

# Treatment of Hyperthyroidism Complicated with Insomnia Based on the Theory of “Liver Governing Conveyance and Dispersion”

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**Abstract:** Clinically, patients with hyperthyroidism often suffer from sleep disorders. Western medicine primarily treats hyperthyroidism-related insomnia with sedative-hypnotic drugs, which have significant side effects, high addiction potential, and numerous adverse reactions. Traditional Chinese Medicine (TCM) has shown good efficacy in treating insomnia, not only improving sleep quality but also helping regulate emotions and benefiting the entire body. In TCM, hyperthyroidism falls under the category of “goiter disease” (Ying Bing), with the main pathological location being the liver. Insomnia, referred to as “inability to lie still” (Bu Mei) in TCM, is primarily caused by emotional injury and is also closely related to the liver. Based on the theory of “liver governing conveyance and dispersion,” this paper explores the relationship among the three through the “liver,” aiming to provide new TCM treatment ideas for patients with hyperthyroidism complicated by insomnia.

**Keywords:** Liver governing conveyance and dispersion, Hyperthyroidism; Insomnia, Traditional Chinese Medicine, Treatment.

## 1. Introduction

Hyperthyroidism (thyrotoxicosis) is a common endocrine system disease caused by excessive production of thyroid hormones by the thyroid gland itself, leading to a syndrome characterized primarily by increased excitability of the nervous, circulatory, and digestive systems and hypermetabolism [1]. It manifests as irritability, insomnia, easy agitation, heat intolerance, excessive sweating, palpitations, fatigue, increased appetite with weight loss, etc. Among these patients, 40.0% to 63.0% often suffer from anxiety and insomnia, presenting as difficulty falling asleep, irritability, anxiety, difficulty returning to sleep after waking, or even complete sleeplessness throughout the night. This mental health issue severely affects patients' quality of life [2]. Insomnia is also a common and frequently occurring clinical condition. In China, approximately 10% to 15% of adults suffer from insomnia, and nearly half of these patients have had the condition for over 10 years. The number of affected individuals is increasing annually, with a growing prevalence among young people [3]. One study has confirmed that the neuropsychiatric status of patients with hyperthyroidism is highly correlated with the symptoms of insomnia patients. Insomnia in hyperthyroidism patients not only worsens the hyperthyroid condition but may also lead to other potentially dangerous symptoms [4]. Hyperthyroidism is a modern medical disease name. Its prominent feature is enlargement or nodules beside the larynx in the front of the neck, which corresponds to “goiter disease” (Ying Bing) in TCM literature. Insomnia, known as “inability to lie still” (Bu Mei) in TCM, is a group of clinical syndromes characterized primarily by difficulty falling asleep, short sleep duration, dream-disturbed sleep, easy awakening, or even complete sleeplessness. TCM believes that both insomnia and goiter disease are closely related to emotional disharmony and liver qi stagnation, manifesting as anxiety, irritability, insomnia, dizziness, headache, and other symptoms. In TCM theoretical foundations, the “liver” is called the “general.” It governs the regulation of emotions, the smoothing of qi movement, and

ensures the circulation of qi and blood. Therefore, modern TCM practitioners believe that soothing the liver and regulating qi is particularly critical in treating hyperthyroidism complicated by insomnia [5]. This paper, through an in-depth analysis of the theoretical basis of “liver governing conveyance and dispersion,” combined with the TCM theories of insomnia (Bu Mei) and goiter disease (Ying Bing), hopes to provide new ideas for the clinical treatment of patients with hyperthyroidism and insomnia through methods such as soothing the liver and regulating qi.

