

Clinical Application and Mechanism Exploration of Acupuncture in the Treatment of Allergic Rhinitis

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ABSTRACT

Allergic Rhinitis (AR) is a globally prevalent chronic allergic disease of the nasal mucosa, with paroxysmal sneezing, watery nasal discharge, nasal itching, and nasal congestion as core symptoms, significantly affecting patients' quality of life. Although modern medicine can quickly alleviate symptoms, it has limitations such as obvious side effects and easy relapse after discontinuation. As a characteristic therapy of Traditional Chinese Medicine, acupuncture shows advantages of simple operation, high safety, and definite efficacy in the treatment of AR. Combining relevant research in the past five years, this paper systematically reviews the clinical application (including single acupuncture therapy and combined therapy) and mechanism of acupuncture in the treatment of AR, finding that single therapies such as filiform needle acupuncture (such as Five Gates and Ten Changes acupoint combination), warm needling, and refined moxibustion can effectively reduce the Total Nasal Symptom Score (TNSS) and Total Non-Nasal Symptom Score (TNNSS), while acupuncture combined with drugs or Chinese medicine can further enhance the therapeutic effect (Total effective rate $RR=1.17$, $95\%CI[1.13,1.21]$). Its mechanism of action is mainly related to regulating immune balance (Th1/Th2), improving nasal nerve function, and modulating the hypothalamic-pituitary-adrenal (HPA) axis. Currently, related research still has problems such as small sample sizes and inconsistent efficacy standards. In the future, more high-quality multicenter studies are needed to promote the standardization and normalization of acupuncture treatment for AR.

KEYWORDS

Allergic Rhinitis (AR); Acupuncture treatment; Clinical application; Mechanism of action; Efficacy evaluation (TNSS/TNNSS)

1 Introduction

1.1 Epidemiological characteristics and health burden of allergic rhinitis

Allergic rhinitis (AR) is a non-infectious chronic inflammatory disease of the nasal mucosa mediated by specific immunoglobulin E (IgE). The most typical clinical symptoms are paroxysmal sneezing, watery rhinorrhea, nasal itching, and nasal congestion, often accompanied by eye itching, conjunctival congestion, and tearing. In severe cases, it can even cause headaches, dizziness, memory decline, and decreased sense of smell ^[1,8].

From an epidemiological perspective, the global prevalence of AR has reached 10%-40%, and it has been continuously rising in recent years due to factors such as environmental changes and lifestyle modifications. It shows no obvious geographical limitations and has both perennial and seasonal characteristics ^[8]. In our country, the self-reported prevalence rate of AR exceeds 17%, with children and adolescents being the high-risk population (incidence rate approximately 20%-30%). Especially in humid areas, the incidence rate of perennial AR is higher due to dense dust mites ^[1,8].

The impact of AR on patients' quality of life is multifaceted: nasal congestion leads to sleep disorders, such as difficulty falling asleep and a sleep interruption rate exceeding 60%; frequent sneezing and runny nose cause embarrassment in social situations, resulting in a 40% decrease in social activity participation; fatigue and difficulty concentrating also reduce work or study efficiency by 30%-50%. More critically, long-term illness increases the risk of complications such as asthma (comorbidity rate 30%-50%) and sinusitis, imposing a dual burden on both personal health and social medical resources ^[1,12].

1.2 Limitations of modern medical treatments for AR

Currently, the mainstream approaches for modern medical treatment of AR include three categories: pharmacotherapy, immunotherapy, and surgical treatment. Among these, pharmacotherapy mainly consists of antihistamines (such as loratadine) and intranasal corticosteroids (such as budesonide). Although they can quickly alleviate symptoms such as nasal itching and sneezing within 15-30 minutes, long-term use easily leads to side effects—antihistamines may cause drowsiness (incidence rate 10%-20%) and dry mouth, while intranasal corticosteroids carry the risk of nasal mucosa atrophy (incidence rate 3%-5%) ^[1,12]; Immunotherapy (such as sublingual administration of dust mite allergens) can only target a single allergen, and the treatment course is particularly long, requiring 6-36 months. Not to mention the high cost, the recurrence rate remains 25%-30% even 2 years after discontinuation ^[1-2]; Surgical treatment (such as inferior turbinate reduction surgery) is only suitable for patients who do not respond to medication and have nasal anatomical abnormalities. It is an invasive treatment, with a postoperative nasal dryness incidence rate exceeding 40% ^[1,10].

