

Ultrasound-Guided Stellate Ganglion Block with Cervicotemporal Myofascial Trigger Point Acupuncture for Insomnia with Comorbid Anxiety and Depression: A Retrospective Observational Study

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Purpose: Insomnia is a prevalent sleep-wake disturbance that significantly impairs the quality of life and adversely affects physical and mental health. This study aimed to evaluate the clinical efficacy of ultrasound-guided stellate ganglion block (SGB) combined with acupuncture at cervicotemporal myofascial trigger points (MTrPs) in patients with insomnia accompanied by anxiety and depression.

Patients and Methods: This retrospective study included 42 patients diagnosed with insomnia and comorbid anxiety and depression who were treated at the Anesthesia and Sleep Clinic of the Shandong Second Provincial General Hospital between November 2024 and April 2025. All patients received ultrasound-guided SGB combined with acupuncture at cervicotemporal MTrPs. Treatment efficacy was assessed by comparing Pittsburgh Sleep Quality Index (PSQI), Hamilton Anxiety Scale (HAMA), and Hamilton Depression Scale (HAMD) scores before treatment initiation and four weeks after completion of the intervention.

Results: Compared with baseline, post-treatment PSQI scores (5.00 ± 2.84 versus 17.10 ± 2.61 ; mean difference, -12.10 ; 95% CI, -12.91 to -11.28 ; $P < 0.001$), HAMA scores (5.05 ± 2.80 versus 19.00 ± 4.23 ; mean difference, -13.95 ; 95% CI, -15.09 to -12.82 ; $P < 0.001$), and HAMD scores (3.41 ± 2.68 versus 15.76 ± 4.43 ; mean difference, -12.36 ; 95% CI, -13.56 to -11.15 ; $P < 0.001$) were all significantly reduced after four weeks of therapy.

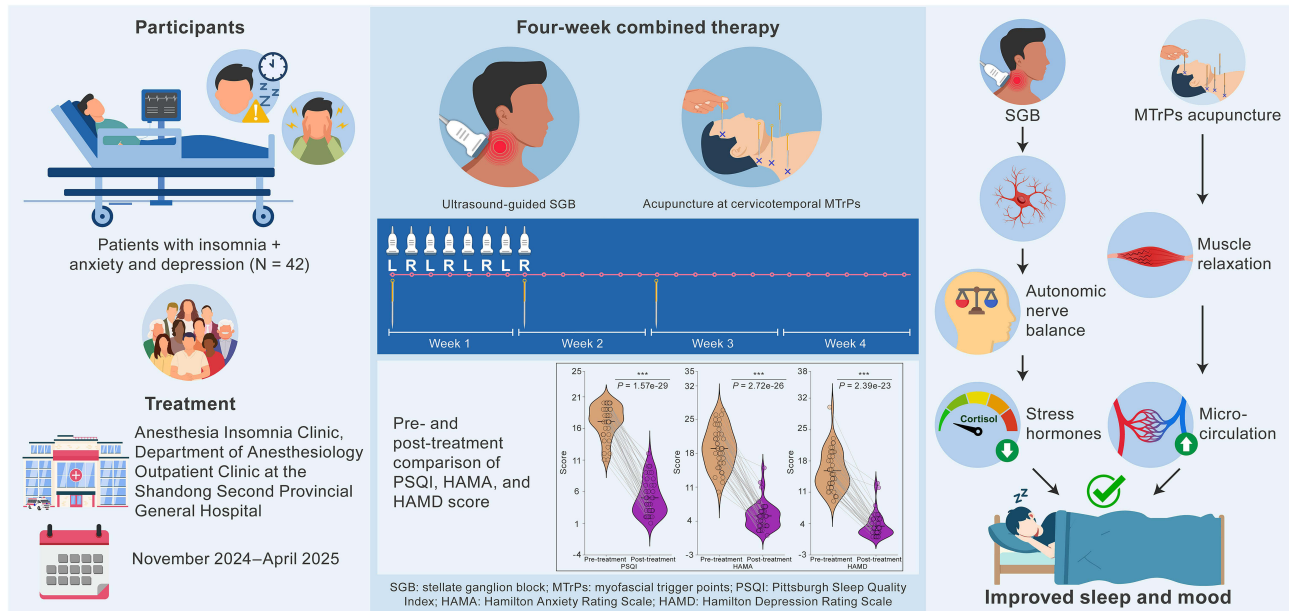
Conclusion: The preliminary study suggests that ultrasound-guided SGB combined with acupuncture at the cervicotemporal MTrPs is an effective, comprehensive intervention for insomnia with comorbid anxiety and depression. The benefits may result from synergistic mechanisms involving autonomic balance regulation, suppression of excessive sympathetic activity, reduction of myofascial tension, and modulation of the sleep-wake cycle. These findings warrant further clinical application and investigation.

Plain Language Summary: Sleep problems, such as insomnia, affect many people and can harm both mental and physical health. When insomnia occurs alongside anxiety or depression, the effects can be even more severe. This study examined a combined treatment for people with insomnia, anxiety, and depression. The approach used two techniques. The first was SGB, and the second was acupuncture at cervicotemporal MTrPs. We reviewed the records of 42 patients who received both treatments over four weeks. Before and after treatment, patients completed questionnaires measuring sleep quality, anxiety, and depression. The results showed significant improvements in sleep

quality, with anxiety and depression symptoms becoming much milder. Anxiety showed the greatest improvement of the three measures. No patients experienced serious side effects. These findings suggest that combining SGB with acupuncture at MTRPs may help break the cycle in which poor sleep and emotional distress reinforce each other. Although these results are encouraging, the study was small and short-term. Larger, longer studies are needed to confirm these benefits and determine how long they last.

