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Original Article

Effect of auricular pressure bean combined with wrist-ankle needle on cognitive function and prognosis in migraine patients with anxiety and depression disorders

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Abstract: Objective: To investigate the effects of auricular pressure bean combined with wrist-ankle needle on cognitive function and prognosis in migraine patients with comorbid anxiety and depressive disorders. Methods: A retrospective study was conducted on 99 migraine patients treated at Hefei First People's Hospital between January and December 2023. Based on therapeutic protocols, participants were allocated into auricular pressure bean group (n=22), wrist-ankle needle group (n=20), and combined group (combined auricular pressure bean with wrist-ankle needle, n=57). Pain intensity, depression severity, anxiety severity, cognitive function, and quality of life across three groups were compared before treatment and at 4 weeks post-treatment. Patient migraine recurrence after 3 months was recorded. Pearson correlation analysis was employed to assess the correlation between improvement in anxiety and depression scores and improvement in cognitive function scores. Results: After treatment, all three groups showed a decreasing trend in Visual Analogue Scale, Hamilton Rating Scale for Depression-17 and Hamilton Anxiety Rating Scale scores (all P<0.05). The combined therapy group had lower scores than other groups (all P<0.05). Montreal Cognitive Assessment and Migraine-Specific Quality of Life Questionnaire scores were increased across all groups, with the combined therapy group scoring the highest (all P<0.05). Statistically significant differences existed in recurrence rates among the three groups (P<0.05). Improvements in anxiety and depression symptoms were positively correlated with cognitive function improvements across all treatment modalities (P<0.05). Conclusion: The combined therapy can significantly relieve the pain and anxiety and depression symptoms of migraine patients, improve cognitive function and quality of life, and reduce recurrence rate. It shows better efficacy than single therapy.

Keywords: Auricular pressure bean, wrist-ankle needle, anxiety and depressive disorders, migraine, cognitive function

Introduction

Migraine is a chronic neurological disease characterized by recurrent unilateral pulsatile headaches with moderate to severe pain intensity [1]. The global prevalence rate is about 14.7%, and the prevalence rate of Chinese adults is 9.3% [2]. Studies have shown that 30% to 50% of migraine patients are accompanied by anxiety and depression. Anxiety and depression can reduce the pain threshold as an incentive to increase the frequency and intensity of migraine attacks. On the contrary, chronic recurrent headache further aggravates the patient's emotional disorders, forming a vicious circle of negative emotions and headaches that reinforce each other. This dynamic may also impair patients' cognitive function [3]. This not only hinders patients' daily work and social activities, but also weakens their treatment compliance and self-management ability, which has a negative impact on the long-term prognosis of the disease.

For migraine patients with anxiety and depression, combined drug therapy is usually used. This treatment usually includes the use of analgesics to relieve pain, while taking anti-anxiety

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drugs and antidepressants. Although effective to some extent, long-term use may lead to side effects, including gastrointestinal reactions, drowsiness and dependence [4]. Therefore, a safe and effective treatment with minimal side effects is urgently needed in clinical practice. Auricular pressure bean therapy and wrist-ankle needle are both simple, easily administered, and minimally painful specialized therapies. Auricular pressure bean therapy stimulates acupoints on the auricle to unblock meridians, regulate organ functions, and calm the mind. It modulates autonomic nervous system activity to alleviate anxiety and pain [5]. Wrist-ankle needle is a subcutaneous needling technique that involves shallow insertion at specific stimulation points on the wrist and ankle. This efficiently channels meridian energy, harmonizing qi and blood while providing sedation and pain relief [6]. However, the current research mainly focuses on the immediate analgesic effect of single therapy [7], which leads to insufficient evidence to support the combined treatment plan for the complex interaction of migraine, anxiety and depression.

Based on this, the purpose of this study was to explore the effects of auricular point pressing therapy combined with wrist-ankle acupuncture on anxiety and depression symptoms, cognitive function and quality of life in such patients. Its goal is to provide a theoretical basis for the development of a more optimized and comprehensive non-drug treatment plan in clinical practice, thereby improving the prognosis of patients.

Materials and methods

Study design

A retrospective study was conducted on 99 migraine patients treated at Hefei First People's Hospital between January and December 2023. Based on therapeutic protocols, participants were allocated into auricular pressure bean group (n=22), wrist-ankle needle group (n=20), and combined group (n=57).

