

A Discussion on the Mechanisms and Research Progress of the Combined Treatment of Insomnia Due to Deficiency of Both the Heart and Spleen with Acupuncture and Gui Pi Decoction Based on the Brain-Gut Axis Theory

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Abstract: *Insomnia is a common clinical sleep disorder, and deficiency of both the heart and spleen is one of its primary clinical patterns. The core pathogenesis involves deficiency of qi and blood, inadequate nourishment of the heart spirit, and dysfunction of the spleen and stomach. In modern medicine, the gut-brain axis theory reveals a bidirectional signaling mechanism between the gut and the central nervous system; this pathway plays a key role in sleep regulation and aligns with the classical TCM theories that “when the stomach is not harmonious, sleep is disturbed” and “the heart and spleen are interrelated.” The combination of acupuncture and Gui Pi Decoction has demonstrated significant efficacy in the clinical treatment of insomnia caused by deficiency of both the heart and spleen. It intervenes in the gut-brain axis through multiple pathways—including the regulation of neurotransmitter secretion, gut microbiota homeostasis, hypothalamic-pituitary-adrenal (HPA) axis function, and immune-inflammatory responses—ultimately achieving the goal of improving sleep. Taking the gut-brain axis theory as a starting point, this article reviews the pathological mechanisms of heart-spleen deficiency-type insomnia from both traditional Chinese and Western medical perspectives. It elaborates on the mechanisms of action, research progress, and current challenges of the combination of acupuncture and Gui Pi Decoction, providing a theoretical basis for further mechanistic research and the optimization of clinical applications of this therapy.*

Keywords: Gut-brain axis, Insomnia due to deficiency of both the heart and spleen, Acupuncture, Gui Pi Decoction, Combined acupuncture and herbal therapy, Mechanism of action.

1. Introduction

Insomnia is a common sleep disorder in clinical practice. In China, approximately 15% of the population suffers from insomnia, and about 45% experience insomnia symptoms to varying degrees, with the incidence rate showing an upward trend [1]. Patients often have difficulty falling asleep, experience short sleep duration, and suffer from poor sleep quality, which can lead to decreased attention and memory decline. Long-term insomnia can also cause or exacerbate other chronic diseases, such as diabetes, hypertension, obesity, cardiovascular disease, and chronic kidney disease, severely affecting patients' normal lives and health [2]. With the development of Traditional Chinese Medicine (TCM) theory, clinical studies have shown that TCM treatment for insomnia is effective, with minimal side effects and a broad range of applications [3]. The “Heart-Spleen Deficiency” pattern is a common subtype of insomnia. According to TCM, the heart governs the spirit, and the spleen governs transformation and transportation; insufficiency of the heart and spleen leads to deficiency of both qi and blood, resulting in restlessness of the mind. This pattern is characterized by frequent dreaming and easy awakening, palpitations and forgetfulness, mental fatigue and poor appetite, a pale tongue, and a thin pulse [4]. Gui Pi Tang is a classic TCM formula for treating insomnia of the Heart-Spleen Deficiency type. Its core pathogenesis involves mental overthinking damaging the spleen, resulting in insufficient generation of qi and blood, which in turn leads to the heart being deprived of nourishment and the spirit

becoming unsettled. At the same time, dysfunction in the spleen and stomach's transport and transformation directly affects the tranquility of the heart and spirit—reflecting the interdependent relationship among the zang-fu organs, as expressed by the principle that “the spleen houses intention, the heart houses the spirit; the spleen nourishes the heart, and the heart governs the spleen.”

The brain-gut axis includes the hypothalamic-pituitary-adrenal (HPA) axis, the gut microbiota, the enteric nervous system, and the central immune system, serving as a bridge connecting the central nervous system and the gastrointestinal nervous system [5]. Western medicine holds that dysfunction of the brain-gut axis can lead to disruptions in the immune, nervous, and endocrine systems, and is closely associated with insomnia [6]. Research by Wu Liping et al. [7] suggests that the brain-gut axis may regulate post-stroke insomnia through the gut microbiota, brain-gut peptides, and the HPA axis. This mechanism aligns closely with the principles of Traditional Chinese Medicine (TCM)—namely, that “the heart and spleen are interrelated” and “when the stomach is not harmonious, sleep is disturbed.” Cerebrovascular diseases are a condition for which acupuncture treatment is particularly effective, and the theory of the brain-gut axis has further deepened scholars' understanding of brain and gastrointestinal functions [8], providing modern biological targets for the treatment of insomnia with Traditional Chinese Medicine.