Keywords: autonomic nervous system modulation, sleep quality, insomnia, emotional disorders, acupuncture therapy, sympathetic blockade

Graphical Abstract



Introduction

Insomnia disorder, a common sleep-wake disturbance, markedly impairs quality of life and adversely affects both physical and mental well-being worldwide.^{1–3} According to the World Health Organization (WHO), approximately 30% to 50% of adults report some degree of sleep disturbance, with 10% to 20% meeting diagnostic criteria for insomnia disorder.^{1,2,4} Notably, anxiety and depressive disorders frequently co-occur in individuals with insomnia,^{5–8} exacerbating symptoms such as prolonged sleep latency, frequent nocturnal awakenings, and early morning arousal. This bidirectional relationship creates a self-perpetuating cycle that worsens sleep and mood disturbances and increases the risk of severe outcomes, including suicidal behavior and cardiovascular diseases.^{9,10} These interrelated conditions impose a significant burden on affected individuals, their families, and broader society.

Pharmacotherapy has traditionally been the primary approach for managing insomnia disorders accompanied by anxiety and depression. Benzodiazepines and non-benzodiazepine hypnotics are commonly prescribed to relieve insomnia symptoms. In contrast, selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs) are often used to address comorbid anxiety and depressive disorders.^{11–13} However, these medications have several limitations. Prolonged benzodiazepine use may lead to dependence, tolerance, and adverse effects such as residual sedation and cognitive impairment.¹⁴ Although non-benzodiazepines have a lower potential for dependence, they are still associated with adverse effects, including dizziness and fatigue.¹⁵ Currently, cognitive behavioral therapy for insomnia (CBT-I) and pharmacotherapy are the internationally recognized standard treatments for insomnia with coexisting anxiety and depression.^{16–19} Nevertheless,

challenges such as limited accessibility, poor adherence, and the risk of side effects often hinder their ability to provide safe, effective, and sustained improvement in affected patients.^{16,20,21}

With advancing research into the pathogenesis of insomnia disorder accompanied by anxiety and depression, increasing attention has been given to the pivotal roles of nervous system dysregulation and musculoskeletal dysfunction.²² The stellate ganglion, a key component of the cervical sympathetic chain, modulates sympathetic outflow to the head, neck, and upper limbs, and exerts broad regulatory influences on the cardiovascular, respiratory, endocrine, and central nervous systems.^{23,24} Ultrasound-guided stellate ganglion block (SGB) enables precise delivery of local anesthetic (LA) to the periganglionic region, thereby interrupting sympathetic transmission, restoring autonomic balance, and improving sleep quality as well as alleviating anxiety and depression symptoms.²⁵ A growing body of evidence supports the therapeutic potential of SGB in the management of insomnia, anxiety, and depressive disorders.^{26,27}

Acupuncture, a cornerstone of traditional Chinese medicine (TCM), has shown distinct therapeutic benefits in treating sleep disturbances and emotional disorders. Myofascial trigger points (MTrPs) in the cervical and temporal regions are hyperirritable loci within skeletal muscle that have been implicated in the pathophysiology of insomnia, anxiety, and depression.^{28,29} Targeted acupuncture at MTrPs can relieve pain, improve sleep, and stabilize mood through multiple mechanisms, including modulation of muscle tension, enhancement of local microcirculation, activation of endogenous analgesic pathways, and regulation of the neuro-endocrine-immune axis.^{30,31} Several studies have indicated that the number of active MTrPs in patients with chronic low back pain or migraine correlates significantly with sleep quality, and targeted MTrP interventions can improve sleep quality and reduce dependence on hypnotic medications.^{29,32,33}

Although both SGB and MTrP-targeted acupuncture have sound theoretical foundations and empirical support for treating insomnia with comorbid anxiety and depression, evidence on their combined use is limited. SGB primarily exerts central autonomic regulation, whereas acupuncture at the cervicotemporal MTrPs provides localized relief of peripheral myofascial pain. The combination of these two modalities allows for concurrent modulation of the neuroendocrine system and somatic musculature, disrupting the pathological cycle in which insomnia, anxiety, and depression reinforce each other. Therefore, this retrospective study aimed to evaluate the efficacy and safety of combining ultrasound-guided SGB with cervicotemporal MTrPs acupuncture in patients with insomnia and comorbid anxiety or depression. The findings may offer novel insights and provide evidence-based guidance for future clinical practice.

Material and Methods

Study Design

This single-center, retrospective observational study was conducted at the Shandong Second Provincial General Hospital. All enrolled patients received a combined treatment regimen of ultrasound-guided SGB and acupuncture at the cervicotemporal MTrPs, which represents the standard treatment protocol for insomnia at our institution. Primary data were obtained from patients' medical records. Demographic and clinical information, including age, sex, date of visit, chief complaint, current illness history, and past medical history, was systematically extracted.

The study protocol was reviewed and approved by the Ethics Committee of the Shandong Second Provincial General Hospital (approval No.2025-028-01; April 28, 2025) and conducted in accordance with applicable laws, regulations, and institutional guidelines. Informed consent for participation from participants or the participants' legal guardians/next of kin was waived in compliance with national legislation and institutional requirements.

Participants

In this retrospective observational study, 58 patients diagnosed with insomnia disorder, anxiety, and depression were initially identified from the medical records of the Anesthesia Insomnia Clinic, Department of Anesthesiology Outpatient Clinic at the Shandong Second Provincial General Hospital between November 2024 and April 2025. Sixteen patients were excluded due to failure to meet the inclusion criteria. The remaining 42 patients were enrolled in the study and completed the entire treatment course. A follow-up assessment was performed four weeks after the intervention to evaluate treatment outcomes (Figure 1).