## 2. Theoretical Elaboration of “Liver Governing Conveyance and Dispersion”

### 2.1 TCM Theoretical Research

Tracing the origin and development of “liver governing conveyance and dispersion” through historical research, Shuowen Jiezi interprets “conveyance” (Shu) as “to open,” implying dredging and opening, and extends “dispersion” (Xie) to mean “to discharge” and “to diffuse” [6]. Most scholars believe that the term “conveyance and dispersion” originated from the Inner Canon of the Yellow Emperor. Suwen · Wuchang Zhengda Lun states: “In the period of generation and occurrence, it is called opening and spreading. When the earth conveys and disperses, the green qi reaches, the yang harmony transforms and spreads, the yin qi follows, the engendering qi purely transforms, and all things flourish” [7]. It can be seen that discussions on “conveyance and dispersion” existed as early as the Pre-Qin period. The accurate association of this concept with the liver can be found in the Jin-Yuan period in Zhu Danxi's Gezhi Yulun, which states, “What governs conveyance and dispersion is the liver.” During the Ming-Qing period, it was further developed. Xue Lizhai changed it to “liver governing conveyance and dispersion.” Subsequently, Yu Jiayan proposed, “The liver governs planning and strategy, and its nature loves conveyance and dispersion.” Later, Qing dynasty physician

Chen Menglei stated, “The liver governs conveyance and dispersion, therefore it is called ‘dispersing’” [8]. At this point, the theory of “liver governing conveyance and dispersion” gradually became more complete.

The liver governing conveyance and dispersion means that the liver has the function of maintaining the smooth and unobstructed movement of qi throughout the body, preventing stagnation and depression, thereby promoting the circulation of essence, qi, blood, and body fluids, as well as emotional well-being. If the liver’s conveyance and dispersion function is normal, then the ascending and descending of qi in the body are orderly, and the activities of the zang-fu organs and meridians are normal and harmonious. Otherwise, as stated in Lingshu · Benshen Pian, “If liver qi is deficient, there is fear; if excessive, there is anger,” leading to abnormal emotional conditions. It is evident that the liver plays a major role in regulating emotional disorders. Emotions have multifaceted effects on the human body. Depression, anxiety, and insomnia are all caused by emotional disharmony. Therefore, the liver’s smooth conveyance and dispersion are of great significance in guiding their treatment. Tang Rongchuan said in Xuezheng Lun · Zangfu Bingji Lun, “The liver belongs to wood. If the wood qi is harmonious and unobstructed, without becoming depressed, then the blood vessels will flow smoothly” [7]. The circulation of blood in the human body also depends on the propulsion of liver qi. Qi moves, then blood moves. Longstanding qi stagnation leads to blood stasis, and static blood obstructing the heart spirit or transforming heat to harass the heart spirit can also cause emotional disorders. Thus, the normal function of the liver in governing conveyance and dispersion is an important condition for ensuring normal material metabolism and emotional well-being. Therefore, TCM often starts with the liver in treating emotional disorders and regulating metabolism. As Wang Mengying stated, “Among the seven emotions causing diseases, they must begin with the liver.” This shows that the liver is closely related to human emotions, spirit, and sleep.

## 2.2 Modern Mechanism Research

Modern scholars have conducted theoretical and experimental research on the liver’s function of governing conveyance and dispersion and regulating emotions, believing that it is closely related to the neuro-endocrine system. Its two major pathways are the hypothalamic-pituitary-adrenal (HPA) axis and the hypothalamic-pituitary-thyroid (HPT) axis. The HPA axis is primarily activated by increased secretion of glucocorticoids. Studies have found that glucocorticoids stimulate the excitability and sensitivity of the limbic system in the brain, which can affect the liver’s conveyance and dispersion function. The limbic system, especially the hippocampus, hypothalamus, and amygdala, governs the regulation of human instinctual motivation and emotions, helping to maintain homeostasis in the brain’s internal environment. It is the main regulatory center for liver governing conveyance and dispersion. The hippocampus is an important component of the negative feedback regulation of the HPA axis. Various stresses and negative emotions can damage corresponding areas of the hippocampus. Under the regulation of the HPA axis, this manifests externally as adverse emotional reactions such as anxiety and irritability [8]. A large number of TCM clinical studies also indicate that liver diseases with excess

pattern are mainly dominated by sympathetic nervous system hyperactivity, while deficiency patterns are dominated by parasympathetic nervous system hyperactivity. This suggests that the autonomic nervous system is also an information pathway for liver governing conveyance and dispersion, regulating this function through the hypothalamus - brainstem - autonomic nervous system.