Acupuncture employs methods to regulate the spirit, strengthen the spleen, tonify qi, and calm the mind, primarily selecting acupoints such as Baihui, Shenmen, Sanyinjiao, Zusanli, Xinshu, and Pishu to facilitate brain-gut interaction through meridian regulation; Gui Pi Decoction, derived from Zheng Ti Lei Yao, is effective in tonifying qi, strengthening the spleen, nourishing blood, and calming the mind, and serves as a classic formula for the pattern of deficiency of both the heart and spleen. Clinical studies have confirmed that the combination of acupuncture and Gui Pi Decoction for treating insomnia caused by deficiency of both the heart and spleen is more effective than acupuncture or Chinese herbal medicine alone, with a low recurrence rate and few adverse reactions [9]. Based on the gut-brain axis theory, this article systematically elaborates on the mechanisms and research progress of this combined therapy, providing a reference for both clinical and basic research.

2. The Pathogenic Mechanism Linking Insomnia Due to Deficiency of Both the Heart and Spleen to the Brain-Gut Axis

2.1 Pathogenesis in Traditional Chinese Medicine: Deficiency of the Heart and Spleen, Insufficient Nourishment of the Mind, and Disharmony of the Spleen and Stomach

The *Su Wen: Treatise on the Evaluation of Feverish Diseases* states: “Where pathogenic factors congregate, the vital energy must be deficient.” The pathological basis of insomnia lies in the dysfunction of the spleen’s physiological functions, resulting in a deficiency of sources for the generation of acquired qi and blood, and a failure to nourish the spirit. The condition initially manifests as a spleen disorder, which subsequently affects the “mother” organ, leading to a secondary heart disorder; the clinical manifestation is dual deficiency of qi and blood in the heart and spleen [10]. The *Lingshu: Treatise on Distension* states: “In cases of heart distension, the heart is short of breath, and sleep is restless,” pointing to internal injury to the heart, insufficiency of heart yang qi, an inability to transform red essence into blood, and a lack of nourishment for the spirit, resulting in restless sleep. Furthermore, the *Guide to Clinical Practice: Medical Case Records—Insomnia* records the following case: “The pulse is hready; it cannot fully nourish the muscles. The patient experiences discomfort during nighttime sleep because the spleen’s nourishing qi is depleted and cannot properly irrigate the body. Therefore, treatment should follow the principles of Gui-Pi Decoction to warm the body” [11].

Meridian examination is a method based on the theory of meridians that involves palpating the corresponding meridian pathways or relevant acupoints to identify positive reaction points associated with the disease, thereby guiding clinical diagnosis and treatment [12]. By stimulating specific acupoints along the meridians through acupuncture and moxibustion, the circulation of qi and blood is promoted, and the balance of yin and yang within the body is regulated. There are ancient records of acupuncture and moxibustion being used to treat insomnia; the goal of improving sleep is achieved by unblocking the body’s meridians, regulating yin and yang, and strengthening the body’s vital energy while expelling pathogenic factors [13]. For short-term insomnia

caused by deficiency of both the Heart and Spleen, the principle is to select acupoints based on pattern differentiation; the treatment principle is to tonify the Heart and Spleen, nourish blood, and calm the spirit; the focus is on regulating the physiological functions of the Heart and Spleen. In acupoint selection, points on the Foot-Taiyang Bladder Meridian and the Governor Vessel are primarily used, with points predominantly distributed across the head, face, neck, and lower limbs. Treatment primarily utilizes specific points such as Spleen Shu, Heart Shu, Shenmen, Sanyinjiao, Baihui, Zusanli, Anmian, and Sishencong, among others, as primary points, and treatment is tailored according to the patient’s syndrome. This approach is widely used in clinical practice and yields excellent results [14].

