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Original Article

Effect of acupuncture combined with auricular beanembedding on autonomic nervous system function, heart rate variability and mental state of migraine patients

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Abstract: Objective: To analyze the effects of acupuncture combined with auricular bean embedding on autonomic nervous dysfunction, heart rate variability and psychological state of migraine patients. Method: Sixty migraine patients admitted to our hospital from August 2022 to June 2023 were selected for this retrospective study. Based on their treatment protocols, the patients were divided into the acupuncture alone group (control group) and acupuncture combined with auricular bean embedding group (observation group), with 30 cases in each group. The clinical effects in the two groups were compared. The heart rate variability (low-frequency power, high-frequency power, standard deviation of all normal sinus intervals) of patients between the two groups after treatment was compared. The SF-McGill Pain Questionnaire (SF-MPQ) scores were compared between the two groups before and after treatment, as were psychological scores using the Hamilton Anxiety Scale (HAM-A) and quality of life (QOL) scores. The autonomic nervous dysfunction was also compared between the two groups before and after treatment. Results: The observation group showed superior clinical efficacy compared to the control group (χ^2=8.161, P=0.043). Clinical features scale (CFS) scores significantly decreased in both groups post-treatment, with greater reduction in the observation group (t=4.283, P < 0.001). Heart rate variability parameters also showed significant improvements in the observation group, including increases in both low-frequency power and high-frequency power (t=2.010, P=0.049; t=2.111, P=0.039 respectively) and standard deviation of sinus intervals (t=2.435, P=0.018). Post-treatment SF-MPQ scores were significantly lower in the observation group compared to the control group (t=17.709, P < 0.001), indicating reduced pain. Anxiety levels, as measured by HAM-A scores, decreased more significantly in the observation group compared to the control group (t=3.429, P=0.001). Both groups showed significant improvements in quality of life, with the observation group saw more substantial effects (t=7.235, P < 0.001). Conclusion: Acupuncture combined with auricular bean embedding effectively improves autonomic nervous dysfunction, enhances the activity of the autonomic nervous system, including both sympathetic and parasympathetic nerves, restores autonomic nerve balance, and relieves clinical symptoms of migraine patients. It also demonstrates significant therapeutic efficacy and holds substantial value in clinical application and warrants promotion.

Keywords: Acupuncture, ear point burying beans, migraine headache, autonomic nervous system function, heart rate variability

Introduction

Migraines are a prevalent neurological disorder worldwide, classified alongside conditions such as primary sclerosis, Parkinson's disease and Alzheimer's disease [1, 2]. While migraines may not be life-threatening, painful episodes can severely impair patients' quality of life (QOL) and ability to function in daily activities, including learning and concentration [3, 4]. Characterized by recurrent unilateral pulsating headaches of moderate intensity, migraines are often accompanied by symptoms such as nausea, vomiting, and photophobia.

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The clinical treatment for migraines present significant challenges, with existing interventions often limited by inconsistent analgesic effects, prolonged treatment durations, high relapse rates, and the risk of developing drug resistance [5]. Current Western medicine approaches primarily focus on symptom management through vasodilators, which, although providing some relief, fail to address the underlying autonomic nervous dysfunction associated with migraines [5, 6].

According to traditional Chinese medicine (TCM), a migraine is related to the poor circulation of qi and blood. Treatment strategies are aimed at promoting blood circulation, removing blood stasis, and regulating qi to relieve pain [7, 8]. Acupuncture and ear point bean embedding are common TCM modalities for migraine management. Acupuncture, a simple and widely practiced technique, stimulates specific acupoints to promote the flow of qi, relieve pain, and regulate circulation. Auricular bean embedding can stimulate specific auricular acupoints, which has been shown to calm the nervous system and improve mental state [9, 10]. Therefore, this study aims to evaluate the combined effects of acupuncture and auricular bean embedding on the autonomic nervous system function, heart rate variability and psychological state of migraine patients, hoping to provide more theoretical references for the effective treatment of migraines.