Inclusion criteria: (1) Meeting the International Classification of Headache Disorders, 3rd edition (ICHD-3) revised by the International Headache Society [8]; (2) Meeting the diagnostic criteria for anxiety disorders and depressive disorders as outlined in the International Classification of Diseases, 11th Revision [9]; (3) Aged 18-65 years; (4) Disease duration ≥6 months with ≥2 headache episodes per month; (5) Complete clinical documentation.

Exclusion criteria: (1) Secondary migraine, such as cerebrovascular disease or intracranial tumors; (2) Concurrent severe organic diseases of the heart, liver, kidneys, etc.; (3) Acute phase of psychiatric disorders, such as manic episodes; (4) Allergy to auricular pressure seeds or Wangbuluxing seeds, or contraindications to wrist-ankle acupuncture.

Efficacy analysis was conducted based on the intergroup difference in VAS scores after 4 weeks of treatment [10]. With α=0.05 (two-tailed) and a total sample size N=99, the calculated test power was 96.81%>80%. This study was approved by the Ethics Committee of Hefei First People's Hospital.

Treatment

All patients received standard treatment. For migraine management, ibuprofen (Sanofi-Aventis China Co., Ltd., National Drug Approval No. H10900089) was prioritized during acute episodes for rapid symptom relief. During the maintenance phase, flunarizine (Jiangxi Huiren Pharmaceutical Co., Ltd., National Drug Approval No. H20033514) was administered to reduce attack frequency. For anxiety and depression intervention, sertraline (Chengdu Aobang Pharmaceutical Co., Ltd., National Drug Approval No. H20060383) and venlafaxine (Beijing Fuyuan Pharmaceutical Co., Ltd., National Drug Approval No. H20143052) were administered.

When reviewing the medical records of all patients, we found that the treatment plan varied due to contraindications and the availability of actual resources at the time of treatment. The auricular acupuncture group comprised patients with no contraindications to auricular seed therapy, no history of allergy to the adhesive tape or Vitex seed used, and no skin lesions or infections on the auricle that would impede application. These patients showed subjective intolerance to treatment - specifically, they explicitly refused to accept wrist-ankle acupuncture treatment for fear of acupuncture. Despite the investigator fully explaining the procedure, safety profile, and analgesic mechanism of wrist-ankle acupuncture, the patient remained adamant in refusing this therapy.

Patients in the wrist-ankle acupuncture group had no skin infections or lesions at the acupuncture sites, no severe coagulation disorders, and no history of epilepsy or needle phobia. During the patient's consultation period, the hospital experienced a temporary shortage of dedicated ear acupuncture pressure bean materials (Wangbuluxing seeds or accompanying adhesive tape), preventing immediate ear acupuncture pressure bean treatment. Due to the need for rapid pain relief in patients with acute headache episodes, these individuals were only included in the wrist-ankle acupuncture group. In the combined group, patients had no allergy to ear acupuncture materials, no auricular skin issues, or no contraindications for wrist-ankle acupuncture. Both treatment resources were available at the time of consultation, and patients received the combined treatment protocol.

Auricular pressure bean group: The Shenmen, Subcortical, Occipital, Temporal, Liver, and Kidney points were selected. The auricular skin was disinfected with 75% alcohol. Once the alcohol completely evaporated, adhesive tape (0.6 cm × 0.6 cm) bearing Wangbuluxing seeds were applied to each selected auricular point. Continuous gentle pressure was applied with the thumb and forefinger until the patient developed a sensation of soreness and distension. The patient was instructed to self-administer pressure three times daily, 30 minutes after breakfast, lunch, and dinner respectively. Each application lasted 1-2 minutes per point, alternating between both ears. The patches were replaced twice weekly for a continuous treatment period of four weeks [11].

Wrist-ankle needle group: Insertion points were selected according to headache location. For frontal pain, Zone 1 was chosen; for temporal pain, Zone 2; for vertex pain, Zone 1; for occipital pain, Zone 5 or Zone 6. For unilateral headaches, the affected side was treated and for bilateral or non-localized headaches, both sides were treated. The skin was disinfected with 75% alcohol. A 30-gauge, 1.5-inch sterile disposable acupuncture needle was rapidly inserted to the head at an angle of 15-30°, parallel to the subcutaneous tissue, with a depth of about 1.2 inches. It was ensured that no resistance, soreness, numbness, swelling or pain was present under the needle. The needle was retained for 30 minutes. The treatment plan was administered three times a week for four consecutive weeks [12].