Overall, modern medical approaches primarily focus on symptom control, making it difficult to fundamentally improve patients' physical conditions. This fails to meet the clinical demand for "safe and long-lasting" treatment options.

1.3 Research significance and objectives of acupuncture treatment for AR

As a traditional therapy in Traditional Chinese Medicine, acupuncture has unique advantages in the treatment of AR: a single treatment session takes approximately 30 minutes and is simple to perform; it has few side effects, with the incidence of local bleeding or pain being less than 5%; moreover, it not only alleviates symptoms but also regulates physical constitution, for example, helping patients with lung qi deficiency and cold to relieve problems such as aversion to cold and fatigue^[1,5]. Research in the past five years has also shown that acupuncture not only reduces TNSS and TNNSS scores in AR patients but also regulates immune function and improves the local nasal microenvironment^[4,11].

Therefore, based on the results of clinical studies and mechanistic explorations in the past five years, this paper aims to systematically analyze the clinical application patterns (including monotherapy and combination therapy) and therapeutic efficacy differences of acupuncture treatment for AR, clarify its mechanisms of action (immunoregulation, neuroregulation, neuro-endocrine regulation), while pointing out the limitations of current research and proposing future directions, to provide a reference for the standardized application of acupuncture in the clinical treatment of AR.

2 Overview of allergic rhinitis

2.1 Modern medical understanding of AR

2.1.1 Definition and classification

According to the 'Allergic Rhinitis and its Impact on Asthma' (ARIA) guidelines, AR is a non-infectious chronic inflammatory disease of the nasal mucosa mediated by IgE that occurs in atopic individuals after exposure to allergens^[8]. Clinically, it is mainly divided into two categories:

Among them, perennial AR (PAR) occurs throughout the year, with allergens mostly being common indoor substances such as dust mites, animal dander, and fungal spores, resulting in persistent symptoms with small fluctuations (TNSS score stable at 6-10 points), and having a more lasting impact on patients' daily lives^[6]; while seasonal AR (SAR) mainly occurs during pollen seasons, such as tree pollen from March to May, grass pollen from June to August, and ragweed pollen from September to October, with symptoms appearing suddenly (TNSS score sharply increases to 8-12 points), and can resolve spontaneously after the pollen season passes^[8].

In addition, according to the severity of symptoms, it can also be divided into mild (TNSS ≤ 6 points, does not affect sleep) and moderate to severe (TNSS > 6 points, interferes with sleep or work)^[12].

2.1.2 Pathogenesis

The core pathogenesis of AR is IgE-mediated type I hypersensitivity reaction, which is mainly divided into three phases:

The first phase is the sensitization phase, where allergens such as house dust mite Der p1 are captured by dendritic cells in the nasal mucosa and then presented to CD4+ T cells, inducing their differentiation into Th2 cells; Th2 cells secrete IL-4, promoting B cells to proliferate and differentiate into plasma cells, producing specific IgE, which binds to the surface of mast cells or basophils via FcεRI receptors^[8,12],

The second phase is the activation phase, when the body re-encounters the same allergen, the allergen cross-links with IgE, activating signaling pathways, triggering mast cell degranulation, and releasing inflammatory mediators such as histamine, leukotriene C4 (LTC4), and prostaglandin D2 (PGD2)^[12];

The third phase is the effector phase, where histamine acts on H1 receptors, causing vasodilation of nasal mucosa (manifested as nasal congestion) and increased glandular secretion (manifested as rhinorrhea); while LTC4 prolongs the inflammatory response, lasting 24-48 hours, further aggravating nasal mucosal edema and eosinophil (EOS) infiltration^[8,12].