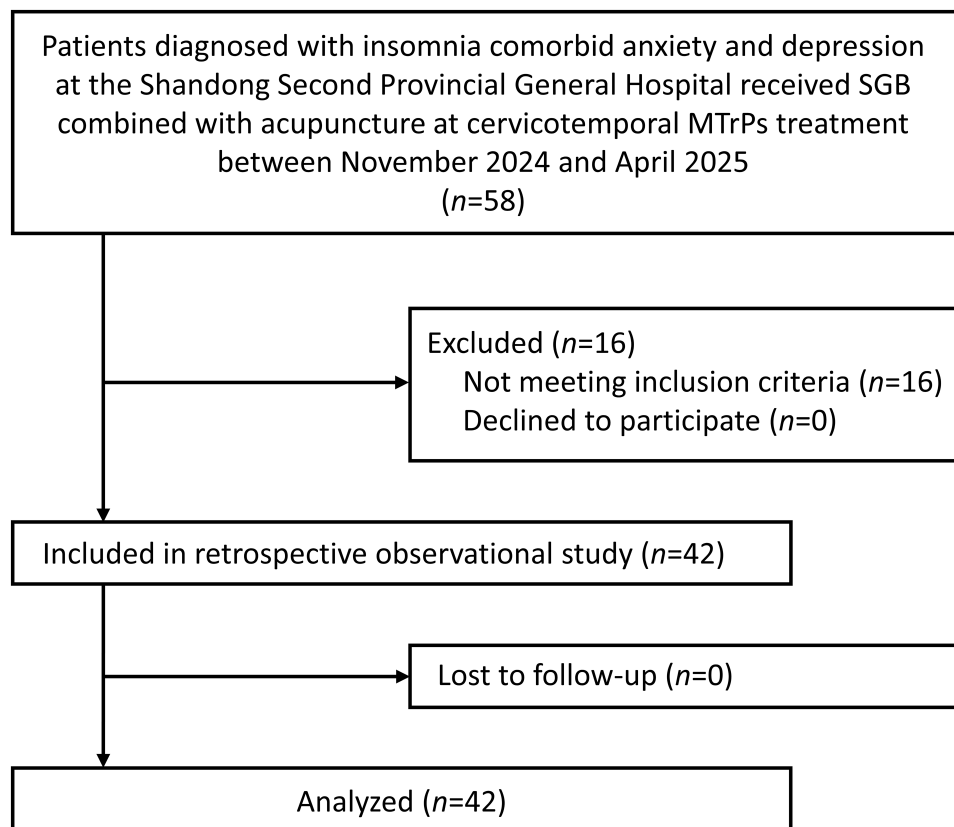


Figure 1 Flow diagram of the study.

Abbreviations: SGB, stellate ganglion block; MTrPs, myofascial trigger points.

Inclusion criteria were as follows: (1) diagnosis of insomnia disorder according to the “Diagnostic and Statistical Manual of Mental Disorders” published by the American Psychiatric Association, and characterized by difficulty falling asleep (≥ 30 min), light sleep, poor sleep quality, frequent nocturnal awakenings (> 2 times per night), early morning awakening, difficulty returning to sleep after awakening, daytime fatigue or functional impairment, total daily sleep time < 6 hours, and symptom duration ≥ 30 days;³⁴ (2) age between 18 and 75 years; (3) Pittsburgh Sleep Quality Index (PSQI) score > 10 , indicating moderate to severe sleep disturbance; (4) comorbid depressive and anxiety disorders, defined as Hamilton Depression Rating Scale (HAMD) score > 8 and Hamilton Anxiety Rating Scale (HAMA) score > 8 ; and (5) no use of other sleep-affecting medications within two weeks before treatment initiation.

The exclusion criteria were as follows: (1) heart, liver, or kidney insufficiency or electrolyte disturbance; (2) contraindications to SGB, including coagulopathy and local or systemic infection. Coagulopathy was defined as prothrombin time or activated partial thromboplastin time exceeding the upper limit of normal, an international normalized ratio ≥ 1.4 , or platelet count $< 80 \times 10^9 \text{ L}^{-1}$;³⁵ (3) infection or neoplastic lesions at the acupuncture site; (4) inability to cooperate with treatment procedures or complete follow-up assessments; and (5) severe cognitive impairment or language difficulties.

Clinical Treatment

All treatments were performed at Anesthesia Insomnia Clinic, Department of Anesthesiology Outpatient Clinic, Shandong Second Provincial General Hospital by a single attending physician (YZW), who did not participate in subsequent follow-up assessments.

Acupuncture at Cervicotemporal MTrPs

Before the procedure, the location of the MTrPs was identified and marked using a surgical skin marker. The skin overlying the trigger points in the cervical and temporal regions was disinfected with iodophor solution. Anatomical

landmarks were localized, including the anterior tubercles of the C2 and C4 transverse processes of the scalenus anterior muscle, the medial border of the mid-portion of the sternocleidomastoid muscle, trigger points in the upper trapezius, and trigger points in the temporalis muscle (Figure 2A–C). These sites typically demonstrated tenderness on palpation and contained a palpable taut band or a discrete, movable nodule.

A disposable, sterile acupuncture needle (0.35 × 50 mm, CR-3550, Cloud & Dragon Medical Devices Co., Ltd., Wujiang) was inserted perpendicularly into each trigger point. The needle was manipulated in multiple directions until a local twitch response was elicited, followed by rapid puncture repeated 7–10 times at each site. After needle removal, gentle pressure was applied to the puncture site for approximately 30 seconds to prevent bleeding (Figure 2D–E). Treatments were administered once weekly for three consecutive sessions.

Ultrasound-Guided SGB

Patients were positioned supine with the head rotated toward the contralateral side, mouth slightly open, and anterior neck muscles relaxed. Standard monitoring, including oxygen supplementation and continuous electrocardiographic (ECG) surveillance, was initiated. A high-frequency linear ultrasound transducer (3–13 MHz, L12-4S; M9 Premium Ultrasound