2.2 Modern Mechanisms: Dysfunction of the Brain-Gut Axis Mediates the Development of Insomnia

2.2.1 Dysfunction of the Hypothalamic-Pituitary-Adrenal Axis (HPA Axis)

Most patients with insomnia exhibit dysfunction of the HPA axis [15]. Modern research shows that patients with insomnia exhibit elevated levels of corticotropin-releasing hormone (CRH), adrenocorticotrophic hormone (ACTH), and cortisol (CORT), as well as other abnormal activities resulting from hyperfunction of the HPA axis due to [16]. Some researchers have shown that treatment can lower patients’ serum CORT levels and regulate their HPA axis function, restoring homeostasis in the body and thereby alleviating the state of hyperarousal, which improves patients’ sleep and daytime functioning [17].

2.2.2 Decline in Melatonin (MT) System Function

Studies have shown that MT is the most commonly used and most powerful biomarker of the human circadian rhythm [18]. Melatonin is regulated by external light: as night falls and light stimulation diminishes, melatonin synthesis and secretion levels rise significantly compared to daytime levels. By activating the two G protein-coupled membrane receptors, MT1 and MT2, it inhibits metabolism in the suprachiasmatic nucleus of the hypothalamus, thereby maintaining normal human circadian rhythms and ensuring a healthy sleep cycle. Therefore, adequate levels of MT are crucial for healthy sleep; sleep disorders caused by circadian rhythm disruption are often due to reduced MT secretion. Melatonin, the primary hormone secreted by the pineal gland, has sedative and sleep-inducing effects; timely supplementation can effectively improve sleep [19].

2.2.3 The Influence of Inflammatory Cytokines

Clinically, inflammatory responses are often accompanied by sleep disturbances; therefore, certain inflammatory responses may be related to sleep [20]. Current research indicates that certain inflammatory mediators, such as IL-1, IL-8, TNF- α , IL-12, and IL-18, are associated with sleep, while others, such as IL-4, IL-10, and IL-13, may affect slow-wave sleep and lead to insomnia [21]. Recent studies have shown that reduced sleep can trigger immune and inflammatory responses in the peripheral and central nervous systems [22]. Some researchers have found that patients with insufficient sleep

exhibit significantly elevated concentrations of inflammatory factors [23]. Therefore, the occurrence of insomnia is correlated with elevated levels of inflammatory factors.

3. Core Mechanisms of Acupuncture Combined with Gui Pi Decoction in Modulating the Brain-Gut Axis

3.1 Pharmacological Mechanisms of Gui Pi Decoction in Regulating the Brain-Gut Axis

Deficiency of spleen qi leads to a lack of sources for the generation of qi and blood; insufficiency of heart blood results in inadequate nourishment of the heart spirit, manifesting as insomnia. Therefore, in traditional Chinese medicine treatment, the approach of tonifying qi and nourishing blood, while strengthening the spleen and nourishing the heart, is adopted, with the formula Gui Pi Tang selected. Gui Pi Decoction was first recorded in *Jisheng Fang* by Yan Yonghe of the Southern Song Dynasty. The original formula lists the following ingredients: “Astragalus (stem removed), Atractylodes, Poria (wood removed), sour jujube seeds (roasted, shell removed), and longan flesh—each one liang; Ginseng and Wood Fragrance (unroasted)—each half liang; and licorice (roasted)—two qian and a half.” According to the original text, it was initially used to treat conditions characterized by “excessive worry, overwork damaging the heart and spleen, forgetfulness, and palpitations” [24]. Later, Xue Lizhai of the Ming Dynasty modified the formula by adding Angelica sinensis and Polygala tenuifolia to the original prescription, a version that has been used continuously by subsequent generations to this day. The specific dosages are as follows: Astragalus 15g, Codonopsis 15g, Atractylodes 15g, Sour Jujube Seed 15g, Poria Sclereus 9g, Longan Flesh 9g, Angelica 9g, Wood Fragrance 9g, Polygala 6g, Fried Licorice 6g, Fresh Ginger 3 slices, Red Dates 3 pieces.

