood, and malnutrition of the ear orifices.” Treatment emphasizes “syndrome classification + harmonizing Qi and blood, nourishing the ear orifices,” with specific patterns including kidney essence deficiency, liver Qi stagnation, spleen-stomach weakness, phlegm-dampness obstruction, and Qi stagnation and blood stasis. Corresponding herbal treatments and acupuncture are administered based on different patterns. This article reviews the progress in treating idiopathic tinnitus from both Western and TCM perspectives.

2. Definition of Tinnitus

Tinnitus is the subjective perception of abnormal sounds in the ear without external acoustic stimulation. It is classified into objective and subjective tinnitus based on whether the sound can be detected by an examiner. Objective tinnitus is often associated with underlying anatomical abnormalities causing abnormal sound generation or perception. In contrast, subjective tinnitus, unlike objective tinnitus, is not caused by actual acoustic stimulation transmitted to the ear canal. Instead, it refers to a subjective perception of sound in the ear or cranium under conditions lacking other physical acoustic stimulation [1]. When no clear etiology is identified, it is termed idiopathic tinnitus. As one of the most common clinical symptoms in otology, tinnitus can be either a symptom of various diseases or an independent disease. With socioeconomic development, improved living standards, and accelerated life rhythms, mental stress from work and daily life has increasingly impacted people, leading to a rising incidence of tinnitus with a younger trend. Tinnitus is often accompanied by irritability, anxiety, and depression; long-term tinnitus significantly impairs patients' quality of life, making research into its pathogenesis and the search for effective drugs increasingly urgent [2] [3].

3. Pathogenesis of Tinnitus

The pathogenesis of tinnitus remains incompletely elucidated. Recent studies have found a close association between the central nervous system and the occurrence and progression of tinnitus. Numerous studies indicate that tinnitus is related to the cochlear nucleus, inferior colliculus, thalamus, and auditory cortex. For example, Wang Yimin suggested that tinnitus may be associated with increased spontaneous discharge activity in the lateral hypothalamic nucleus and secondary auditory cortex [4]. Eggermont and Roberts proposed that the pattern of tinnitus

involves a disinhibition mechanism in the inferior colliculus and dorsal cochlear nucleus (DCN): reduced peripheral input weakens the role of inhibitory neurons in central nuclei such as the inferior colliculus and DCN, leading to excessive discharge and tinnitus [5]. Beyond the widely studied cochlear nucleus, inferior colliculus, thalamus, and auditory cortex, abnormal central nervous system function in tinnitus patients is also closely linked to changes in neurotransmitter levels, trace element imbalances, and abnormal limbic system function [6]. Additionally, studies have found that tinnitus-related neuronal changes are not limited to the central auditory system but may involve non-auditory brain regions. Imaging studies have shown that tinnitus is associated with increased synchronous α activity in the subcallosal anterior cingulate cortex, insula, parahippocampal region, and amygdala [7]. Furthermore, extensive evidence indicates that many tinnitus patients concurrently suffer from anxiety and/or depression. Long-term tinnitus distress can cause mental and even behavioral abnormalities, leading to the view that idiopathic tinnitus is a psychosomatic disorder possibly related to the limbic system [8]. In addition, due to the unclear etiology and complex pathological changes of subjective tinnitus, inner ear microcirculatory disorders causing local ischemia and hypoxia are also considered important etiologies of the disease [9]. Recent studies suggest a close link between tinnitus and neuroinflammation: changes in the intracranial microenvironment and external stimuli can activate microglia, release inflammatory factors, induce neuroinflammation, and further affect the intracranial microenvironment, resulting in tinnitus [10].

4. Current Issues in Tinnitus Research

Most cases of tinnitus are idiopathic, *i.e.*, occurring without obvious etiology, with unclear pathogenesis, undefined pathophysiological progression, poor efficacy of drugs and other auxiliary treatments, and uncertain prognosis. The incidence of tinnitus is increasing annually and affecting younger populations [11], severely impairing quality of life. Long-term tinnitus risks triggering a series of psychosomatic diseases, which in turn exacerbate tinnitus. As one of the three major diseases in otolaryngology, finding effective treatments for tinnitus has become an urgent issue in the field.