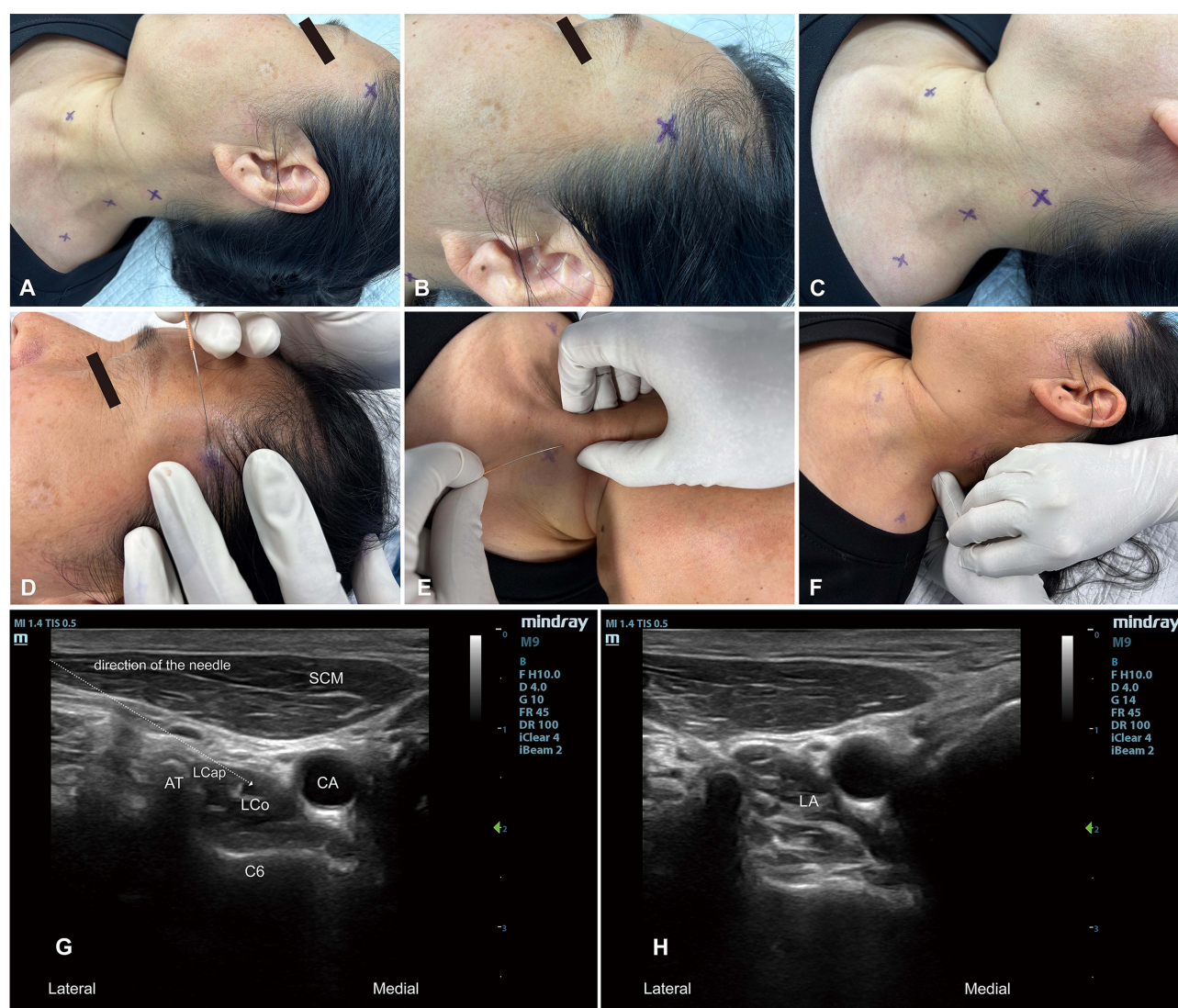


Figure 2 Ultrasound-guided SGB combined with acupuncture at cervicotemporal MTrPs. (A) Surface localization of cervicotemporal MTrPs; (B) Surface localization of cervical MTrPs; (C) Surface localization of temporal MTrPs; (D) Needling of cervical MTrPs; (E) Needling of temporal MTrPs; (F) Ultrasound-guided SGB; (G) Sonographic illustration of SGB; (H) Post-SGB injection.

Abbreviations: SGB, stellate ganglion block; MTrPs, myofascial trigger points; SCM, sternocleidomastoid muscle; LCo, longus colli; LCap, longus capitis; CA, carotid artery.

System, Mindray Bio-Medical Electronics Co., Ltd., Shenzhen) was placed in the trachea-parallel supraclavicular plane and moved laterally from the medial border of the sternocleidomastoid (SCM) muscle.

Ultrasound imaging identified the transverse process of the C6 vertebra, including its anterior and posterior tubercles. The probe was then shifted caudally toward the C7 level until the anterior tubercle of the C6 transverse process was no longer visible. Key anatomical structures, including the SCM, C6 nerve root, carotid artery (CA), longus colli (LCo), and longus capitis (LCap) muscles, were visualized (Figure 2F–G). Color doppler was used to assess vascular anatomy along the intended needle trajectory.

Under in-plane ultrasound guidance, the needle was advanced into the space between the C6 nerve root and the internal jugular vein, with careful avoidance of critical structures such as the internal carotid artery and brachial plexus. The needle tip was positioned at the surface of the LCo beneath its anterior fascia. After confirming the absence of blood or cerebrospinal fluid via negative aspiration, 4 mL of 1% lidocaine was injected (Figure 2H). The needle was then withdrawn, and gentle pressure was applied to the puncture site to prevent bleeding. Patients were monitored for the appearance of Horner syndrome and other potential complications. The SGB procedure was performed once daily, alternating between sides, for a total of eight consecutive sessions.

All patients received treatment according to the standardized institutional protocol. SGB once daily (alternating bilaterally, eight total sessions) and MTrPs needling once weekly (three total sessions). No patient had taken medications or received any other sleep-affecting interventions in the two weeks before treatment initiation, and none received additional treatments or pharmacological agents during the 4-week treatment period (Figure 3).

Clinical Assessment

All patients who completed the treatment course underwent evaluation of sleep quality, anxiety, and depression in the morning before treatment initiation (8:00–10:00) and again after completion of the 4-week treatment period (Figure 3). Follow-up assessments were performed by the same anesthesiologist.

Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI), which yields a total score from 0 to 21, with higher scores indicating poorer sleep. Anxiety was evaluated using the 14-item Hamilton Anxiety Rating Scale (HAMA), scored on a 5-point scale (0–4) per item; total scores of 0–7 indicate minimal or no anxiety, with higher scores reflecting greater severity. Depression was assessed with the 24-item Hamilton Depression Rating Scale (HAMD), in which most items are scored on a 5-point scale (0–4) and some on a 3-point scale (0–2); total scores < 8 indicate minimal or no depressive symptoms, with higher scores corresponding to more severe depression.