Regulating neurotransmitters: Increases central and peripheral 5-HT and GABA levels, promotes melatonin synthesis, prolongs sleep duration, and improves sleep architecture; Inhibits HPA axis hyperactivity: Reduces cortisol and adrenocorticotrophic hormone (ACTH) levels, alleviates chronic stress, and restores endocrine homeostasis; Regulates gut microbiota: Increases the abundance of Bifidobacteria and Lactobacilli, elevates short-chain fatty acid (SCFA) levels, repairs the intestinal barrier, and reduces LPS translocation; Anti-inflammatory protection: Reduces IL-6 and TNF- α , inhibits neuroinflammation, and protects hippocampal neurons; Regulates brain-gut peptides: Restores the rhythms of VIP, motilin, and leptin, and coordinates gastrointestinal function with sleep rhythms.

3.2 Mechanisms of Action of Acupuncture Intervention on the Brain-Gut Axis

Acupuncture focuses on regulating the spirit, strengthening the spleen, harmonizing the stomach, and calming the mind. Points are primarily selected from the Governor Vessel, Heart Meridian, Spleen Meridian, and Stomach Meridian. Through the neuro-meridian – humoral network to regulate the brain-gut axis. Neural pathways: Stimulation of Governor Vessel points such as Baihui and Shenting activates the

ascending reticular activating system, regulating the sleep center; stimulation of points such as Zusanli and Sanyinjiao transmits signals via the vagus nerve to the nucleus of the solitary tract in the brainstem, regulating the autonomic nervous system and gastrointestinal function; Neurotransmitter regulation: Increasing 5-HT and GABA levels in the hippocampus and gut, reducing norepinephrine (NE), and balancing the sleep–wake system; Microbiota Regulation: Corrects gut microbiota dysbiosis in insomnia models, increases the abundance of beneficial bacteria, and improves the metabolic profile; HPA Axis Regulation: Inhibits CRH neurons in the hypothalamus, reduces cortisol levels, and breaks the stress–insomnia vicious cycle; Anti-inflammatory Effects and Gut Barrier Protection: Reduces pro-inflammatory factors, enhances the expression of tight junction proteins, and improves intestinal permeability.

3.3 Synergistic Mechanism of Acupuncture and Herbal Medicine Combination

Acupuncture externally regulates meridians, rapidly adjusts qi dynamics, and calms the mind to address symptoms; Gui Pi Decoction internally tonifies qi and blood, strengthens the spleen to treat the root cause, and calms the mind to consolidate the foundation. Together, they achieve a holistic approach that addresses both symptoms and root causes while harmonizing the brain and gut: Synergistic enhancement of neurotransmitters: Acupuncture rapidly increases central neurotransmitters, while Gui Pi Decoction sustainably improves intestinal neurotransmitter synthesis, resulting in a bidirectional increase in 5-HT, GABA, and melatonin. Synergistic Restoration of the Microbiome and the Intestinal Barrier: Acupuncture rapidly regulates the structure of the gut microbiota, while Gui Pi Decoction nourishes the intestinal microecology over the long term; together, they synergistically enhance intestinal barrier function, dually downregulating cortisol and pro-inflammatory factors, thereby interrupting the neuro-endocrine-immune dysregulation loop. By regulating the flow of qi and blood in the Spleen and Heart meridians, and with Gui Pi Decoction replenishing the source of qi and blood, the treatment achieves “a healthy spleen, abundant blood, a calm mind, and restful sleep.”