2.1.3 Diagnostic criteria and evaluation metrics

The diagnosis of AR should refer to the ARIA guidelines and must simultaneously meet two conditions: first, the presence of typical symptoms (at least 2 of sneezing, rhinorrhea, nasal itching, and nasal congestion, lasting ≥ 1 hour daily, with a course of ≥ 2 weeks); second, positive allergen detection, such as a wheal diameter ≥ 3 mm in skin prick tests, or serum-specific IgE ≥ 0.35 kUA/L^[8,10].

Efficacy evaluation metrics are divided into subjective and objective categories: subjective indicators include TNSS (each of sneezing, rhinorrhea, nasal congestion, and nasal itching rated 0-3 points, total score 0-12), TNNSS (each of accompanying symptoms such as eye itching and tearing rated 0-3 points, total score 0-15), and the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ), covering 7 dimensions with a total score of 0-42^[5-6]; objective indicators include serum total IgE (normal range 0-100IU/mL, mostly exceeding 150IU/mL in AR patients), peripheral blood EOS count (normal $0.05-0.5 \times 10^9/L$, often exceeding $0.5 \times 10^9/L$ in AR patients), and nasal mucosa EOS infiltration (biopsy showing ≥ 10

cells/high-power field)^[2,12].

2.2 Understanding of AR in TCM

2.2.1 Etymology of the disease name

In TCM classics, AR falls under the category of "bi qiu". The term "bi qiu" first appeared in "Suwen-Maijie Pian", which records "invasion of collateral channels causes headache, bi qiu, and abdominal swelling", marking the first connection between nasal diseases and meridians and qi-blood^[10]; During the Jin Dynasty, "Helian Liushu" clearly stated "qiu refers to clear nasal discharge", defining the core symptom of "bi qiu"; In the Ming Dynasty, "Waiké Zhengzong" further added "bi qiu is characterized by watery nasal discharge, caused by lung qi deficiency and invasion of wind-cold", further elaborating on the relationship between etiology and symptoms^[9-10]. In addition, other TCM records such as "qiu ti" and "bi liu qing ti" also correspond to AR symptoms, these collectively form the disease nomenclature system for AR in TCM^[9].

2.2.2 Etiology and pathogenesis

In TCM, the core pathogenesis of AR is 'deficiency of zang-fu organs and retention of latent pathogens', and the dysfunction of the lung, spleen, and kidney is the fundamental cause.

For example, the lung qi deficiency and cold type accounts for 60%-70% of AR patients, mostly due to insufficient innate constitution or chronic disease consuming lung qi, leading to weak lung qi and insecure defensive qi, which allows wind-cold pathogens to easily invade the nasal cavity; when lung qi fails in its dispersing function, it results in loss of control of body fluids (manifested as clear nasal discharge) and obstruction of qi flow in the nasal cavity (manifested as nasal congestion)^[11,10].

The spleen qi deficiency type accounts for 20%-25%, often due to improper diet or overwork damaging spleen qi, insufficient production of qi and blood will deprive the nasal cavity of nourishment, and spleen dysfunction in transportation will also lead to internal generation of dampness, which ascends to the nasal cavity, further aggravating nasal congestion and causing persistent nasal discharge^[5,10].

The kidney yang deficiency type is relatively rare, accounting for only 5%-10%, mostly due to congenital kidney yang deficiency or chronic disease damaging the kidney, insufficient kidney yang leads to inadequate warming, resulting in the lung losing nourishment (this is related to the theory of 'lung and kidney mutual generation'), abnormal water metabolism will also cause cold water to ascend to the nasal cavity, and patients often have symptoms such as aversion to cold, cold limbs, and soreness in the lower back and knees^[9-10].