Combined group: The treatment program combined wrist and ankle acupuncture with auricular seed therapy. Each session involved the performance of wrist-ankle acupuncture, with simultaneous administration of auricular seed pressing. The same treatment protocol was applied to the auricular acupuncture and wrist-ankle acupuncture groups. The ear seed replacement cycle was staggered with the wrist and ankle acupuncture treatment interval to ensure continuous treatment stimulation.

Observation indicators

Basic information: The general characteristics of all patients were reviewed, including gender, age, course of disease, type of migraine, frequency of attack and duration of headache. All patients were evaluated before treatment and 4 weeks after treatment.

Pain intensity: Visual Analogue Scale (VAS) was developed by Huskisson et al. [13]. The scale uses a 10-point sliding ruler with a length of 10 centimeters, and the ends are marked as '0' and '10', representing the lowest and highest pain levels, respectively. The higher the score, the more severe the pain. The Cronbach's alpha coefficient of the Chinese version of the scale is 0.807 [14, 15].

Depression severity: The Hamilton Depression Scale (HAMD-17) [16] contains 17 items. It uses a five-level scoring system of 0 to 4 points, with a total score range of 0 to 52 points. The higher the score, the higher the severity of depression. The Cronbach's alpha coefficient of the Chinese version of the scale is 0.832 [17, 18].

Anxiety level: The Hamilton Anxiety Scale (HAMA), included 14 items, using a five-level scoring system of 0 to 4 points [19]. The total score ranges from 0 to 56 points and the higher the score, the more serious the anxiety. The Cronbach's alpha coefficient of the Chinese version of the scale is 0.810 [20, 21].

Cognitive function: The Montreal Cognitive Assessment (MoCA) [22] contains 11 items, with a full score of 30 points. A score of ≥26

points indicates normal cognitive function. The Cronbach's alpha coefficient of the Chinese version of the scale is 0.730 [23, 24].

Quality of life: Migraine-specific quality of life questionnaire (MSQ) [25] contains 14 items, using a 6-point Likert scale of 1 to 6 points, with a total score range of 0 to 100 points. The higher the score, the better the quality of life. The Cronbach's alpha coefficient of the Chinese version of the questionnaire is 0.730 [26, 27].

Adverse reactions: During the treatment, it is necessary to closely observe and record the adverse reactions of all groups of patients. These reactions include auricular local skin swelling, itching and injury caused by auricular point sticking, subcutaneous hemorrhage, hematoma and acupuncture site pain caused by wrist-ankle acupuncture. The number of cases, specific manifestations and severity of adverse reactions were recorded in detail. The incidence rate of adverse reaction was calculated using the formula: Number of adverse reaction cases/Total number of cases × 100%.

Headache recurrence: All patients received a three-month follow-up after treatment, and the recurrence of migraine was recorded through outpatient visits, telephone follow-up or online questionnaires. Recurrence was defined as the number of migraine attacks ≥2 times per month, or a single headache attack lasting ≥4 hours and VAS pain score ≥4 points.

Statistical analysis

Data analyses were conducted using Statistical Product and Service Solutions 27.0 (IBM, Armonk, NY, USA). The normality of measurement data was assessed using the Kolmogorov-Smirnov test. Normally distributed variables were expressed as mean ± standard deviation (SD). Non-normally distributed data were represented as [M (Q_1, Q_3)] and analyzed using the Mann-Whitney U test. Differences between groups were compared using one-way analysis of variance (ANOVA), while within-group comparisons before and after treatment employed paired *t*-tests. The count data were presented in the form of frequency and percentage [*n* (%)] and analyzed by chi-square test. The ordinal data were analyzed by Wilcoxon test. Pearson correlation analysis was used to evaluate the linear relationship between the improvement of anxiety and depression scores and the improvement of cognitive function scores. Correlation strength was defined as follows: $|r| \geq 0.7$ indicated strong correlation, $0.4 \leq |r| < 0.7$ indicated moderate correlation, and $0.2 \leq |r| < 0.4$ indicated weak correlation. Efficacy analysis employed G*Power 3.1 software (Heinrich Heine University Düsseldorf, Düsseldorf, North Rhine-Westphalia, Germany), with a power level >80% indicating a clinically meaningful difference. Figures and tables were generated using GraphPad Prism 10 (GraphPad Software, La Jolla, California, USA) software. $P<0.05$ was considered statistically significant.