Patient data and methods

Patient data

This retrospective cohort study included 60 patients admitted to Shanghai Fifth People's Hospital between August 2022 and June 2023. The patients were divided into two groups based on their treatment modality: a control group (n=30) that received acupuncture treatment alone and an observation group (n=30) treated with acupuncture combined with auricular bean embedding treatment. The study was approved by the Ethics Committee of the Shanghai Fifth People's Hospital and was exempt from informed consent.

Inclusion criteria for this patient: (1) All patients met the diagnostic criteria for migraines outlined in the "*Guidelines for the Diagnosis and Treatment of Migraine in China" and the "International Classification of Headache Diseases*" formulated by the International Headache Society in 2004 [11, 12]; (2) Patients were in the active phase of a migraine attack. Exclusion criteria: (1) Patients with other organic dysfunction and malignant tumors; (2) Patients with mental disorders that impaired independent communication; (3) Patients allergic to the treatment methods used in this study.

Methods

① Point selection [5]: Bilateral C3-4, C4-5 cervical Jiaji, Baihui, bilateral Fengchi, bilateral Shuaigu, bilateral Toulinqi, auricular points including the occiput, forehead, brain, and Shenmen; ② Location: The location of acupoints was determined according to the *Name and Location of Acupoints Standard* (GB/T 12346-2006) published in 2006; ③ Instruments: Disposable sterile acupuncture needles (0.25 mm × 40 mm) produced by Beijing Hanyi Medical Equipment Co., Ltd. (No. 20150075); electronic acupuncture instrument (SDZ-II B, Huatuo Brand) from Suzhou Medical Products Factory Co., Ltd.

The control group was treated by acupuncture alone. The patient was instructed to relax in a seated position. The acupuncture site was sterilized, and the practitioner fixed the site with the left hand while holding a disposable stainless steel filiform needle (0.25 mm × 40 mm) in the right hand for needle insertion. The C3-4 and C4-5 cervical Jiaji points were needled perpendicularly to a depth of 15 mm. The Fengchi point was needled at a 15 mm depth angled toward the tip of the nose. The Baihui, Shuaigu and Toulinqi points were needled at a flat angle to a depth of 15 mm. After the needling sensation (deqi) was achieved, the needles were retained for 30 minutes. Additionally, the bilateral Fengchi points were connected to an electroacupuncture instrument, with continuous wave and frequency controlled at 1 Hz. The intensity was adjusted according to the patient's tolerance, based on sensations of neck swelling.

The observation group was treated with additional auricular bean embedding based on the treatment for control group. The patient was positioned either supine or sitting, with the ear exposed. The skin of the ear was disinfected and cleaned with cotton ball soaked in 75%

alcohol. Once the ear skin dried, the practitioner used tweezers to lift the edge of adhesive tape containing Vaccaria seeds and gently applied it to the selected ear point. The seed was pressed slightly to stimulate the area, inducing a mild flushing of the local skin. Treatment was applied to one ear at a time, with alternating ear applications in subsequent sessions. The previous seed paste was removed before the new one was applied. For the selection of auricular points, reference was made to *Acupuncture Moxibustion Methodology* (4th edition), a textbook of the 13th Five-Year Plan for higher education in Chinese medicine industry. The specific points were as follows: the pillow (AT3) located on the posterior lateral surface of the tragus, corresponding to the third area of the tragus; the forehead (AT1) located on the anterior lateral surface of the tragus, corresponding to the first area of the tragus; the brain (AT3,4i) located at the notch of the scaphoid fossa, between the third and fourth tragus areas; and the Shenmen (TF4) located at the upper third of the triangular fossa, corresponding to the fourth area of the triangular fossa.