The HPT axis primarily involves the hypothalamus secreting thyrotropin-releasing hormone (TRH), which stimulates the pituitary to secrete thyroid-stimulating hormone (TSH), which then acts on the thyroid. The T3 and T4 secreted by the thyroid further inhibit TSH secretion via negative feedback, thus maintaining the stability of the HPT axis. Studies have found that changes in thyroid hormone levels are related to the occurrence of mental disorders [9]. Low thyroid levels can cause depression, with fT3 and fT4 playing major roles. Wang Xueyi et al. [10] studied 26 hospitalized patients with mental disorders and found that their T4 and fT4 levels were higher than normal during depressive episodes and returned to normal after treatment, indicating that changes in thyroid hormone levels in some patients with mental disorders are related to the waxing and waning of symptoms. Zhang et al. [8] believe that the liver’s regulation of emotions (conveyance and dispersion) is closely related to the HPT axis. Changes in thyroid hormone levels negatively feedback to the hypothalamus and are integrated by the cerebral cortex, manifesting as external emotional changes, possibly depression or mania.

Hyperthyroidism with insomnia is also related to increased neurofunctional activity, abnormal sympathetic nerve excitation at night, and overactivity of the HPA axis. Possible mechanisms of insomnia also include abnormal secretion of melatonin, which regulates circadian rhythms and neuroendocrine functions, and abnormal levels of gamma - aminobutyric acid (GABA), a functional neurotransmitter in the central nervous system that reduces brain excitability [9]. Modern studies have shown that the HPT axis is not only related to the occurrence of goiter disease but also closely related to insomnia. When the endocrine axis is disturbed, thyroid hormone secretion becomes abnormal, thus triggering hyperthyroidism and potentially insomnia [11].

## 3. Theoretical Elaboration of Hyperthyroidism Complicated with Insomnia

Hyperthyroidism is a modern medical disease name. Its clinical features of swelling or nodules beside the larynx correspond to “goiter disease” (Ying Bing) in ancient TCM literature. The name “Ying Bing” first appeared in Zhubing Yuanhou Lun · Ying Hou: “Goiter is caused by sadness, anger, and qi stagnation..., one should not live long; constant consumption can cause goiter” [11]. Goiter disease is mainly caused by internal injury due to emotions, improper diet, and environmental factors, leading to qi stagnation, phlegm coagulation, and blood stasis accumulating in front of the neck. Linzheng Zhinan Yian records: “Restlessness and easy anger, qi-fire knots form goiter” [12], also pointing out that the etiology of hyperthyroidism is mainly related to emotional dysregulation. Professor Han Mingxiang [13] believes that the main pathological location of goiter disease is the liver. Due to the dysfunction of the liver in governing conveyance and

dispersion, qi, blood, and body fluids fail to circulate properly. Over time, fluids accumulate and phlegm coagulates in front of the neck, forming lumps. Furthermore, prolonged qi stagnation transforms into fire, which decoicts yin blood, leading to blood stasis obstruction. Therefore, swelling with nodules appears on both sides of the larynx. The treatment principle is to regulate qi, resolve goiter, and disperse nodules. Insomnia falls under the category of “inability to lie still” (Bu Mei) in TCM. It is called “inability to sleep, inability to lie down, inability to close eyes” in the Inner Canon of the Yellow Emperor. It is characterized by the inability to obtain normal sleep regularly. Mild cases may manifest as short sleep duration, difficulty falling asleep, intermittent sleep, while severe cases involve complete sleeplessness. Zhangshi Yitong, Volume 16, records: “Inability to sleep often arises from overwork, excessive thinking, joy, anger, fear, and fright,” indicating that insomnia is closely related to emotions [14]. Many TCM practitioners believe that the main pathological location of insomnia is the heart, caused by an imbalance between nutrient qi and defensive qi, and yin-yang disharmony. The treatment principle is to calm the spirit and stabilize the mind. The author believes it is also closely related to the liver. You Zajing said, “When a person is awake, the ethereal soul resides in the eyes; when asleep, the ethereal soul hides in the liver” [15]. It can be seen that the liver storing blood and housing the ethereal soul is crucial in the development of the etiology and pathogenesis of insomnia. The liver is a zang organ characterized by wind and wood. It governs conveyance and dispersion and can regulate human emotions. If the liver’s conveyance and dispersion function is abnormal, emotions become depressed, and the person suffers from depression and cannot sleep. If qi stagnation transforms into fire, liver fire flares up, causing irritability and inability to sleep.