Results

Comparison of baseline data

The three groups were comparable in terms of gender, age, disease duration, migraine type, occurrence frequency, headache duration, pain intensity, depression severity, anxiety level, cognitive function, and quality of life, with no statistically significant differences observed (all $P>0.05$) (**Table 1**).

Comparison of pain intensity improvement

There was no statistically significant difference in VAS scores among the three groups prior to treatment ($P>0.05$). Following four weeks of treatment, all groups exhibited a decreasing trend in VAS scores. The combined group's mean score (2.28±1.09) was significantly lower than that of the auricular pressure bean group (3.18±1.15) and the wrist-ankle needle group (3.15±1.19) ($P<0.05$) (**Figure 1**).

Comparison of depression severity

There was no statistically significant difference in HAMD-17 scores among the three groups prior to treatment ($P>0.05$). Following four weeks of treatment, all groups exhibited a downward trend in HAMD-17 scores. The combined therapy group's mean score (12.70± 2.64) was significantly lower than that of the auricular pressure bean group (14.68±4.35) and the wrist-ankle needle group (15.30± 4.27) ($P<0.05$) (**Figure 2**).

Comparison of anxiety level

There was no statistically significant difference in HAMA scores among the three groups prior

Table 1. Comparison of baseline data

Project	Auricular pressure bean group (*n*=22)	Wrist-ankle needle group (*n*=20)	Combined group (*n*=57)	F/χ^2	*P*
Sex, *n* (%)				0.330	0.848
Male	10 (45.45)	10 (50.00)	30 (52.63)		
Female	12 (54.55)	10 (50.00)	27 (47.37)		
Age, mean ± SD	36.10±8.41	37.35±9.70	35.84±8.20	0.232	0.793
Disease duration, year, mean ± SD	3.97±1.24	4.13±1.87	4.18±1.67	0.132	0.877
Migraine type, *n* (%)				0.710	0.950
Migraine without aura	10 (45.45)	11 (55.00)	26 (45.61)		
Migraine with aura	7 (31.82)	6 (30.00)	19 (33.34)		
Chronic migraine	5 (22.73)	3 (15.00)	12 (21.05)		
Occurrence frequency, *n* (%)				2.721	0.256
≤4 episodes per month	15 (68.18)	14 (70.00)	30 (52.63)		
>4 episodes per month	7 (31.82)	6 (30.00)	27 (47.37)		
Headache duration, hour, mean ± SD	6.57±1.07	6.99±1.12	7.14±1.04	2.283	0.108
VAS, mean ± SD	5.23±0.85	5.10±1.41	5.21±1.41	0.064	0.938
HAMD-17, mean ± SD	17.77±7.86	19.10±7.06	19.98±7.52	0.698	0.500
HAMA, mean ± SD	22.32±7.30	21.55±7.69	23.14±7.59	0.353	0.703
MoCA, mean ± SD	26.32±1.84	26.10±2.51	26.18±2.14	0.058	0.944
MSQ, mean ± SD	43.59±8.29	44.85±7.16	43.98±8.59	0.130	0.879

Note: VAS, Visual Analogue Scale; HAMD-17, Hamilton Rating Scale for Depression-17; HAMA, Hamilton Anxiety Rating Scale; MoCA, Montreal Cognitive Assessment; MSQ, Migraine-Specific Quality of Life Questionnaire.

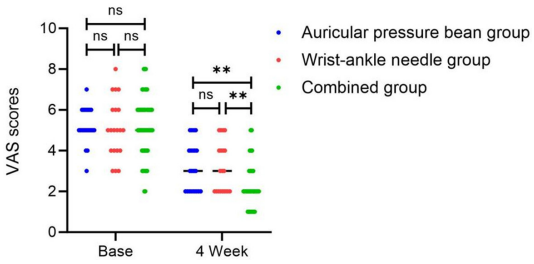

Figure 1. VAS scores for the three groups of patients. Note: VAS, Visual Analogue Scale. ns: not significant; ***P*<0.01.