Evaluation criteria

Data collection: Patient demographic information, such as age, gender, onset time, and duration of illness, was collected from the hospital's medical records system. Additionally, a fasting 5 ml blood sample was drawn from the antecubital vein in the morning for blood testing. The sample was centrifuged at 3000 r/min for 5 minutes, and the supernatant was collected for analysis using a fully automatic biochemical analyzer (XR420A, Guangdong Kangyu Medical Equipment Co., Ltd.).

Clinical effects: The clinical efficacy in the two groups, as well as the autonomic nervous system function scores before and after treatment, was compared.

Clinical efficacy was mainly divided into four categories. Basic cure: The headache symptoms almost disappeared with no recurrence within three months; Markedly effective: The severity of headache decreased by two grades, with a significantly reduction in pain intensity and headache frequency within three months; Effective: the headache severity decreased by one grade, with some improvement in both pain intensity and attack frequency; Not effect: no improvement in headache severity, duration, or frequency, or a worsening of the condition. The effective rate was determined by summing the basic cure rate, markedly effective rate, and effective rate.

Clinical features scale (CFS) score: Autonomic nerve dysfunction [13] was assessed using the Clinical Features Scale (CFS). This scale evaluates the severity of clinical symptoms related to autonomic nerve function, focusing on six core items associated with sympathetic nerve and motor features. The total possible score ranges from 0 to 18 points. Based on the score, the severity of autonomic nerve dysfunction can be categorized into normal (0 points), mild (1-6 points), moderate (7-12 points) and severe (≥ 13 points).

Heart rate variability: The heart rate variability (HRV) parameters were compared between the two groups after treatment, including low-frequency power, high-frequency power, standard deviation of NN intervals (SDNN) [14].

SF-McGill pain questionnaire: The SF-McGill pain questionnaire scores of the two groups before and after treatment were compared. The SF-MPQ consists of 15 descriptors: 11 sensory and 4 affective. Each descriptor was rated on an intensity scale: 0= none, 1= mild, 2= moderate, and 3= severe. Three pain scores were derived from the sum of the intensity rank chosen for sensory, affective and total descriptors. The Cronbach's alpha value for the total questionnaire was 0.88 [15].

Hamilton anxiety scale (HAM-A) score: The psychological state of the patients were evaluated using the HAM-A scale. This scale uses a 5-level scoring method (0-4 points), and each level is rated as follows: 0 points: no symptom; 1 point: mild; 2 points: moderate; 3 points: severe; 4 points: extremely severe. The HAM-A assesses various symptoms, including anxiety, tension, fear, insomnia, cognitive function, depressive mood, somatic anxiety (muscle symptoms), sensory symptoms, cardiovascular symptoms, respiratory symptoms, gastrointestinal symptoms, reproductive and urinary system symptoms, vegetative nervous system symptoms, and behaviors when interacting with others. The total score categorizes anxiety as follows: severe anxiety (total score > 29); significant anxiety (21 < total score ≤ 29); positive anxiety

Table 1. Comparison of the basic data between the two group

Group	Control group (n=30)	Observation group (n=30)	t	p
Age	43.55±8.11	43.56±8.13	0.005	0.996
Gender (Male/Female)	17/13	18/12	0.069	0.793
Duration of each attack (hours)	4.44±1.11	4.46±1.12	0.056	0.956
Course of disease (years)	1.12±0.3	1.12±0.32	0.071	0.943
Smoking history [n (%)]	8 (26.67%)	9 (30%)	0.082	0.774
Alcohol consumption [n (%)]	10 (33.33%)	11 (36.67%)	0.073	0.787
Hypertension [n (%)]	5 (16.67%)	5 (16.67%)	0	1
Diabetes [n (%)]	3 (10%)	2 (6.67%)	0	1

Table 2. Comparison of blood pressure and hematological parameters between the two groups