5. Research Progress in Western Medicine Treatment of Tinnitus

Western medicine treatments are mostly based on pathogenic mechanisms, but current understanding of tinnitus pathogenesis remains hypothetical, with unclear efficacy. Mainstream Western treatments for tinnitus include:

5.1. Pharmacotherapy

Neurotrophic drugs such as methylcobalamin and citicoline; cochlear circulation improvers such as vasodilators (flunarizine, betahistine), Ginkgo biloba extract (to reduce blood viscosity), and platelet inhibitors (aspirin); and drugs to improve

inner ear energy metabolism such as adenosine triphosphate or coenzyme A [12]. Recent studies have found that lidocaine exhibits good clinical efficacy in improving inner ear microcirculation and hearing [13] [14]. However, as a local anesthetic and antiarrhythmic, it has significant systemic side effects and is not routinely used for tinnitus, only as a short-term experimental treatment in clinical practice.

5.2. Neuromodulation

1) Hyperbaric oxygen therapy: Studies have shown that hyperbaric oxygen improves cochlear hypoxia, reduces inner ear edema and inflammation, and sufficient oxygen supply inhibits free radical formation, enhances cell viability, thereby improving auditory cell function and resisting inflammatory and functional damage [15]. 2) Repetitive transcranial magnetic stimulation (TMS): Involves continuous delivery of multiple pulses over a period to produce sustained stimulation of neural structures. Initially used for treating neurological and psychiatric disorders such as depression, anxiety, schizophrenia, and Parkinson's disease, TMS has recently been applied to tinnitus, particularly centrally sensitized tinnitus, by regulating abnormal activity in the auditory cortex. However, it exhibits large individual differences, requires highly personalized treatment regimens, and has unstable efficacy, so it is not currently used as a routine treatment [16] [17].

5.3. Sound Therapy

Its principle is to reduce auditory central gain using low-level sounds covering the hearing-impaired area to alleviate tinnitus. Specifically, white noise, music, or professional tinnitus maskers can cover tinnitus frequencies, reducing the brain's sensitivity to abnormal signals and improving adaptation to tinnitus. This treatment requires high patient compliance and has a slow onset [18] [19].

5.4. Psychological Therapy

Numerous studies indicate that tinnitus is closely associated with the hippocampal limbic system, which regulates emotions. Clinically, most patients with anxiety or depression often experience tinnitus, leading to the view that tinnitus is a psychosomatic disorder. Thus, psychological therapy, including cognitive-behavioral regulation, can be used as an auxiliary treatment for tinnitus [20] [21].

To date, Western medicine has not found a radical cure for tinnitus; most treatments only temporarily relieve symptoms without achieving long-term stable efficacy or complete elimination.

6. TCM Research on Tinnitus Treatment

TCM descriptions of tinnitus pathogenesis date back to Huangdi Neijing ("The Yellow Emperor's Inner Canon"). The Emperor asked: "What causes ringing in the ears?" Qibo replied: "The ear is where the converging meridians gather. Thus, when the stomach is empty, the converging meridians become deficient; defi-

ciency leads to downward flow, and depletion of meridians causes tinnitus [11].” According to the Guidelines for Common TCM Diagnosis and Treatment of Otolaryngological Diseases (2011), tinnitus is classified into five patterns: wind-heat invasion, liver-fire ascending, phlegm-fire stagnation, spleen-stomach weakness, and kidney essence deficiency, all considered closely related to the liver, spleen, and kidneys. In TCM theory, “the kidney opens into the ear,” and kidney Yin deficiency is a common pattern of tinnitus, thus treatment focuses on replenishing essence and tonifying the kidney, activating blood circulation, and unblocking the orifices. Current TCM treatments include:

6.1. Herbal Therapy

Studies have identified the top 10 most frequently used effective ingredients in tinnitus treatments as *Poria cocos*, *Bupleurum chinense*, *Glycyrrhiza uralensis*, *Paeonia lactiflora*, *Atractylodes macrocephala*, *Polygala tenuifolia*, *Fructus liquidambaris*, *Ligusticum chuanxiong*, *Cyathula officinalis*, and *Codonopsis pilosula*. Common high-frequency herbal combinations are *Glycyrrhiza uralensis* + *Poria cocos* → *Bupleurum chinense*, *Atractylodes macrocephala* + *Paeonia lactiflora* + *Poria cocos* → *Bupleurum chinense*, *Polygala tenuifolia* + *Paeonia lactiflora* + *Bupleurum chinense* → *Poria cocos*, all focusing on soothing the liver and regulating Qi, activating blood circulation and unblocking orifices, strengthening the spleen and draining dampness, and tonifying the kidney and calming the spirit [22]. Different decoctions are administered based on tinnitus patterns. Recent studies have shown that Erlong Zuoci Wan (EZW) exhibits good efficacy either alone or in combination with other therapies [23]. Its therapeutic mechanism may involve reducing discharges in the lateral inferior colliculus (ICx) and secondary auditory cortex (AII) [4], regulating cyclic adenosine monophosphate (cAMP) levels in cochlear tissue, and activating protein kinase A (PKA) expression to exert therapeutic effects on deafness and tinnitus [4]. EZW is derived from Liuwei Dihuang Wan (a six-ingredient decoction) with the addition of magnetite and *Bupleurum chinense*. Liuwei Dihuang Wan consists of *Rehmannia glutinosa*, *Dioscorea opposita*, *Cornus officinalis*, *Paeonia suffruticosa*, *Alisma orientale*, and *Poria cocos* [24] [25]. Modern pharmacological studies have shown that in the EZW formula, *Alisma orientale* has good immunomodulatory effects; *Poria cocos* exerts anti-inflammatory, antioxidant, and antibacterial effects, significantly enhancing immune function in tinnitus patients; *Bupleurum chinense* may inhibit inflammatory factors in the auditory cortex and regulate brain-derived neurotrophic factors, neurotransmitters, and neuroendocrine, thereby treating tinnitus [26]. EZW has become a commonly used TCM for tinnitus.