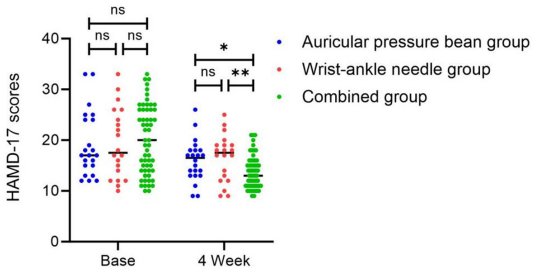

Figure 2. HAMD-17 scores for the three patient groups. Note: HAMD-17, Hamilton Rating Scale for Depression-17. ns: not significant; **P*<0.05; ***P*<0.01.

to treatment (*P*>0.05). Following four weeks of treatment, all groups exhibited a downward trend in HAMA scores. The combined therapy group's mean score (7.70±2.64) was significantly lower than that of the auricular pressure bean group (9.68±4.35) and the wrist-ankle needle group (10.30±4.27) (*P*<0.05) (**Figure 3**).

Comparison of cognitive function

There was no statistically significant difference in MoCA scores among the three groups prior to treatment (*P*>0.05). Following four weeks of treatment, all groups exhibited an upward trend in MoCA scores. The combined therapy group demonstrated a significantly higher mean score (28.57±1.83) compared to both the auricular pressure bean group (27.31±2.46) and the wrist-ankle needle group (27.45±2.60) (*P*< 0.05) (**Figure 4**).

Comparison of quality of life

There was no statistically significant difference in MSQ scores among the three groups prior to treatment (*P*>0.05). Following four weeks of treatment, all groups exhibited an upward trend

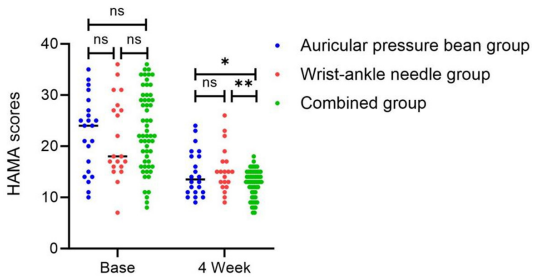

Figure 3. HAMA scores for the three patient groups. Note: HAMA, Hamilton Anxiety Rating Scale. ns: not significant; *P<0.05; **P<0.01.

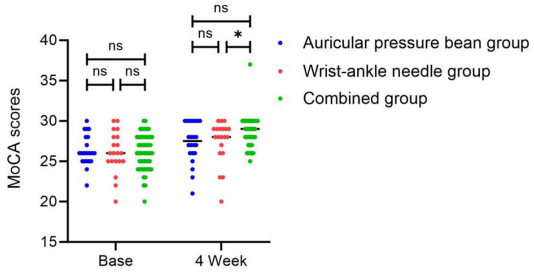

Figure 4. MoCA scores for the three patient groups. Note: MoCA, Montreal Cognitive Assessment. ns: not significant; *P<0.05.

in MSQ scores. The combined therapy group's score (79.54±7.73) was significantly higher than that of the auricular pressure bean group (73.18±11.64) and the wrist-ankle needle group (74.75±6.94) (P<0.05) (**Figure 5**).

Comparison of adverse reaction incidence

During treatment, three patients (13.64%) in the auricular pressure bean group experienced adverse reactions, all presenting as mild localized redness, swelling, or itching of the auricle skin. Three patients (15.00%) in the wrist-ankle needle group experienced adverse reactions: two cases involved minor subcutaneous bleeding at the insertion points, and one case involved transient mild pain at the insertion points. A total of 10 patients (17.54%) in the combined group had adverse reactions, including 5 cases of mild ear local discomfort, 2 cases of mild subcutaneous hemorrhage at the acupuncture site, and 3 cases of transient mild pain at the wrist-ankle acupuncture point. All adverse reactions were quickly relieved after symptomatic treatment, and no patients withdrew from the study due to adverse events. There was no significant difference in the incidence of adverse reactions among the three groups (P>0.05) (**Table 2**).