Parameters	Control group (n=30)	Observation group (n=30)	t	P
Systolic blood pressure (mmHg)	125.24±10.56	127.35±11.45	0.742	0.461
Diastolic blood pressure (mmHg)	80.85±8.62	81.24±10.26	0.161	0.873
Hemoglobin level (g/dL)	13.54±0.85	13.45±0.78	0.410	0.683
Platelet count (× 10^9 cells/L)	262.23±20.15	263.17±22.31	0.172	0.864
White blood cell count (× 10^9 cells/L)	6.77±0.47	6.80±0.52	0.223	0.824
C-reactive protein (mg/L)	3.98±1.05	4.12±1.24	0.494	0.623

(14 < total score ≤ 21); and mild or no anxiety (total score ≤ 14). The HAM-A showed good internal consistency, with a Cronbach's alpha value of 0.893 [16].

Quality of life (QOL) scores: The QOL score was analyzed using the short-term health survey developed by the Boston Center for Health Research in 1988, covering eight aspects of health: physiological function, physical function, physical pain, general health, energy, social function, emotional function and mental health. The total score ranges from 0 to 100, with higher scores indicating better QOL. The Cronbach's alpha value was 0.8 [17].

Statistical methods

All data were analyzed using SPSS 23.0. Categorical data were presented expressed as [n (%)] and analyzed using the chi-square test. Normality tests of continuous variables was assessed using the Shapiro-Wilk test. Continuous variables following a normal distribution were presented as mean ± standard deviation and analyzed using the t-test with corrected variance. Non-normally distributed data were expressed as median (25th percentile, 75th percentile) and analyzed using the Wilcoxon rank-sum test. Statistical significance was determined by a two-tailed *P*-value of < 0.05.

Results

Comparison of basic data between the two groups

In the control group, there were 17 males and 13 females (**Table 1**). The average age was (43.55±8.11) years old (27-65). The duration of each attack ranged from 1 to 6 hours, with an average of (4.44±1.11) hours. The course of disease ranged from 5 months to 2 years, with an average of (1.11±0.33) years. In the observation group, there were 18 males and 12 females. The average age was (43.56±8.13) years old (27-66). The duration of each attack ranged from 1 to 6 hours, with an average of (4.46±1.12) hours. The course of disease ranged from 5 months to 2 years, with an average of (1.12±0.32) years. Statistical analysis revealed no significant differences between the groups in terms of age, gender, duration of attacks, or course of disease (all P > 0.05).

Comparison of blood pressure and hematological parameters between the two groups

The comparison of blood pressure and hematological parameters between the two groups revealed no significant differences (**Table 2**). The systolic blood pressure in the control and observation group was 125.24±10.56 mmHg and 127.35±11.45 mmHg, respectively (t=

Table 3. Comparison of clinical efficacy between the two groups [n (%)]

	Basic cure	Markedly effective	Effective	Ineffective
Observation group	10 (33.33%)	9 (30.00%)	10 (33.33%)	1 (3.33%)
Control group	5 (16.67%)	4 (13.33%)	15 (50.00%)	6 (2.00%)
χ^2		8.161		
P		0.043		

Table 4. Comparison of CFS score between the two groups before and after treatment

Grouping	Number of cases	Before treatment	After treatment	t	p
Observation group	30	5.33±3.02	2.33±1.2	5.062	< 0.001
Control group	30	5.35±3.01	3.66±1.22	2.861	0.007
t		0.027	4.283		
P		0.979	< 0.001		

Note: CFS, Clinical Features Scale.

0.742, P=0.461); and the diastolic blood pressure in the two groups were 80.85±8.62 mmHg and 81.24±10.26 mmHg (t=0.161, P=0.873). Hemoglobin levels were 13.54±0.85 g/dL in the control group and 13.45±0.78 g/dL in the observation group (t=0.410, P=0.683). Platelet counts were 262.23±20.15 × 109 cells/L in the control group and 263.17±22.31 × 10^9 cells/L in the observation group (t=0.172, P=0.864). White blood cell counts were 6.77±0.47 × 10^9 cells/L in the control group and 6.8±0.52 × 10^9 cells/L in the observation group (t=0.223, P=0.824). C-reactive protein levels also showed no statistical difference, with the control group at 3.98±1.05 mg/L and the observation group at 4.12±1.24 mg/L (t=0.494, P=0.623).