There is also the lung heat excess type, accounting for less than 5%, mostly caused by external contraction of wind-heat or consumption of spicy foods leading to heat stagnation in the lung meridian, when heat pathogens steam upward to the nasal cavity, it results in nasal itching, yellow and thick nasal discharge, and is often accompanied by dry mouth and sore throat^[10].

2.2.3 Key points for pattern differentiation

In TCM, pattern differentiation for AR requires integration of three dimensions: symptoms, tongue signs, and pulse signs:

Patients with Lung Qi Deficiency and Cold pattern typically have profuse clear nasal discharge, aggravated nasal congestion upon exposure to cold, accompanied by aversion to cold and fatigue. The tongue appears pale with a white coating, and the pulse is floating and weak^[11].

Patients with Spleen Qi Deficiency pattern have persistent thin white nasal discharge, often accompanied by poor appetite and loose stools, as well as mental fatigue and limb weakness. The tongue is mostly pale and swollen with teeth marks and a greasy white coating, and the pulse is soft and weak^[5].

Patients with Kidney Yang Deficiency pattern experience watery nasal discharge, particularly prominent nasal congestion at night, accompanied by aversion to cold and cold limbs, increased nocturia. The tongue appears pale with a white and slippery coating, and the pulse is deep and thin^[9].

Patients with Lung Channel Heat Excess pattern have significant nasal itching, thick yellow nasal discharge, accompanied by dry mouth and sore throat. The tongue is red with a thin yellow coating, and the pulse is floating and rapid^[10].

3 Clinical application of acupuncture in ar treatment

3.1 Single acupuncture therapy

Single acupuncture therapy is the basic approach for AR treatment, with the core being the regulation of zang-fu organ functions and meridian qi and blood through syndrome differentiation and acupoint selection. It mainly includes filiform needle acupuncture, moxibustion, and some special therapeutic methods.

3.1.1 Filiform needle therapy

The core of filiform needle therapy is "syndrome differentiation and acupoint selection," from which many special acupoint combination schemes have been derived. The therapeutic efficacy varies with different syndrome patterns.

Jiang Hong et al. conducted a study involving 58 AR patients with spleen-lung qi deficiency syndrome, who were randomly divided into a treatment group and a control group, with 29 cases in each group. The treatment group received Five Gates and Ten Changes acupoint combination (bilateral Taibai, Zulinqi, Zusanli, Yingu, Taiyuan, Hegu, Yingxiang, Yintang), while the control group used budesonide nasal spray. Both groups received treatment twice a week for four weeks as one course of treatment. The results showed that after treatment, the total TNSS scores of both groups were significantly lower than before treatment ($P<0.001$), but the total TNSS score of the treatment group (3.24 ± 1.56) was significantly lower than that of the control group (5.87 ± 1.89) ($P<0.001$); moreover, the treatment group also showed significantly better scores than the control group in the "nasal symptoms" and "activity limitations" sub-items of the RQLQ scale ($P<0.05$), and could improve TCM syndromes such as fatigue, shortness of breath, poor appetite, and loose stools [5].

Du Zhongming conducted a study on perennial allergic rhinitis (PAR), randomly dividing 59 patients into a holistic acupoint selection group (29 cases) and a local acupoint selection group (30 cases). The holistic acupoint selection group chose Dazhui (GV14), Feishu (BL13), Zusanli (ST36), and Hegu (LI4), while the local acupoint selection group chose Yingxiang (LI20) and Yintang (EX-HN3). Both groups received treatment once every other day, with 4 weeks as a course of treatment, and were followed up for 2 months. The results showed that at weeks 2-3 of treatment, the TNSS scores (5.00 ± 1.23 , 5.50 ± 1.12) of the local acupoint selection group were significantly lower than those of the holistic acupoint selection group ($P<0.05$), indicating that local acupoint selection is more effective in rapidly improving nasal symptoms. However, at the 2nd month of follow-up, the RQLQ score (23.00 ± 3.56) and TNNSS score (2.00 ± 0.56) of the holistic acupoint selection group were significantly lower than those of the local acupoint selection group ($P<0.05$), suggesting that holistic acupoint selection has advantages in long-term efficacy and improvement of concomitant symptoms [6].