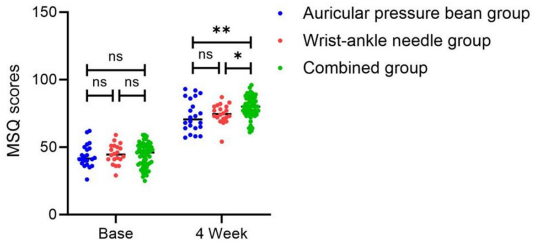

Figure 5. MSQ scores for the three patient groups. Note: MSQ, Migraine-Specific Quality of Life Questionnaire. ns: not significant; *P<0.05; **P<0.01.

Comparison of headache recurrence patterns

In this study, the recurrence rate of headache in the combined group was the lowest, and only 5 of 57 patients relapsed, with a recurrence rate of 8.77%. There were 6 cases of recurrence among the 22 patients in the auricular pressure bean group, with the recurrence rate of 27.27%. The wrist-ankle needle group had 6 recurrences among 20 patients, yielding a recurrence rate of 30.00%. Statistically significant differences existed in recurrence rates among the three groups (χ^2=6.720, P<0.05) (**Table 3**).

Correlation between improvement in anxiety and depression and improvement in cognitive function

In this study, improvements in anxiety and depression symptoms were positively correlated with cognitive function improvements across all treatment modalities (P<0.05). Among these, the combined therapy group demonstrated the strongest correlation between depression improvement and cognitive enhancement (r=0.480, P<0.001), followed by the wrist-ankle needle group (r=0.470, P=0.037), while the auricular pressure bean group showed a relatively weaker correlation (r=0.429, P=0.047). The combined therapy group demonstrated the strongest correlation between anxiety improvement and cognitive enhancement (r=0.556, P<0.001), followed by the wrist-ankle needle group (r=0.555, P=0.011), while the auricular pressure bean group showed a relatively weaker correlation (r=0.475, P=0.025) (**Table 4**).

Discussion

Migraine, a highly prevalent chronic neurovascular disorder, is increasingly associated with anxiety and depressive disorders, which have

Table 2. Comparison of adverse reaction incidence

Group	Earlobe Skin Reaction	Subcutaneous hemorrhage/Hematoma	Pain at the Acupuncture Site	Total Adverse Reactions
Auricular pressure bean group (*n*=22)	3 (13.63)	0 (0.00)	0 (0.00)	3 (13.63)
Wrist-ankle needle group (*n*=20)	0 (0.00)	2 (10.00)	1 (10.00)	3 (15.00)
Combined group (*n*=57)	5 (8.77)	2 (3.51)	3 (5.26)	10 (17.54)
χ^2				0.204
P				0.903

Table 3. Comparison of headache recurrence patterns

Group	Number of Recurrence Cases
Auricular pressure bean group (*n*=22)	6 (27.27)
Wrist-ankle needle group (*n*=20)	6 (30.00)
Combined group (*n*=57)	5 (8.77)
χ^2	6.720
P	0.035

become critical factors affecting patient prognosis. This retrospective study analyzed clinical data from migraine patients with anxiety and depression disorders, comparing the efficacy of auricular pressure bean therapy, wrist-ankle needle, and their combined treatment. The results showed that combined therapy was significantly better than single therapy in relieving pain, improving emotional disorders, enhancing cognitive function and reducing recurrence rate. This study confirmed that auricular acupressure combined with wrist-ankle acupuncture as a non-drug treatment strategy has a significant effect.