#### **4. Relationship Between “Liver Governing Conveyance and Dispersion” and Hyperthyroidism Complicated with Insomnia**

Clinically, patients with hyperthyroidism often have concurrent insomnia. In TCM, goiter disease and insomnia are also closely related. The occurrence of goiter disease is mainly due to internal injury from emotions, improper diet, environmental factors, and constitutional factors. The occurrence of insomnia is mainly related to emotional disorders, improper diet, and imbalance between activity and rest. Both are closely related to emotions and diet, which are in turn closely related to the liver and spleen. Worry, anger, and frustration damage the liver. Liver qi loses its ability to regulate and becomes stagnant. Liver depression leads to spleen deficiency. Body fluids fail to be transported and transformed, easily accumulating into phlegm. Qi stagnation and phlegm coagulation accumulate in front of the neck, forming goiter disease. Emotional dissatisfaction, stagnation, and anger injure the liver, leading to depression and inability to sleep at night. It can be seen that both conditions are related to liver depression and qi stagnation. Moreover, prolonged qi stagnation with fire can damage yin blood. Fire heats and decoicts yin fluids, causing abnormal qi and blood circulation, leading to blood stasis in front of the neck and goiter disease. Qi stagnation with fire disturbing the heart spirit, combined

with phlegm-heat and static blood, leads to irritability and inability to sleep. Thus, both are related to liver yin deficiency with fire hyperactivity [16]. Liver depression leads to spleen deficiency. Patients with improper diet are more likely to injure the spleen. Spleen dysfunction leads to food accumulation, generating phlegm-heat, and stomach qi becomes disharmonious, as stated in Suwen · Nidao Lun: “If the stomach is not harmonious, one cannot lie down comfortably.” Spleen deficiency with dysfunction fails to transport and transform water dampness. Coupled with dietary irregularities, fluids cannot be transported, accumulating into phlegm and dampness, which also blocks blood circulation. This can further aggravate the accumulation of qi, phlegm, and blood stasis forming goiter disease [17].

Clinically, most patients with hyperthyroidism and insomnia are women, and both conditions are accompanied by emotional problems. TCM believes that women, from a congenital constitution, tend to be more emotional. They are more prone to emotional instability leading to qi stagnation and liver qi depression. Therefore, compared to men, they tend to overthink and are prone to anxiety. This not only worsens hyperthyroidism but also affects sleep, and poor sleep further aggravates hyperthyroidism. The two conditions interact. Qing dynasty physician Ye Tianshi proposed in Linzheng Zhinan Yian that “women take the liver as their congenital foundation.” The liver is the zang organ that stores blood and governs conveyance and dispersion, regulating emotions and storing blood. It can be seen that the liver is closely related to women’s physiology and pathology [18]. Thus, the occurrence of goiter disease and insomnia is related to the liver. Investigating the etiology and pathogenesis reveals a close connection with the liver’s conveyance and dispersion function. Clinically, emotional disorders frequently occur due to liver issues. The liver is a firm zang organ, storing blood and housing the ethereal soul. It has the functions of smoothing the flow of qi throughout the body, promoting the circulation of essence, qi, blood, and body fluids, and regulating emotions. If the liver’s conveyance and dispersion are dysfunctional, goiter disease is prone to be complicated by insomnia. The two conditions interact. Longstanding insomnia can also worsen goiter disease. Additionally, liver depression leads to spleen deficiency. The dysfunction of liver conveyance and dispersion, coupled with dietary irregularities, can also affect the progression of goiter disease with insomnia. Therefore, starting with the liver to normalize its conveyance and dispersion is crucial for treating goiter disease with insomnia.