Comparison of the clinical efficacy between the two groups

In the observation group, 33.33% of patients achieved a basic cure, 30.00% experienced markedly effective results, 33.33% showed effective results, and 3.33% were ineffective. In contrast, 16.67% of patients in the control group achieved basic cure, 13.33% had markedly effective results, 50.00% showed effective results, and 20.00% were ineffective. Analysis demonstrated a superior clinical efficacy in the observation group compared to the control group (χ^2=8.161, P=0.043) (**Table 3**).

Comparison of CFS scores between the two groups before and after treatment

The comparison of CFS scores before and after treatment between the two groups revealed significant improvements in both groups, with a more substantial effect observed in the observation group (**Table 4**). Before treatment, CFS scores were similar between the two groups [(5.33±3.02) vs (5.35±3.01) (t=0.027, P=0.979)]. After treatment, the observation group showed a marked reduction in CFS scores to 2.33±1.2 (t=5.062, P < 0.001), and the control group also decreased to 3.66±1.22 (t=2.861, P=0.007). Notably, the post-treatment CFS score was substantially lower than that in the control group (t=4.283, P < 0.001).

Comparison of the heart rate variability (HRV) between the two groups after treatment

As shown in **Table 5**, the low-frequency power increased from 801.22±105.11 MS^2 to 890.22±119.22 MS^2 in the observation group, while the control group showed a smaller increase from 802.19±96.22 MS^2 to 832.11±104.22 MS^2; the high-frequency power in the observation group improved significantly from 701.22±156.11 MS^2 to 900.22±121.11 MS^2, while that in the control group increased from 714.32±145.33 MS^2 to 839.36±101.39 MS^2. The SDNN increased from 90.11±13.22 MS to 106.33±17.22 MS in the observation group, whereas the control group showed a smaller increase from 94.13±12.29 MS to 96.11±15.22 MS. Before treatment, there were no significant differences between the two groups in terms of low-frequency power (t=0.037, P=0.971), high-frequency power (t=0.336, P=0.738), or the SDNN (t=1.221, P=0.227). However, after the treatment, the observation group was significantly superior to the control

Table 5. Comparison of HRV between the two groups before and after treatment

Grouping	Low frequency power (MS^2)		High frequency power (MS^2)		SDNN (MS)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Observation group	801.22±105.11	890.22±119.22	701.22±156.11	900.22±121.11	90.11±13.22	106.33±17.22
Control group	802.19±96.22	832.11±104.22	714.32±145.33	839.36±101.39	94.13±12.29	96.11±15.22
t	0.037	2.010	0.336	2.111	1.221	2.435
P	0.971	0.049	0.738	0.039	0.227	0.018

Note: HRV, heart rate variability; SDNN, Standard deviation of NN intervals.

Table 6. Comparison of SF-McGill pain questionnaire between the two groups before and after treatment

Grouping	Before treatment	After treatment	t	p
Observation group (n=30)	44.33±1.11	15.22±2.11	66.901	< 0.001
Control group (n=30)	44.35±1.09	22.94±1.11	75.488	< 0.001
t	0.079	17.709		
P	0.938	< 0.001		

Table 7. Comparison of HAM-A score between the two groups of patients before and after treatment

Group	Before treatment	After treatment	t	p
Observation group (n=30)	12.99±3.11	7.22±3.22	7.060	< 0.001
Control group (n=30)	11.56±4.13	9.67±2.23	2.206	0.031
t	1.513	3.429		
P	0.136	0.001		

Note: HAM-A, Hamilton anxiety scale.

group in the above indicators (P=0.049, 0.039, 0.018).