3.1.2 Moxibustion

Moxibustion primarily relies on warm heat stimulation to warm the meridians, disperse cold, and support the righteous qi, being particularly suitable for the deficiency-cold syndrome pattern of AR, among which warm needling moxibustion and refined moxibustion are most widely applied.

Wang Dan selected 72 cases of AR patients with lung qi deficiency-cold pattern, randomly dividing them into a warm needling moxibustion group (36 cases) and a conventional acupuncture group (36 cases). The acupoints selected for both groups were Feishu (BL13), Lieque (LU7), Yingxiang (LI20), and Yintang (EX-HN3). The warm needling moxibustion group applied moxa sticks to warm the needle handles after obtaining qi through acupuncture, while the conventional acupuncture group only performed acupuncture. Both groups received treatment twice weekly, with four weeks constituting one course of treatment. The results showed that the total effective rate of the warm needling moxibustion group (90.91%) was significantly higher than that of the conventional acupuncture group (81.82%) ($P<0.05$). Moreover, the total TNSS score (2.87 ± 1.23) and total nasal sign score (1.23 ± 0.56) of the warm needling moxibustion group were also significantly lower than those of the control group ($P<0.05$), with more prominent improvements in nasal congestion and rhinorrhea symptoms [11]. Chen Feixue observed the therapeutic effect of precise moxibustion combined with conventional acupuncture, randomly dividing 60 AR patients into a treatment group (30 cases) and a control group (30 cases). The control group received only conventional acupuncture, while the treatment group received precise moxibustion (selecting Feishu and Zusanli points) in addition to conventional acupuncture. Two weeks constituted one course of treatment, with a total of two courses. The results showed that the total effective rate of the treatment group (86.21%) was higher than that of the control group (79.31%) ($P<0.05$). Moreover, in terms of nasal congestion and runny nose subscores of TNSS, as well as the nasal or oral maxillary pain subscore of TNNSS, the improvement in the treatment group was more significant ($P<0.05$) [7].

3.1.3 Characteristic acupuncture techniques

He's Three-Channel Acupuncture Method is commonly used by Professor Zhang Zheng. He believes that the pathological basis of AR is "deficiency of zang-fu organs and retention of latent pathogens," and the main pathogenesis is weakness of zang-fu organs and disharmony of meridian qi. Therefore, he advocates "unblocking and tonifying" as the treatment principle, primarily using He's Three-Channel Acupuncture Method. In clinical practice, the 'micro-penetrating method (filiform needle acupuncture)', 'warm-penetrating method (moxibustion)', and 'strong-penetrating method (pricking bloodletting)' are flexibly combined. Acupoint selection emphasizes fewer but precise points, addressing both local orifice opening and overall organ tonification, resulting in significant clinical effects. For example, for lung qi deficiency and cold type, Yingxiang (micro-penetrating) and Feishu (warm-penetrating) are selected, while for lung meridian heat excess type, Shaoshang (strong-penetrating) is added [9].

Auricular acupressure is often used as an adjunctive therapy. Zhao Shuang et al. proposed selecting ear acupoints such

as nose, lung, spleen, kidney, and adrenal gland. After disinfection with 75% alcohol, Vaccaria seeds are applied and pressed 3-4 times daily, with 5-7 days constituting one course of treatment. This approach can both regulate immune function and reduce recurrence during remission periods ^[4].

3.2 Acupuncture combined therapy

The combined use of acupuncture with drugs or Chinese medicine can exert synergistic effects, further enhance therapeutic efficacy, and reduce the limitations of single therapy, making it particularly suitable for patients with acute exacerbation and moderate to severe AR.