4. Progress in Clinical Research on the Combined Use of Acupuncture and Gui Pi Decoction for Treating Insomnia Due to Deficiency of Both the Heart and Spleen

4.1 Evidence of Clinical Efficacy

The combined acupuncture and herbal therapy, also known as “concurrent use of acupuncture and herbal medicine,” is a comprehensive TCM therapy that organically integrates acupuncture with Chinese herbal medicine or proprietary Chinese herbal preparations based on pattern differentiation and treatment principles, fully leveraging the strengths of each modality to achieve a synergistic effect. Niu Qiyun [25] divided 60 elderly patients with insomnia due to deficiency of both the heart and spleen into two groups. The control group was treated with eszopiclone, administered orally at a dose of

1–2 mg per dose, once daily, for a total treatment duration of 36 days. The observation group received the same treatment as the control group plus acupuncture at the back shu points. The results showed that treatment significantly improved patients' sleep quality and significantly prolonged the duration of effective sleep; all scores were significantly higher than pre-treatment levels (all $P < 0.05$), with the observation group showing a more pronounced improvement than the control group. Liu Shengfei [26] treated insomnia due to deficiency of both the heart and spleen in the elderly using the "Tiao Shen" acupuncture method combined with the "Ba Duan Jin" exercise regimen. A total of 99 elderly patients with insomnia caused by deficiency of both the heart and spleen were divided into three groups of 33 patients each: the "Tiao Shen" acupuncture group, the conventional acupuncture group, and the simple acupuncture group. For the "Tiao Shen" acupuncture group (Tiao Shen acupuncture method + Ba Duan Jin health qigong), the acupoints selected were: Primary points: Four Spirit Points (Qinding, Houding, and the paired Luoque points—located 1.5 cun to the front, back, left, and right of the Baihui point); Calming Spirit Points (Calming Spirit I: 0.5 cun above Yintang; Calming Spirit II and III: with eyes looking straight ahead and pupils aligned vertically, 1.5 cun above the eyebrows, i.e., 0.5 cun above the left and right Yangbai points); the "Three Sleep-Inducing Points" (Neiguan, Shenmen, and Sanyinjiao); the Conventional Acupuncture Group (conventional acupuncture combined with the Ba Duan Jin health qigong), with the following acupoints selected: Baihui, Shenmen (bilateral), Sanyinjiao (bilateral), Zhaohai (bilateral), Shenmai (bilateral), and Anmian (bilateral); and the Acupuncture-Only Group (conventional acupuncture). The results showed that the overall response rate in the Mental Regulation Acupuncture Method group was 96.7%, the overall response rate in the conventional acupuncture group was 73.3%, and the overall response rate in the acupuncture-only group was 63.3%. This demonstrates that the "Tuning the Spirit" acupuncture method combined with the Ba Duan Jin health qigong exercise yields superior and more potent effects in improving overall sleep quality, increasing sleep duration, enhancing sleep efficiency, alleviating patients' anxiety, and reducing patients' Traditional Chinese Medicine syndrome scores; the therapeutic effects are significant and long-lasting. Wang Tao [27] used acupuncture combined with Suanzaoren Decoction to treat insomnia in the elderly. A total of 130 elderly patients with insomnia were divided into two groups: the control group received treatment with Suanzaoren Decoction, while the observation group received acupuncture in addition to the control group's treatment. The selected acupoints were: Anmian, Baihui, Shenmen, and Taichong. The results showed that the overall response rate in the observation group was 90.77%, higher than the 72.31% in the control group. Furthermore, this approach increased patients' serum levels of BDNF and 5-HT, reduced PSQI and ISI scores, and lowered TCM syndrome scores, demonstrating superior efficacy compared to treatment with Suanzaoren Decoction alone.

4.2 Progress in Mechanism Research Based on the Brain-Gut Axis

In recent years, research has elucidated the biological basis of combined acupuncture and herbal medicine from the perspective of the brain-gut axis. This combination can

simultaneously increase serum and hippocampal levels of 5-HT and GABA, reduce NE, and regulate melatonin secretion; it can increase the abundance of beneficial bacteria, reduce pathogenic bacteria, elevate SCFAs, and repair the intestinal barrier; it significantly reduces cortisol and ACTH levels and restores circadian rhythms; reduce IL-6 and TNF- α , and suppress central and peripheral inflammation; it also modulates VIP, gastrin, and leptin, thereby achieving simultaneous improvements in gastrointestinal function and sleep.