Statistical Analysis

The normality of continuous variables was assessed using the Shapiro–Wilk test. Data are expressed as counts and percentages, means and standard deviations (SD), or medians with interquartile ranges (IQR), as appropriate. For

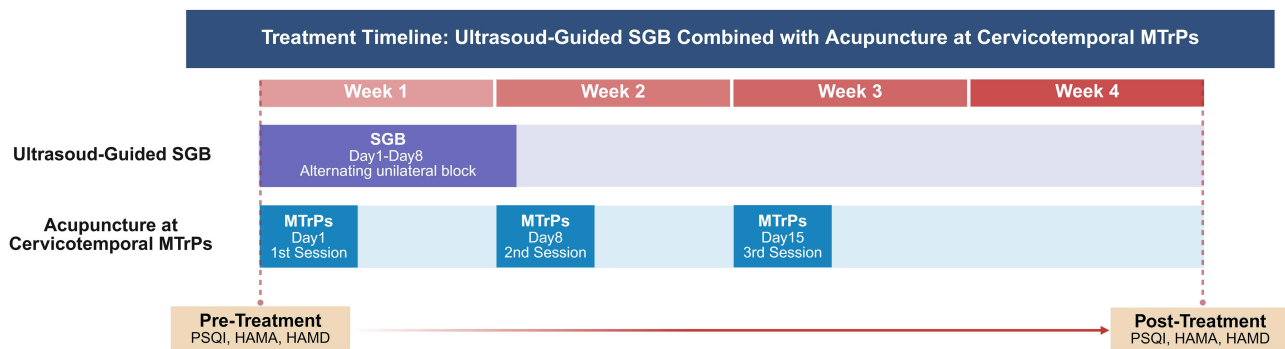


Figure 3 Treatment timeline for ultrasound-guided SGB combined with acupuncture at cervicotemporal MTrPs.

Notes: Created in BioRender. Chen, Z (2025) <https://BioRender.com/i8zdywz>.

Abbreviations: SGB, stellate ganglion block; MTrPs, myofascial trigger points; PSQI, Pittsburgh Sleep Quality Index; HAMA, Hamilton Anxiety Rating Scale; HAMD, Hamilton Depression Rating Scale.

normally distributed data, comparisons before and after treatment were conducted using the paired-sample *t*-test; for non-normally distributed data, the Wilcoxon signed-rank test was applied. To visualize the distribution of post-treatment score changes (Δ PSQI, Δ HAMA, Δ HAMD), a composite plot integrating scatter (raw data), violin (density), and boxplot (quantiles) elements was generated using R version 4.2 (R Foundation for Statistical Computing) with the *ggplot2* package. All *P* values were two-sided, and $P < 0.05$ was considered statistically significant. All statistical analyses were performed using R version 4.2.

Results

A total of 42 patients underwent treatment with ultrasound-guided SGB combined with acupuncture at cervicotemporal MTrPs. Patient ages ranged from 29 to 75 years (mean \pm SD, 50.07 ± 14.43). Demographic and clinical characteristics, including age, American Society of Anesthesiologists (ASA) physical status classification, height, weight, body mass index (BMI), and medical history, are summarized in Table 1.

Compared with baseline, post-treatment scores were significantly reduced for all three outcome measures: the PSQI scores (5.00 ± 2.84 versus 17.10 ± 2.61 ; mean difference, -12.10 ; 95% CI, -12.91 to -11.28 ; $P < 0.001$); the HAMA scores (5.05 ± 2.80 versus 19.00 ± 4.23 ; mean difference, -13.95 ; 95% CI, -15.09 to -12.82 ; $P < 0.001$); and HAMD scores (3.41 ± 2.68 versus 15.76 ± 4.43 ; mean difference, -12.36 ; 95% CI, -13.56 to -11.15 ; $P < 0.001$) (Table 2 and Figure 4A–C).

Figure 5 illustrates the distribution of changes in sleep quality (Δ PSQI), anxiety (Δ HAMA), and depression (Δ HAMD) scores after treatment. Among these, Δ HAMA demonstrated the largest difference, indicating that the combined intervention had the most pronounced effect on alleviating anxiety symptoms.

Table 1 Demographics and Baseline Characteristics

Variables	Value
Age, y	50.07 ± 14.43
Sex, (%)	
Male	11 (26.19)
Female	31 (73.81)
Height, cm	164.09 ± 6.59
Weight, kg	61.00 [56.00, 70.75]
BMI, kg/m ²	23.72 ± 3.01
ASA physical status, (%)	
Class I	27 (64.29)
Class II	15 (35.71)
Previous history, (%)	
Diabetes	4 (9.52)
Hypertension	11 (26.19)
Coronary artery disease	3 (7.14)
Surgery	11 (26.19)
Allergy	0

Notes: Values are presented as mean \pm standard deviation, number (proportion), or median [Q1, Q3].

Table 2 Pre- and Post- Treatment Comparison of PSQI, HAMA, and HAMD Scores

	Pre-Treatment	Post-Treatment (Four Weeks)	Mean Difference (95% CI)	P-Value
PSQI	17.10 ± 2.61	5.00 ± 2.84	$-12.10 (-12.91, -11.28)$	< 0.001
HAMA	19.00 ± 4.23	5.05 ± 2.80	$-13.95 (-15.09, -12.82)$	< 0.001
HAMD	15.76 ± 4.43	3.41 ± 2.68	$-12.36 (-13.56, -11.15)$	< 0.001

Notes: Values are presented as mean \pm standard deviation.

Abbreviations: PSQI, Pittsburgh Sleep Quality Index; HAMA, Hamilton Anxiety Rating Scale; HAMD, Hamilton Depression Rating.