#### **5. Treatment of Hyperthyroidism Complicated with Insomnia Based on “Liver Governing Conveyance and Dispersion”**

##### **5.1 Chaihu Jia Longgu Muli Tang (Bupleurum plus Dragon Bone and Oyster Shell Decoction)**

Chaihu Jia Longgu Muli Tang originates from the Treatise on Cold Damage Disorders. It is formulated by reducing the dosage of Xiao Chaihu Tang, removing licorice, and adding Longgu (Os Draconis), Muli (Concha Ostreae), Qidan (Plumbum), Dahuang (Radix et Rhizoma Rhei), Guizhi (Ramulus Cinnamomi), and Fuling (Poria) [19]. This formula integrates harmonizing exterior and interior, heavy sedative

calming, and clearing heat with supporting the right. Chaihu (Radix Bupleuri), Guizhi, and Huangqin (Radix Scutellariae) harmonize the exterior and interior. Longgu, Muli, and Qidan calm the spirit and anchor the mind. Banxia (Rhizoma Pinelliae) and Shengjiang (Rhizoma Zingiberis Recens) harmonize the stomach and reverse upward qi. Dahuang drains heat and clears fire. Fuling calms the heart and spirit. Renshen (Radix Ginseng) and Dazao (Fructus Jujubae) support the right and eliminate pathogens. Together, they soothe the liver, relieve depression, transform phlegm, drain fire, and calm fright. This formula is indicated for irritability and insomnia caused by liver depression with phlegm-heat disturbing the heart spirit. It is clinically used for hyperthyroidism with insomnia and anxiety triggered by emotional disorders. Multiple clinical studies have confirmed its efficacy. Shan Xiuying [20] divided 68 hyperthyroidism patients with insomnia into two groups. Both received basic methimazole treatment. The control group received estazolam in addition, while the observation group received Chaihu Jia Longgu Muli Tang. Results showed that the observation group had better improvement in sleep quality and fewer adverse reactions. Zheng Wenjun [21] included 90 patients. The control group received Western medicine, while the experimental group received only this formula. After treatment, the experimental group showed superior TCM syndrome scores, sleep quality scores, and anxiety/depression scores compared to the control group, with a higher clinical cure rate and fewer adverse reactions. In summary, Chaihu Jia Longgu Muli Tang can significantly improve insomnia and anxiety in hyperthyroidism patients, enhance sleep quality, and has a good safety profile.

### 5.2 Danzhi Xiaoyao San (Moutan and Gardenia Free and Easy Powder)

Danzhi Xiaoyao San is composed of Xiaoyao San plus Danpi (Cortex Moutan) and Zhizi (Fructus Gardeniae). It excels at soothing the liver, clearing heat, relieving depression, and calming the spirit. It is often used for insomnia due to liver depression with fire hyperactivity or liver depression with spleen deficiency [22]. Modern studies indicate that this formula can regulate neurotransmitters and endocrine function, improving emotional and sleep states. Many TCM practitioners have achieved significant clinical results with it. Professor Lv Jiusheng [23] believes that the core pathogenesis of hyperthyroidism is liver depression with fire hyperactivity and uses modified Danzhi Xiaoyao San to soothe the liver and clear heat, achieving good results. Professor Kang Xuedong [24] points out that hyperthyroidism with insomnia is often caused by liver depression transforming into fire and damaging yin. He advocates using Danzhi Xiaoyao San combined with Suanzaoren Tang (Sour Jujube Seed Decoction) to soothe the liver, nourish yin, calm the spirit, and tranquilize the mind, achieving good therapeutic effects. Chen Yan's [25] clinical observation showed that compared with Western medicine alone, adding modified Danzhi Xiaoyao San significantly improved sleep quality and clinical symptoms in patients with insomnia due to liver depression with fire hyperactivity.