3.2.1 Acupuncture combined with conventional medication

Chen Ting selected 131 patients with acute exacerbation of AR admitted to Changping District Hospital of Traditional Chinese Medicine in Beijing from March 2021 to May 2023, and randomly divided them into a control group (64 cases) and an observation group (67 cases). The control group was treated with conventional medication (budesonide nasal spray + loratadine), while the observation group received acupuncture (selecting Yingxiang, Yintang, Hegu) in addition to the control group's treatment. Both groups were treated three times a week, with two weeks as a course of treatment. The results showed that after treatment, both the EOS count and percentage decreased in both groups, but were lower in the observation group than in the control group ($P < 0.05$); moreover, the total effective rate of treatment in the observation group (92.54%) was higher than that in the control group (78.13%) ($P = 0.013$), while the recurrence rate (7.46%) and incidence of adverse reactions (4.48%) were significantly lower than those in the control group ($P < 0.05$) ^[2].

Ma Xingang, for moderate to severe persistent AR, randomly divided 60 patients into a basic treatment group (30 cases) and an acupuncture treatment group (30 cases). Both groups received health education, the basic treatment group only used desloratadine, while the acupuncture treatment group added acupuncture (selecting Yingxiang, Zusanli, Feishu) on the basis of using desloratadine. The course of treatment was 4 weeks for both groups. The results showed that the total effective rate of the acupuncture treatment group (93.33%) was significantly higher than that of the basic treatment group (70.00%) ($P < 0.05$); moreover, after treatment, the scores of TCM syndromes, VAS score, and RQLQ score in the acupuncture treatment group decreased more significantly than those in the basic treatment group ($P < 0.05$); in terms of serum indicators, the levels of IL-4, IL-13, and IgE in the acupuncture treatment group were significantly lower, while the level of IFN- γ was significantly higher ($P < 0.05$) ^[12].

3.2.2 Acupuncture combined with traditional Chinese medicine

Xiao Yao et al. evaluated the efficacy of acupuncture combined with traditional Chinese medicine through meta-analysis. They systematically searched for randomized controlled trials in databases such as China Biology Medicine, CNKI, Wanfang, and PubMed, primarily through computer electronic searches supplemented by manual searches. A total of 60 RCTs involving 4841 patients were included. The methodological quality was assessed using the Cochrane assessment tool, the quality of evidence was evaluated using GRADE pro 3.6 software, and Meta-analysis was performed using RevMan 5.4 software. The results showed that the acupuncture plus Chinese medicine group was significantly superior to the Chinese medicine alone group in terms of improvements in total effective rate ($RR = 1.17$, 95%CI[1.13, 1.21]), RQLQ score ($SMD = -2.09$, 95%CI[-3.21, -0.98]), TNSS score ($SMD = -0.96$, 95%CI[-1.63, -0.29]), serum IgE ($SMD = -1.14$), and EOS count ($SMD = -2.18$) ($P < 0.05$), and it also showed good safety ^[3].

In clinical practice, doctors prescribe Chinese medicine combinations based on syndrome patterns. For example, for the lung qi deficiency and cold syndrome, Yupingfeng San combined with Xanthium Powder is often used, while for the spleen qi deficiency syndrome, Buzhong Yiqi Decoction is prescribed. Through the synergistic effect of "acupuncture unblocking meridians and Chinese medicine regulating zang-fu organs," the therapeutic effect is enhanced ^[10].

4 The mechanism of acupuncture in treating AR

4.1 Immunoregulatory mechanism

Immune imbalance is the core pathological process of AR, and acupuncture can improve this imbalanced state by regulating immune function through multiple targets.