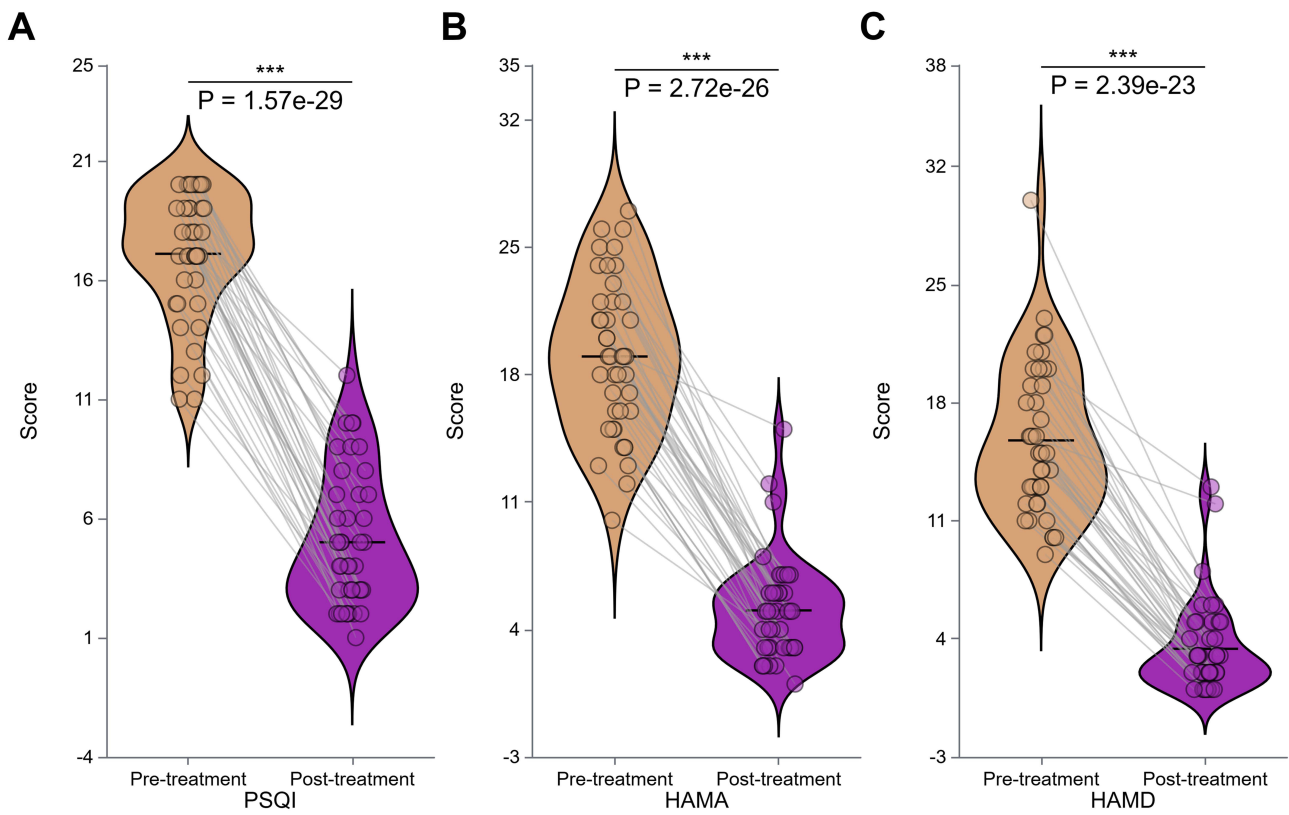


Figure 4 Pre- and post-treatment comparison of (A) PSQI, (B) HAMA, and (C) HAMD scores.

Notes: *** $P < 0.001$ vs pre-treatment.

Abbreviations: PSQI, Pittsburgh Sleep Quality Index; HAMA, Hamilton Anxiety Rating Scale; HAMD, Hamilton Depression Rating Scale.

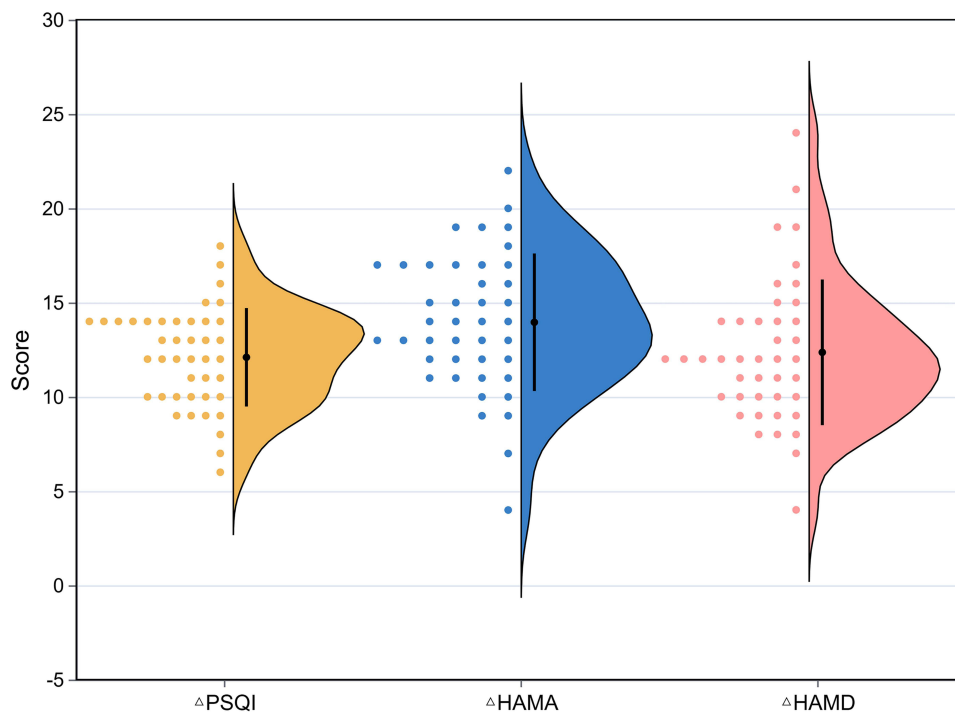


Figure 5 Distribution characteristics of changes in Δ PSQI, Δ HAMA, and Δ HAMD scores between pre-treatment and post-treatment.

Abbreviations: PSQI, Pittsburgh Sleep Quality Index; HAMA, Hamilton Anxiety Rating Scale; HAMD, Hamilton Depression Rating Scale.

No procedure-related complications, such as vagus nerve block, recurrent laryngeal nerve block, phrenic nerve block, cervical nerve block, bleeding, hematoma, or infection, were observed in any patient receiving SGB or cervicotemporal MTrPs acupuncture.