### 5.3 Auricular Point Pressing with Seeds

Auricular point pressing with seeds is a non-invasive TCM

external therapy with high patient compliance. It can effectively improve insomnia and enhance sleep quality [26]. Hyperthyroidism-related insomnia is often due to liver depression transforming into fire, internal obstruction of phlegm and blood stasis, or yin deficiency with fire hyperactivity. Clinically, points such as Shenmen (TF4), Jiaogan (MA-TF1), Pizhixia (MA-AT1), Neifenmi (MA-IC3), Jia Zhuangxian (MA-IC?), Xin (MA-IC1), Gan (CO12), Shen (MA-SC5) are selected and modified according to symptoms [27]. Currently, auricular point pressing is often combined with other therapies to treat secondary insomnia caused by various diseases. Qu Fanghua [28] treated 60 hyperthyroidism patients with insomnia using auricular point pressing combined with herbal foot baths. Compared with a control group, the difference in efficacy was statistically significant ( $P < 0.05$ ), confirming that this combined therapy is safe and effective, suitable for clinical promotion.

## 6. Conclusion and Outlook

In summary, the pathogenesis of hyperthyroidism with insomnia is closely related to dysfunction of the liver in governing conveyance and dispersion according to TCM. Liver qi stagnation, liver depression transforming into fire, and qi movement disorder are the core pathogenesis of this condition. Liver dysfunction in conveyance and dispersion leads to emotional dysregulation and qi stagnation, which then transforms into fire disturbing the heart, causing heart spirit restlessness, ultimately forming the complex clinical manifestation of palpitations, irritability, and difficulty sleeping at night in hyperthyroidism [29]. Clinical treatment based on the theory of liver governing conveyance and dispersion, with main principles of soothing the liver to relieve depression, clearing the liver to drain fire, and calming the heart to tranquilize the spirit, using classical TCM formulas modified for internal use, combined with external TCM therapies like auricular point pressing, can effectively improve abnormal thyroid function and alleviate accompanying symptoms such as insomnia, anxiety, and irritability. Moreover, compared with simple Western sedative-hypnotic treatment, TCM holistic regulation offers significant advantages, with fewer adverse reactions, lower recurrence rates, and greater long-term safety and efficacy, making it worthy of clinical promotion.

Current clinical research on TCM for hyperthyroidism with insomnia primarily focuses on observing the clinical efficacy of classical formulas for soothing the liver. It has been confirmed that treating this condition from the liver is a clear and reliable approach. In future clinical and research work, further in-depth studies on the intrinsic relationship between the theory of liver governing conveyance and dispersion and the pathogenesis of hyperthyroidism with insomnia are warranted. Combining modern endocrinology and neuropsychiatry, we can explore the microscopic targets and molecular mechanisms through which liver depression pathogenesis affects thyroid function and sleep regulation. Additionally, large-sample, multi-center, long-term follow-up evidence-based medical studies can be conducted to unify syndrome differentiation and efficacy evaluation criteria, optimize standardized TCM diagnosis and treatment protocols such as soothing the liver and regulating the heart, harmonizing the liver and spleen, and co-regulating the liver

and kidney [30]. Furthermore, we can strengthen the exploration of comprehensive intervention models combining herbal formulas, external TCM treatments, and emotional regulation to form a more clinically practical and individualized integrated Chinese-Western medicine treatment system, fully leveraging the holistic regulation and simultaneous treatment of both root and branch characteristics of TCM, thereby providing a more complete, scientific, and effective TCM diagnostic and treatment basis for the clinical prevention and treatment of hyperthyroidism patients with insomnia.

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