First is balancing Th1/Th2 cell polarization. AR patients generally exhibit Th2 cell hyperfunction (manifested as elevated levels of IL-4 and IL-13) and suppressed Th1 cell function (reduced IFN- γ levels). Ma Xingang's research found that acupuncture can increase IFN- γ levels in the serum of AR patients by 20%-30%, while reducing IL-4 and IL-13 levels by 15%-25%, thereby reversing the Th1/Th2 imbalance ^[12]. Du Zhongming's animal experiments also confirmed that acupuncture can increase the proportion of Th1 cells and decrease the proportion of Th2 cells in the splenic tissue of AR rats, raising the Th1/Th2 ratio from 0.35 to 0.82 [6]. Secondly is the inhibition of IgE production and mast cell activation. Acupuncture can downregulate B cell activity, reduce the proportion of CD19+ B cells (by approximately 5%-10%), and also inhibit IL-4-induced IgE class switching, leading to a 25%-30% reduction in total serum IgE levels ^[5,12]; at the same time, it can reduce

the degranulation rate of mast cells in the nasal mucosa (from 65% to 30%), inhibit histamine release (serum histamine decreased from 185ng/mL to 112ng/mL), and the underlying mechanism may be related to the downregulation of FcεRI receptor expression on the mast cell surface^[4,12].

Finally is the reduction of EOS infiltration and activation. Acupuncture can decrease the levels of EOS chemokine (eotaxin-1) in peripheral blood (by 30%-40%), reduce EOS migration to the nasal mucosa, causing the nasal mucosa EOS count to decrease from 15.6 cells/high-power field to 5.2 cells/high-power field^[2-3]; at the same time, it can inhibit EOS release of cationic protein (ECP), alleviate nasal mucosa epithelial damage, and reduce the epithelial cell apoptosis rate from 28% to 12%^[12].

4.2 Neuromodulation mechanisms

Neural dysfunction of the nasal mucosa is an important cause of AR symptoms, and acupuncture can improve these symptoms by regulating nerve function.

On one hand is balancing sympathetic-parasympathetic nerves. Acupuncture can increase the levels of the sympathetic neurotransmitter norepinephrine (NE) in the nasal mucosa (from 85pg/mL to 132pg/mL), constrict nasal mucosal blood vessels, thereby alleviating nasal congestion; at the same time, it can also reduce the levels of the parasympathetic neurotransmitter acetylcholine (ACh) (from 125pg/mL to 88pg/mL), decreasing glandular secretion^[4,11].

On the other hand is reducing sensory nerve sensitivity. In AR patients, the release of Substance P (SP) and calcitonin gene-related peptide (CGRP) from sensory nerve endings in the nasal mucosa is elevated, while acupuncture can reduce the levels of these two substances (SP from 65pg/mL to 32pg/mL, CGRP from 85pg/mL to 45pg/mL), and also increase the sensory nerve threshold (from 0.5mA to 1.2mA), reducing the triggering of sneeze reflex^[4]. In addition, acupuncture can also improve local blood circulation in the nasal cavity. Detection using laser Doppler flowmetry found that acupuncture can increase nasal mucosal blood flow by 25%-30%, while reducing vascular permeability (Evans blue exudation decreased by 40%), accelerating the clearance of inflammatory mediators, and alleviating nasal mucosal edema^[1,11].

4.3 Overall neuro-endocrine regulation

Acupuncture can also achieve overall regulation of AR by modulating the hypothalamic-pituitary-adrenal (HPA) axis. Du Zhongming, through an AR rat model, found that acupuncture can reduce the levels of corticotropin-releasing hormone (CRH) and adrenocorticotrophic hormone (ACTH) in serum ($P < 0.05$), improving the functional disorder of the HPA axis; meanwhile, the behavioral scores (sneezing, rhinorrhea frequency) of rats in the acupuncture group were significantly lower than those in the model control group, and pathological changes such as nasal mucosal cilia lodging and edema were also milder^[6].

Clinical research also suggests that acupuncture methods with holistic acupoint selection, such as Dazhui and Feishu, have a more significant regulatory effect on the HPA axis, which is consistent with their superior long-term therapeutic effects^[6].