Comparison of SF-McGill pain scores between the two groups before and after treatment

As shown in **Table 6**, the pre-treatment SF-MPQ scores were similar between the two groups [(44.33±1.11) vs (44.35±1.09) (t=0.079, P= 0.38)]; After treatment, the observation group showed a substantial reduction in SF-MPQ scores to 15.22±2.11 (t=66.901, P < 0.001), and the control group decreased to 22.94±1.11 (t=75.488, P < 0.001). Notably, the post-treatment SF-MPQ score in the observation group was significantly lower than that in the control group (t=17.709, P < 0.001).

Comparison of Hamilton anxiety scale (HAM-A) scores between the two groups before and after treatment

As shown in **Table 7**, the pre-treatment HAM-A score was 12.99±3.11 in the observation group and 11.56±4.13 in the control group (t=1.513, P=0.136). After treatment, the observation group demonstrated a significant decrease in HAM-A scores to 7.22±3.22 (t=7.060, P < 0.001), while the control group exhibited a smaller reduction to 9.67±2.23 (t=2.206, P=0.031). Notably, the post-treatment HAM-A score in the observation group was substantially lower than that in the control group (t=3.429, P < 0.001).

Comparison of quality of life (QoL) scores between the two groups before and after treatment

There was no significant difference in pre-treatment QoL scores between the two groups [(56.65±2.22) vs (56.67±2.23) (t=0.033, P= 0.974)]. After treatment, the observation group showed a significant increase in QoL scores to 70.55±4.12 (t=16.265, P < 0.001), and the control group exhibited a smaller yet significant improvement to 64.44±2.1 (t=13.895, P < 0.001). Notably, the post-treatment QoL score in the observation group was statistically high-

Table 8. Comparison of quality of life scores between the two groups before and after treatment

Group	Before treatment	After treatment	t	P
Observation group	56.65±2.22	70.55±4.12	16.265	< 0.001
Control group	56.67±2.23	64.44±2.10	13.895	< 0.001
t	0.033	7.235		
P	0.974	< 0.001		

er than that in the control group (t=7.237, P < 0.001). The details are shown in **Table 8**.

Discussion

In modern society, increasing life pressure and environment deterioration have contributed to a rising incidence of migraines, a condition usually accompanied by amnesia and insomnia, which severely impact patients' quality of life and public health [18, 19]. A migraine is a nervous dysfunction typically triggered by environmental and genetic factors. Modern medicine believes that the pathogenesis of migraines is related to the patient's autonomic nervous function [20, 21]. Currently, there are many clinical treatment strategies for migraines [22, 23]. From a western medicine perspective, common interventions include analgesia, enhancing sympathetic nerve activity, vasoconstriction, and mitigating inflammatory reactions [24, 25]. However, practical experience has shown that these treatments often result in unstable analgesic effects, lengthy treatment cycles, frequent relapses, and potential development of drug resistance [26-28].

With the growing recognition of TCM, it has increasingly played an important role in modern medicine [29, 30]. A large number of clinical studies have demonstrated that TCM particularly acupuncture, can achieve significant results in treating migraines, providing both short-term and long-term relief [31, 32]. Acupuncture, one of the most popular therapies in TCM, involves the use of metal needles to stimulate specific acupoints on the body to treat various diseases [33, 34]. These acupoints, which include the fourteen meridian points, extra-meridian points, and Ashi points, are unique locations on the body where the qi of the zang-fu organs and meridians converge. They serve as both reactive points of illness and therapeutic points for treatment [35, 36]. The stimulation of these "acupoints" promotes healing by influencing physiological functions and restoring balance to the body's energy flow. For instance, Xu et al. assessed the efficacy of manual acupuncture in preventing episodic migraines without aura. Their study found that twenty sessions of manual acupuncture were superior to both sham acupuncture and usual care in preventing episodic migraines [37]. These results support the use of manual acupuncture in patients who are reluctant to use prophylactic drugs or when prophylactic drugs are ineffective, and this can be considered in future guidelines.