6.2. Acupuncture Regulation

Lingshu-Kouwen (“Spiritual Pivot-Oral Questions”) states: “The ear is where the converging meridians gather.” The meridian theory of “the ear as a convergence of meridians” provides a theoretical basis for acupuncture treatment of tinnitus.

Modern studies have shown that acupuncture can reduce abnormal electrical activity in the cochlea, promote active reorganization of the auditory cortex to better perceive tinnitus signals, and regulate central neurotransmitters to inhibit or stimulate specific components of the auditory system, improving tinnitus symptoms. Acupuncture at auricular acupoints can also improve local blood supply and oxygenation, promote functional recovery of tissue cells, and regulate inner ear function, providing modern scientific evidence for acupuncture in treating tinnitus [27]. Common acupuncture points in clinical practice include Hegu, Waiguan, Zusanli, Qihai, Zhongwan, Fengchi, Ermen, and Tinggong [28].

6.3. Auricular Point Pressing

Clinically, Vaccaria seeds are often used to press acupoints related to the liver, kidney, external ear, internal ear, subcortex, and endocrine. Stimulation via medicinal seeds acts on the cerebral cortex, activating blood circulation and unblocking orifices, dredging meridians, thereby regulating the disordered auditory system and improving tinnitus [29].

6.4. Diet Therapy

1) For kidney deficiency pattern: Sliced pig kidney mixed with ground *Drynaria fortunei*, simmered and consumed. 2) For Qi deficiency pattern: Ginseng porridge (ginseng, *Saposhnikovia divaricata*, magnetite, pig kidney, japonica rice). 3) For liver-gallbladder fire ascending: *Chrysanthemum japonica* rice (*Chrysanthemum japonica* rice). 4) For spleen deficiency with phlegm-dampness obstruction: Acorus calamus soup (Acorus calamus, pig kidney, scallion, rice) [30]. Regular consumption for 1 - 3 courses is generally effective.

6.5. Other Therapies

Recorded traditional therapies also include emotional regulation, ear plugging, moxibustion, nasal insufflation with drugs, ear fumigation, steaming and ironing, and ear drops.

Modern TCM clinical treatment of tinnitus is multi-level and comprehensive, based on the theory of the five Zang organs and constitutional regulation, while emphasizing psychological and emotional intervention for patients and controlling predisposing factors. In clinical practice, “disease differentiation, syndrome differentiation, and constitution differentiation” are combined based on the characteristics of tinnitus onset, accompanying symptoms, tongue coating, and pulse condition, enabling long-term regulation of tinnitus.

7. Discussion and Prospects

Western and TCM approaches to tinnitus treatment, based on different theoretical systems and practical paths, each have advantages and disadvantages. Western medicine can target etiologies with rapid onset and obvious efficacy, suitable for acute tinnitus, but has unclear efficacy for idiopathic tinnitus with unknown eti-

ology, and some drugs (e.g., hormones) are not suitable for long-term use. TCM, guided by holistic regulation and syndrome differentiation, offers diverse treatments including herbal medicine, acupuncture, bloodletting puncture, point injection, guidance techniques, emotional therapy, and control of predisposing factors. Characterized by holistic concepts and syndrome differentiation, TCM enables long-term regulation of tinnitus, suitable for chronic cases.

For idiopathic tinnitus with unclear mechanisms and etiology, TCM syndrome differentiation combined with holistic regulation shows better efficacy compared to Western medicine. It can also provide treatment regimens for non-idiopathic tinnitus. Theoretically, integrated Chinese and Western medicine therapy may achieve better efficacy. With continuous innovation and practice, research on tinnitus treatment is expected to make further breakthroughs.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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