Discussion

Insomnia is a common clinical sleep disorder.³⁶ Patients with chronic insomnia are at increased risk for both physical and psychological complications, particularly anxiety and depression.^{7,37–39} Conversely, psychiatric conditions such as depression and anxiety can disrupt sleep architecture, thereby triggering or exacerbating insomnia.³⁹ Depressive symptoms are considered one of the most significant risk factors for insomnia, whereas anxiety is a known predictor for the onset of sleep disturbances. Therefore, effective treatment strategies should address both mood symptoms and sleep dysfunction to improve quality of life and restore social functioning. Although various therapeutic approaches are available for managing insomnia with coexisting emotional disturbances, monotherapy often demonstrates limited effectiveness in real-world clinical practice.

In the present study, ultrasound-guided SGB combined with acupuncture at the cervicotemporal MTrPs significantly improved the PSQI, HAMA, and HAMD scores in patients with insomnia disorder accompanied by anxiety and depression. These findings suggest that combination therapy may produce synergistic benefits by simultaneously modulating autonomic nervous system activity, improving sleep quality, and alleviating emotional distress.

From a neuroregulatory perspective, ultrasound-guided SGB directly targets the sympathetic chain, reducing excessive sympathetic activity in the head and neck, relieving intracranial vascular spasm. This restores sympathetic-parasympathetic balance, improves cerebral perfusion, and optimizes oxygen supply-demand, thereby enhancing sleep quality. SGB also modulates the hypothalamic-pituitary-adrenal (HPA) axis, lowering stress-related hormones such as adrenaline, noradrenaline, and cortisol.⁴⁰ Additionally, it may regulate neurotransmitters, neuropeptide Y (NPY), 5-hydroxytryptamine (5-HT), and γ -aminobutyric acid (GABA), further influencing HPA axis activity.²⁵ Overactivation of the stellate ganglion can cause tachycardia, hypertension, and endocrine disturbances, contributing to insomnia, anxiety, and depression. Haest et al⁴¹ reported SGB efficacy for insomnia in patients with breast cancer. By inhibiting pre- and postganglionic fibers, SGB modulates cardiovascular activity, glandular secretion, pain transmission, and muscular contraction, exerting therapeutic effects on emotional distress and sleep disorders.²⁵ Preclinical studies demonstrate that SGB can alleviate anxiety and depression through mechanisms involving increased cerebral blood flow and inhibition of the HIF-1 α /NLRP3 inflammatory signaling pathway, with concomitant improvements in sleep disturbances and cognitive decline.^{26,42,43} However, its benefit is limited as monotherapy.⁴⁴

MTrPs, also referred to as tender or trigger points, are hyperirritable nodules within taut skeletal muscle bands detectable by palpation.⁴⁵ As an emerging therapy for insomnia, MTrPs therapy has demonstrated superior efficacy compared to pharmacologic agents without risk of dependence or residual side effects.^{28,32} Persistent muscle fiber contraction at MTrPs can compress supplying blood vessels and nerves, causing localized pain, restricted motion, and chronic fatigue.⁴⁵ Acupuncture-mediated MTrPs inactivation relieves vascular compression, restores blood flow, and mechanical equilibrium, and thereby improves sleep quality. Autonomic imbalance often contributes to MTrP-related local and referred pain, exacerbated by sympathetic overactivity.⁴⁶ Morikawa et al⁴⁷ found that manual MTrP compression significantly enhances parasympathetic activity while simultaneously reducing sympathetic outflow tone and subjective pain perception, a phenomenon termed autonomic recalibration (AR). Acupuncture at MTrPs can activate sensory receptors that modulate autonomic function, reduce sympathetic vasoconstriction, increase cerebral oxygenation, and help regulate the sleep-wake cycle.^{48,49}

In this study, we evaluated the therapeutic effects of ultrasound-guided SGB combined with acupuncture at the cervicotemporal MTrPs in patients with insomnia and comorbid emotional disturbances. The intervention aimed to improve sleep and mood through synergistic neuroregulatory mechanisms. After four weeks of treatment, patients demonstrated significant improvements in sleep quality and marked reductions in anxiety and depression, with the most pronounced effect observed for anxiety. One plausible explanation for this is that insomnia-related anxiety acts as an acute stress response that is rapidly relieved when sleep quality improves. SGB primarily modulates central autonomic activity, whereas MTrPs acupuncture provides localized relief of peripheral myofascial pain. Their combination enables concurrent regulation of the neuroendocrine system and somatic musculature, interrupting the cycle in which insomnia, anxiety, and depression exacerbate one another. Acupuncture at the cervicotemporal MTrPs may further augment anti-anxiety and antidepressant effects via vagal nerve modulation, establishing a bidirectional neural regulatory mechanism alongside SGB. Based on these findings, we propose the