5 Research limitations and future prospects

5.1 Current research limitations

However, although some progress has been made in research on acupuncture treatment for AR, there are still obvious deficiencies.

Firstly, the clinical research design is not rigorous enough. Over 80% of studies are single-center with small sample sizes, mostly ranging from 30-67 cases, with only 5% being multicenter studies. Moreover, the implementation of blinding is difficult, with only 10% of studies using sham acupuncture controls, which easily leads to bias^[1,3].

Secondly, the evaluation criteria for therapeutic efficacy are not unified. 30% of studies only use subjective symptom scores (such as TNSS), lacking support from objective indicators. Furthermore, the definitions of 'effective' and 'significantly effective' vary greatly; for example, some studies define a reduction in TNSS $\geq 30\%$ as effective, while others use $\geq 50\%$, making it difficult to compare results across different studies^[1,5]. Furthermore, the research on mechanisms is relatively fragmented. Most studies focus on local immunity, such as indicators like IgE and EOS, while the exploration of overall regulatory mechanisms such as the HPA axis and neuropeptides is not in-depth enough, and there is also a lack of support from multi-omics technologies like transcriptomics and metabolomics^[4,6].

Lastly, the treatment protocols are not standardized. There are significant variations in acupoint selection, acupuncture techniques (such as the intensity of reinforcing and reducing methods), and course of treatment design. For example, for the same type of lung qi deficiency and cold AR, some studies select "Feishu + Lieque" as the main acupoints, while others choose "Dazhui + Zusanli", lacking a unified standardized protocol^[1,11].

5.2 Future research directions

To address these shortcomings, future research can make breakthroughs in the following directions:

First is to conduct high-quality clinical studies. Design large-sample multicenter randomized controlled trials, with a minimum sample size of 100 cases per single center, while adopting a "sham acupuncture + single-blind" design to reduce bias; also extend the follow-up period to 12 months, focusing on evaluating recurrence rates and complication prevention effects^[1,3].

Second is to establish a unified efficacy evaluation system. Construct a five-dimensional evaluation system of "TNSS + RQLQ + serum IgE + nasal mucosa EOS + nasal resistance", clarify the efficacy grading standards through expert consensus, making the results of different studies more comparable^[1,12].

Third is to deepen mechanism research. Combine animal experiments and clinical samples, use multi-omics technologies to explore the synergistic regulatory pathways of acupuncture on the immune-neuro-endocrine network, clarify the mechanistic differences of different acupuncture protocols, and make the scientific connotation of acupuncture treatment clearer^[6,12]. Fourth is the development of standardized treatment protocols. Optimizing acupoint combinations and operational specifications based on different syndrome patterns, such as clarifying details like acupuncture depth and moxibustion quantity, to form standardized procedures for different syndrome patterns, providing operable evidence for clinical promotion in primary medical institutions^[1,9].

6 Conclusion

Overall, the clinical efficacy of acupuncture in treating AR is clear—whether it's single therapies such as filiform needle acupuncture or warm needle acupuncture, or combined therapies of acupuncture with medication or Chinese medicine, all can effectively improve patients' nasal symptoms (reducing TNSS and TNNSS scores), enhance quality of life (improving RQLQ scores), and have high safety with few side effects.

Its mechanism of action is also relatively clear, mainly involving three aspects: first is immunoregulation, such as balancing Th1/Th2 cells, inhibiting IgE production and EOS activation; second is neuromodulation, such as balancing sympathetic-parasympathetic nerves and improving nasal blood circulation; third is overall neuroendocrine regulation, with the core being regulation of the HPA axis.

Although current research still has problems such as non-standardized designs and inconsistent protocols, with the development of high-quality research and the establishment of standardized protocols, acupuncture is expected to become a core intervention in comprehensive AR treatment, providing patients with safer and longer-lasting treatment options.

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