All three patient groups achieved a significant reduction in VAS scores after four weeks. However, the combined therapy group demonstrated markedly superior analgesic efficacy compared to the monotherapy group, indicating a synergistic analgesic effect between the two techniques. Feng et al. [28] found that auricular pressure bean therapy, by stimulating points such as Shenmen and Subcortical, can regulate autonomic nervous function, unblock qi and blood flow in the head and facial meridians, thereby calming the mind, soothing the spirit, and alleviating pain through meridian regulation. Chen et al. [29] observed that wrist-ankle acupuncture can directly dredge qi stagnation in the cranial meridian by shallow acupuncture on specific wrist and ankle areas, so as to achieve the effect of harmonizing qi and blood, sedation and analgesia. It is hypothesized that when combined, the neuro-regulatory effects of auricular points complement the local meridian-unblocking effects of wrist-ankle needle. This synergy improves overall qi and blood circulation while precisely targeting headache sites, thereby enhancing analgesic efficacy. From a modern medical perspective, migraine pain episodes are associated with activation of the trigeminal vascular system. Excessive activity in the system can lead to excessive release of pain mediators, which can lead to vasodilation and neurogenic inflammation. At the same time, pain signals are transmitted to the cerebral cortex to achieve conscious perception [30]. In addition, auricular therapy plays a role by stimulating specific acupoints (such as Shenmen point, lower cortical point). This stimulation can activate the auricular branches of the vagus nerve and the trigeminal nerve, thereby initiating the central regulation process. This inhibits pain sensitization via the vagus nerve-nucleus of the solitary tract pathway, thereby reducing amplification of pain signals by dorsal horn neurons in the spinal cord. Concurrently, Shenmen stimulation promotes β-endorphin release via the hypothalamic-pituitary-adrenal axis. This substance binds to central and peripheral opioid receptors, directly blocking pain signal transmission [31]. Wrist-ankle acupuncture, through shallow insertion into specific regions of the wrist and ankle, acts upon coarse fibers of somatosensory nerves to inhibit pain signals transmitted by fine fibers. At the same time, stimulating local acupoints can promote the release of serotonin in local tissues. This substance can inhibit the excessive discharge of trigeminal ganglion neurons, thereby reducing the release of pain mediators. This enhanced analgesic effect stems from complementary mechanisms. Wrist-ankle acu-

Table 4. Correlation between improvement in anxiety and depression and improvement in cognitive function

	Auricular pressure bean group (*n*=22)		Wrist-ankle needle group (*n*=20)		Combined group (*n*=57)	
	r	*P*	*r*	*P*	*r*	*P*
ΔHAMD-17-ΔMoCA	0.429	0.047	0.470	0.037	0.480	<0.001
ΔHAMA-ΔMoCA	0.475	0.025	0.555	0.011	0.556	<0.001

Note: HAMD-17, Hamilton Rating Scale for Depression-17; HAMA, Hamilton Anxiety Rating Scale; MoCA, Montreal Cognitive Assessment; Δ, change in score (post-treatment minus pre-treatment).

puncture alleviates acute central nervous system stimulation by rapidly blocking peripheral pain transmission, whilst auricular acupuncture reduces pain sensitivity by modulating central neuroendocrine pathways. The synergistic interaction of these distinct mechanisms underpins its exceptional therapeutic efficacy.

In terms of improving emotional disorders, auricular acupressure at the heel of the bean is the key point for tranquilizing the mind, while subcortical acupoints can regulate the function of the cerebral cortex. Stimulation of both pathways may regulate mood through the following mechanisms. Firstly, by modulating autonomic nervous function via the vagus nerve, reducing sympathetic nervous system excitability, decreasing the release of stress hormones such as noradrenaline, and alleviating anxiety-related somatic symptoms. Secondly, by regulating the hypothalamic-pituitary-gonadal axis, promoting the release of gamma-aminobutyric acid, thereby directly inhibiting excessive amygdala activation and alleviating states of anxiety and depression [32]. Meanwhile, Ren et al. [33] demonstrated that wrist-ankle needle, through shallow subcutaneous tissue puncture, stimulates somatosensory nerve endings, inhibits excessive activation of the limbic system, and reduces the release of anxiety-related neurotransmitters. In combined therapy, wrist-ankle acupuncture rapidly alleviates somatised symptoms of anxiety and depression during the initial treatment phase, thereby establishing therapeutic confidence in patients. At the same time, auricular seed therapy continues to provide stimulation through daily self-pressing to consolidate the effect of emotional improvement and prevent emotional recurrence after discontinuation of single therapy. This study found that the decrease of HAMD-17 and HAMA scores in the combined treatment group was significantly better than that in the single treatment group. This confirms the synergistic effect of the integrated therapy in emotion regulation and provides a new idea for the development of non-drug treatment strategies.

After the 4-week treatment period, the combined therapy group was associated with significantly higher MoCA scores than both auricular acupressure and wrist-ankle needle groups. In addition, there was a significant positive correlation between depression, anxiety, improvement scores and cognitive improvement scores. Among them, the correlation between depression and anxiety improvement scores and cognitive enhancement scores in the combined group was the most significant. Studies have shown that chronic pain caused by long-term migraine can lead to neuronal damage in cognitive-related brain regions such as the prefrontal cortex and hippocampus [34, 35]. Anxiety and depression further aggravate dysfunction in these regions by increasing cortisol levels [36]. This comprehensive therapy enhances cognitive function through a dual approach: both reducing pain-mediated cognitive interference and improving the vulnerability of the emotion-driven hippocampus to cortisol toxicity. Although the correlation between the improvement of depressive symptoms and the improvement of cognitive function in the combined treatment group was moderate, its stability was the best. These findings indicate that combined therapy yields more enduring cognitive benefits, with the potential mechanism being the long-term regulatory effects exerted by both treatments on the neuroendocrine system.