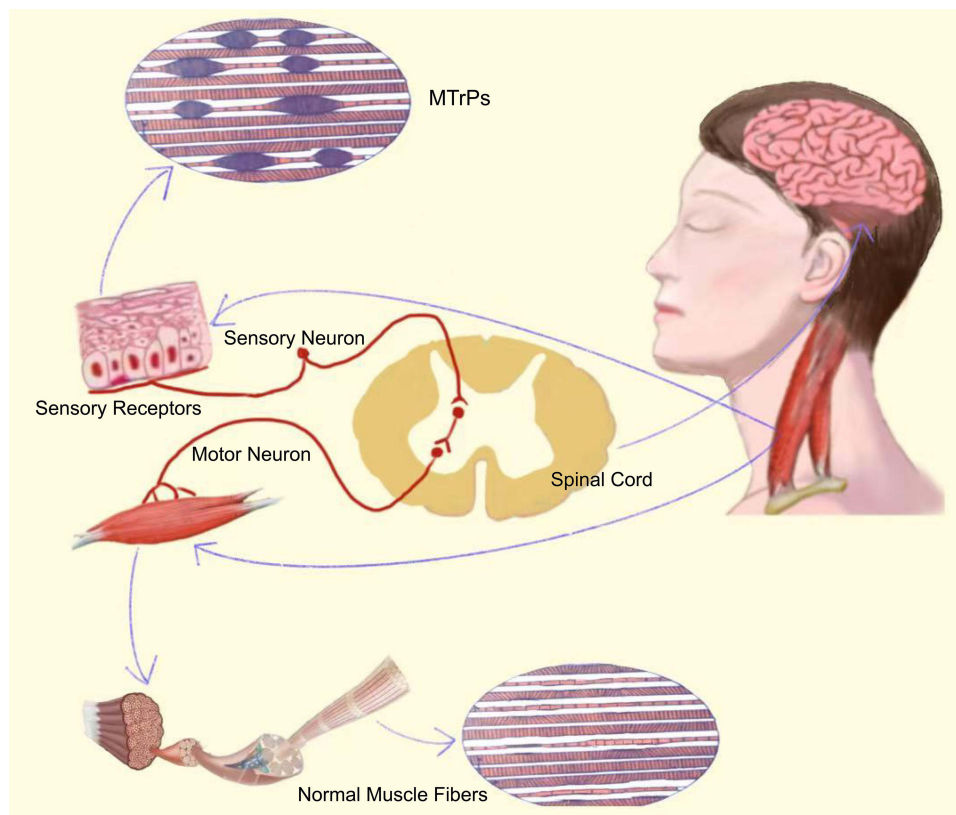


Figure 6 Reflex Arc Treatment Concept.
Abbreviations: MTrPs, myofascial trigger points.

“Reflex Arc Treatment Concept” (RATC), which applies the classical reflex arc model—receptor, afferent nerve, central nervous system, efferent nerve, effector—to this combined therapy. In this framework, MTrPs acupuncture targets the receptor components, while SGB influences the efferent pathway (Figure 6), offering a potential mechanistic explanation for the observed clinical efficacy.

This study has several limitations. First, as a retrospective observational study, the lack of a randomized controlled design may have introduced selection bias. Second, the relatively small sample size and absence of long-term follow-up limit the evaluation of sustained efficacy and recurrence rates. Outcomes were assessed only at 4 weeks post-intervention; thus, it remains unclear whether the improvements in the PSQI, HAMA, and HAMD scores persist over time or regress toward baseline. Third, the neurobiological mechanisms underlying the observed effects remain incompletely understood. Further investigation using advanced neuroimaging and physiological methods, such as functional magnetic resonance imaging (fMRI) and functional near-infrared spectroscopy (fNIRS), is warranted. Preliminary fNIRS findings from our group suggest that ultrasound-guided SGB combined with cervicotemporal MTrPs acupuncture may alleviate insomnia by reducing hyperarousal via enhanced prefrontal cortex excitability.⁵⁰ Future research should include large-scale, multicenter, randomized controlled trials to validate the RATC and elucidate its mechanisms.

Conclusion

This preliminary study suggests that ultrasound-guided SGB combined with acupuncture at cervicotemporal MTrPs is an effective, comprehensive intervention for insomnia with comorbid anxiety and depression. The benefits may arise from synergistic mechanisms involving autonomic balance regulation, suppression of excessive sympathetic activity, reduction of myofascial tension, and modulation of the sleep-wake cycle. These findings warrant further clinical validation and mechanistic investigation.

Abbreviations

AR, Autonomic recalibration; ASA, American Society of Anesthesiologists; BMI, Body mass index; CA, Carotid artery; CBT-I, Cognitive behavioral therapy for insomnia; CI, Confidence interval; ECG, Electrocardiography/electrocardiogram; fMRI, Functional magnetic resonance imaging; fNIRS, Functional near-infrared spectroscopy; GABA, Gamma-aminobutyric acid; HAMD, Hamilton Depression Rating Scale; HAMA, Hamilton Anxiety Rating Scale; HIF-1 α , Hypoxia-inducible factor 1-alpha; HPA, Hypothalamic–pituitary–adrenal; IQR, Interquartile range; LA, Local anesthetic; LCap, Longus capitis muscle; LCo, Longus colli muscle; MTrP, Myofascial trigger point; NPY, Neuropeptide Y; PSQI, Pittsburgh Sleep Quality Index; RATC, Reflex Arc Treatment Concept; SCM, Sternocleidomastoid muscle; SGB, Stellate ganglion block; SNRI, Serotonin–norepinephrine reuptake inhibitor; SSRI, Selective serotonin reuptake inhibitor; TCM, Traditional Chinese medicine.

Data Sharing Statement

The datasets used or analyzed in the current study are available from the corresponding author upon reasonable request.

Ethics Approval and Informed Consent

This study was approved by the Institutional Ethics Committee of the Shandong Second Provincial General Hospital (No.2025-028-01). The guidelines outlined in the Declaration of Helsinki were followed in this study. Written informed consent for participation from participants or the participants' legal guardians/next of kin was waived in accordance with national legislation and institutional requirements.

Consent to Publish

Written informed consent was obtained from the patient for publication of images in [Figure 2](#).

Acknowledgments

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Author Contributions

ZZL: Conceptualization; Methodology; Software; Writing–original draft; Writing–review & editing. LFW: Conceptualization; Methodology; Data curation; Formal analysis; Writing–original draft; Writing–review & editing. PLC: Software; Formal analysis; Writing–original draft. SYC: Investigation; Data curation; Writing–review & editing. JXW: Investigation; Methodology; Writing–review & editing. HZ: Investigation; Data curation; Writing–review & editing. JZ: Investigation; Data curation; Writing–review & editing. GTL: Investigation; Data curation; Writing–review & editing. FMJ: Investigation; Data curation; Writing–review & editing. LYL: Investigation; Resources; Writing–review & editing. RTW: Investigation; Data curation; Writing–review & editing. QQW: Methodology; Software; Writing–review & editing. MXG: Software; Writing–review & editing. ZPC: Conceptualization; Methodology; Software; Supervision; Project administration; Writing–original draft; Writing–review & editing. YZW: Conceptualization; Methodology; Software; Supervision; Project administration; Writing–review & editing. ZZL, LFW, and PLC are the first co-authors of this study. ZPC and YZW are corresponding authors.

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work.

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