In this study, acupuncture treatment demonstrated its ability to not only treat migraines but also regulate the overall functioning of the body. In addition, TCM believes that "ear is the gathering of blood", emphasizing the close relationship between the auricle and various organs of the body. Therefore, embedding beans to stimulate acupoints in the ear is also of great value in the treatment of migraines. Sympathetic nerve fibers, which are particularly abundant in the triangular fossa, connect various parts of the body. Stimulating these ear points allows for the regulation of organ function, enabling clinical treatment through nerve stimulation. The combined treatment of acupuncture and auricular bean embedding maximizes the benefits of both methods, consolidating the treatment effects and achieving an optimal synergistic treatment effect. In addition, our data also showed that the clinical efficacy in the observation group was significantly higher than that in the control group. Compared with the control group, the observation group exhibited lower headache score, self-rating anxiety score and autonomic nervous dysfunction score after treatment. Conversely, the observation group demonstrated significantly higher HRV parameters and QoL score than that of the control group. These data indicate that acupuncture combined with auricular bean embedding therapy has high clinical application value, and can effectively improve the clinical symptoms of patients, alleviate headache, and improve the QoL of patients. This therapy is advantageous due to its high feasibility and safety, making it a highly promising treatment option for migraine patients.

The observed clinical efficacy of acupuncture combined with auricular bean embedding in migraine patients can be attributed to several interrelated physiological mechanisms. First, acupuncture has long been recognized for its ability to modulate the autonomic nervous system (ANS) [38]. By stimulating specific acupoints, acupuncture helps restore balance between the sympathetic and parasympathetic branches of the ANS, which is critical given the role of autonomic dysregulation in the pathophysiology of migraines. Evidence suggests that acupuncture can enhance parasympathetic activity and reduce sympathetic overactivity, which normalizes heart rate variability (HRV), a key indicator of autonomic function [39]. Improved HRV parameters in the observation group, as noted in this study, reflect this enhanced autonomic regulation, potentially leading to reduced migraine frequency and intensity.

Furthermore, the bean embedding at auricular points is grounded in the principles of auriculotherapy, where the ear serves as a microsystem representing the body's organs and systems [40]. Stimulation of the auricular acupoints enhances nerve signal transmission and may influence neurohormonal pathways, promoting the release of endogenous opioids and neuropeptides, such as endorphins [41]. These biochemical mediators contribute to pain relief as well as emotional and physical well-being. The significant reduction in anxiety score observed in our study may correspond with increased endorphin levels, which are known to enhance mood and alleviate pain perception.

Lastly, the combined approach may synergistically enhance the overall treatment effect, leading to improved health-related QoL scores among patients [27]. By addressing both the physiological and psychological dimensions of migraines, this integrated intervention provides a holistic therapeutic strategy that resonates with the underlying tenets of TCM, where the holistic concept is paramount [42].

While this study provides valuable insights into the efficacy of combining acupuncture with auricular bean embedding for treating migraine patients, several limitations should be acknowledged. One notable limitation is the relatively small sample size, which may affect the generalizability of the findings to a broader population of migraine sufferers. A larger sample size would be beneficial in corroborating the observed effects and establishing more robust conclusions regarding the effectiveness of the combined treatment approach. Additionally, the short duration of the intervention period in this study may have limited the assessment of long-term treatment effects and sustainability of symptom relief over an extended timeframe.

In conclusion, acupuncture combined with auricular bean embedding for the treatment of migraines effectively improves autonomic nervous dysfunction, enhances overall autonomic nervous activity, including both sympathetic and parasympathetic functions, restores autonomic balance, and alleviates clinical symptoms of migraine. This approach demonstrates significant clinical efficacy and holds substantial potential for widespread clinical application and promotion.

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Disclosure of conflict of interest

None.

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