The recurrence rate of headache in the combined group was significantly lower than that in the auricular pressure bean and the wrist-ankle needle groups within three months, highlighting the superiority of the combined treatment in preventing recurrence. The recurrence of

migraine involves multifactorial etiology, which is mainly driven by central sensitization, autonomic nervous system disorders, and emotional states [37]. Auricular pressure bean therapy emphasizes holistic regulation but has limited efficacy in resolving local meridian stagnation. Wrist-ankle needle excels in rapid pain relief but lacks sustained effects on visceral function regulation. Wu et al. [38] demonstrated that wrist-ankle needle rapidly inhibits pain signal transmission and alleviates acute symptoms. Tan et al. [39] have shown that ear bean pressing therapy can continuously regulate autonomic nerve function and qi and blood circulation of zang-fu organs, improve central sensitization and reduce recurrence incentives through continuous stimulation of auricular points. At the same time, it can improve the quality of life, enhance patients' treatment compliance and self-management ability, and further reduce the risk of recurrence. These findings suggest that optimizing non-pharmacological treatment needs to strike a balance between symptom relief and etiological regulation, and achieve long-term prognosis improvement through multi-target treatment. Furthermore, observations regarding treatment safety in this study revealed that while there was no statistically significant difference in the overall incidence of adverse reactions across the three groups. The combined group exhibited numerically higher rates than both the auricular pressure bean and wrist-ankle needle groups, demonstrating a certain upward trend. This phenomenon is in line with the clinical logic that combination therapy involves two different physical stimulation modes, exposing patients to more intervention points, which may theoretically increase the cumulative probability of mild adverse reactions. Although combination therapy has excellent efficacy, transparent communication with patients on potential mild adverse reactions is essential for informed consent. Its clinical application must be based on a sound safety guarantee system, which should cover standardized operating procedures, enhanced monitoring mechanisms, and immediate intervention programs for complications.

This study also has some limitations. First, its retrospective design may introduce inherent selection bias. In addition, although the baseline characteristics are comparable, the imbalance of sample size between groups may weaken the robustness of the research results. Second, the follow-up period was only 3 months, and the long-term efficacy and recurrence pattern need to be further observed. The core efficacy evaluation was only based on the patient's self-reported or researcher-assessed questionnaire scores, and lacked objective indicators reflecting the pathophysiological mechanism of migraine. Finally, factors such as operator differences and patient treatment compliance were not strictly controlled, which may affect the stability of the results. To further consolidate these research findings, subsequent studies must employ large-scale, multicenter, and randomized double-blind designs. Integrating specific objective biomarkers targeting migraine pathophysiology is crucial for ultimately validating the therapeutic benefits and elucidating its mechanism of action.

In summary, the combination of auricular pressure bean therapy and wrist-ankle needle for migraine patients with anxiety and depressive disorders demonstrates synergistic effects in alleviating pain, improving emotional disturbances, enhancing cognitive function, and reducing recurrence rates. The combination therapy has better curative effect than single therapy, and provides clinicians with safe, effective and minimally invasive non-drug treatment options. In order to firmly incorporate this combination therapy into the comprehensive migraine treatment system, the current work needs to be supplemented by rigorous mechanism research. In-depth understanding of its mechanism of action will in turn guide the effective promotion and implementation of the therapy.

Conclusion

Combined auricular pressure bean therapy and wrist-ankle needle significantly alleviates headache severity in migraine patients with comorbid anxiety and depression disorders. This therapy can effectively improve anxiety and depression symptoms, significantly reduce the recurrence rate, promote the recovery of cognitive function and improve the quality of life. Its multi-dimensional treatment effect is better than that of single therapy, indicating that there is a synergistic effect between the two treatment methods. This strategy provides a safe and effective new non-drug treatment for patients with chronic migraine and emotional disorders.

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Disclosure of conflict of interest

None.

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