4.3 Principles of Acupoint Selection and Formulation

Core Acupoints for Acupuncture: Baihui, Shenting (to regulate the spirit), Shenmen, Neiguan (to calm the heart), Zusanli, Sanyinjiao (to strengthen the spleen), Xinshu, Pishu (back-shu points to regulate the viscera).

Modified Gui Pi Decoction: For severe insomnia, add Polygonum multiflorum and Albizia bark; for spleen deficiency with loose stools, add Chinese yam and coix seed; for severe palpitations, add biota seed and magnetite.

Treatment Course: Typically 2–4 weeks, with 5–7 acupuncture sessions per week and one dose of Chinese herbal medicine daily; patient compliance is good.

5. Current Issues and Research Prospects

5.1 Current Issues

Insufficient depth in mechanism research: Studies are largely confined to single aspects such as neurotransmitters, gut microbiota, or the HPA axis, lacking integrated omics-based analysis (metabolomics, microbiome, transcriptomics). Some RCTs have small sample sizes, lack blinding, have short follow-up periods, and lack validation through objective sleep monitoring (PSG) and biomarkers. Lack of protocol standardization: Inconsistencies in acupoint selection, needling techniques, herbal formula dosages, and treatment duration make widespread adoption difficult. There is a shortage of large-sample, long-term follow-up studies, and data on adverse reactions are limited.

5.2 Research Outlook

Utilize multi-omics and molecular biology techniques to identify key targets and signaling pathways through which the combination of acupuncture and herbal medicine regulates the gut-brain axis. Conduct multicenter, large-sample, double-blind, placebo-controlled RCTs incorporating objective measures such as PSG, EEG, and microbiome analysis, and integrate cognitive behavioral therapy for insomnia (CBT-I) to establish a comprehensive intervention model combining "acupuncture and herbal medicine + psychological therapy + lifestyle modifications."

6. Conclusion

The core pathogenesis of insomnia caused by deficiency of both the heart and spleen is characterized by deficiency of both the heart and spleen, insufficiency of qi and blood, and inadequate nourishment of the heart spirit, which closely

aligns with the dysfunction of the gut-brain axis in modern medicine. This study selected acupoints based on the gut-brain axis theory; among them, acupuncture at Zhongwan, Qihai, and Guanyuan can strengthen the spleen and harmonize the stomach while tonifying original qi; acupuncture at Tianshu, Zusanli, Xiajuxu, and Shangjuxu has the effect of regulating the intestines and viscera; acupuncture at Sishencong and Baihui can awaken the mind, open the orifices, calm the spirit, and soothe the heart [28]. Sun Jungang et al. [29] pointed out that acupuncture at Zusanli can improve the function and structure of the gut microbiota in mice. It is evident that acupuncture treatment based on the gut-brain axis theory can stimulate nervous system activity, improve brain function, and help regulate sleep mechanisms to alleviate patients' insomnia symptoms. Combined treatment using acupuncture based on the gut-brain axis theory and the "Calm the Spirit and Promote Sleep" formula can produce synergistic effects. Gui Pi Tang focuses on internal regulation to nourish the heart, calm the spirit, and tonify the heart and spleen; whereas acupuncture treatment acts directly on local pathological sites to unblock meridians and harmonize qi and blood; The combination of the two approaches addresses the underlying pathophysiology through multiple targets, exerting effects by locally regulating neurotransmitters and holistically improving constitutional health, thereby helping to alleviate insomnia symptoms and improve sleep structure [30]. The combination of acupuncture and Gui Pi Decoction synergistically regulates the gut-brain axis through multiple pathways—including neural, endocrine, immune, gut microbiota, and brain-gut peptide pathways—to strengthen the spleen and tonify qi, nourish blood and calm the mind, and harmonize the gut and brain. This approach demonstrates proven clinical efficacy and high safety. In the future, standardized protocols should be established with the gut-brain axis as the core target, providing a more robust scientific basis for the clinical promotion and translation of this therapy.

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