

The efficacy of auricular acupressure combined with emotional freedom techniques on the postoperative pain and anxiety state of patients with lower limb fractures

A randomized clinical controlled trial

Xianglong Zhou, MSc^{a,*}, Guoqin Zhang, BS^b, Dandan Chen, MSc^c, Huiping Yao, BS^c, Qi Wang, MSc^b

Abstract

Background: Lower limb fractures cause local pain, swelling, ecchymosis, and dysfunction. Clinically, incision and reduction surgery are often employed to treat lower limb fractures. However, postoperative pain can be intense, leading to adverse emotions that hinder subsequent recovery.

Methods: A total of 99 postoperative patients with lower limb fractures were randomly divided into 3 groups: the control group (routine care, 33 patients), the auricular acupressure group (routine care plus auricular acupressure, 33 patients), and the combined group (routine care, auricular acupressure, and emotional freedom techniques [EFT], 33 patients). Pain levels were measured using the visual analog scale (VAS), and anxiety levels were measured using the self-rating anxiety scale (SAS) at various time points post-intervention. Patient satisfaction with nursing care was also evaluated at the end of the intervention.

Results: The VAS scores in the combined group were significantly lower than those in the auricular acupressure and control groups at 4, 12, 24, and 48 hours post-intervention ($P < .05$). Additionally, the SAS scores in the combined group were significantly lower than those in the auricular acupressure and control groups at 72 hours post-intervention ($P < .05$). The combined group also reported significantly higher satisfaction with nursing care compared to the other 2 groups at the end of the intervention ($P < .05$).

Conclusion: Auricular acupressure combined with EFT effectively reduces pain levels, alleviates anxiety, and increases patient satisfaction with nursing care in postoperative patients with lower limb fractures.

Abbreviations: EFT = emotional freedom techniques, NRS = numerical rating scale, SAS = self-rating anxiety scale, VAS = visual analog scale.

Keywords: anxiety, auricular acupressure, emotional freedom techniques, lower limb fracture, nursing satisfaction, pain

1. Introduction

Lower limb fractures encompass various types caused by external trauma or bone disease, resulting in the disruption of the integrity or continuity of the femur, tibia, fibula, and other bones in the lower limb. This disruption causes local pain, swelling, ecchymosis (bruising), and dysfunction. Additionally, some patients may experience deformities or abnormal movements at the fracture sites, which can affect limb function and daily activities.^[1] Clinically, incision and reduction surgery is often employed to treat lower limb fractures. However, postoperative pain can be intense, leading to adverse emotions that hinder subsequent recovery. Although multi-modal and self-controlled

analgesia pumps have mitigated some adverse reactions, they fall short of clinical needs concerning usage duration, contraindications, and cost reduction.^[2]

Patients with lower limb fractures often struggle to understand and accept their condition due to their limited spatial imagination or insufficient professional knowledge. This lack of understanding can result in pessimism, anxiety, and depression, adversely affecting subsequent treatment and rehabilitation.^[3] Auricular acupressure has been demonstrated to reduce postoperative pain in patients with lower limb fractures by exerting physiological effects.^[4,5] Emotional freedom techniques (EFT), which integrate acupoint stimulation with neurolinguistic

The authors have no funding and conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

^a Department of Orthopaedics, Taizhou Third People's Hospital, Taizhou, Jiangsu, China, ^b Department of Nursing, Taizhou People's Hospital, Taizhou, Jiangsu, China, ^c Department of Intensive Care Medicine, Zhejiang Provincial People's Hospital, Zhejiang, China.

* Correspondence: Xianglong Zhou, Department of Orthopaedics, Taizhou Third People's Hospital, Taizhou, Jiangsu, China (e-mail: 847728825@qq.com).

Copyright © 2025 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open-access article distributed under the terms of the Creative Commons Attribution-Non Commercial License 4.0 (CCBY-NC), where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.

How to cite this article: Zhou X, Zhang G, Chen D, Yao H, Wang Q. The efficacy of auricular acupressure combined with emotional freedom techniques on the postoperative pain and anxiety state of patients with lower limb fractures: A randomized clinical controlled trial. *Medicine* 2025;104:5(e41401).

Received: 13 July 2024 / Received in final form: 31 December 2024 / Accepted: 13 January 2025

<http://dx.doi.org/10.1097/MD.00000000000041401>

programming based on traditional Chinese medicine meridian theory, can quickly and effectively release negative emotions and psychological trauma and alleviate physical discomfort.^[6,7]

After reviewing the relevant literature, it was found that studies on the clinical efficacy of auricular acupressure combined with EFT in the treatment of postoperative pain after lower limb fracture have not been reported. This study aims to investigate the effectiveness of auricular acupressure combined with EFT in reducing postoperative pain and alleviating anxiety in patients with lower limb fractures.

2. Methods

2.1. Ethical approval of the study protocol

Ethical approval was obtained from the Ethic Committee of the Third People's Hospital of Taizhou City (No. TZSRY-LS-2023YL-007) for the prospective, randomized, controlled trial. Written informed consent was obtained from patients or their guardians prior to participation in this study.

2.2. Participants

Patients with lower limb fractures admitted to the Department of Orthopedics at the Third People's Hospital of Taizhou City from December 2023 to April 2024 were enrolled in this study. These fractures consisted of the intertrochanteric, femoral neck, fibula, tibia. Inclusion criteria: aged ≥ 18 years; met the diagnostic criteria for lower limb fractures and required surgical treatment; surgery was performed with continuous epidural anesthesia, and postoperative analgesia was managed without the use of analgesic pumps; patients who were able to correctly use the visual analog scale (VAS) to express their pain level; Exclusion criteria: patients with serious primary diseases of the heart, brain, liver, kidneys, or hematopoietic system; patients with skin injuries to the auricle or allergies to adhesive tape; patients with psychiatric disorders; pregnant and lactating women. According to the above criteria, total number of 99 cases were enrolled and assigned to control group, Auricular acupressure group, and combined group by the random number table method, with 33 patients in each group. The sample size was calculated using the statistical software G*power, which determined a minimum of 30 patients per group. Accounting for a 10% loss in follow-up rate, and a total of 99 patients were finally selected.

Participants could stop the intervention in the following situations: the participant or his/her representative demands discontinuation, the participant withdraws consent, the clinical investigation is difficult due to severe adverse events or complications, the disease is deteriorating and continuation of the study is difficult, the inclusion and exclusion criteria were violated during the clinical investigation, the participant refused to comply with the instructions of the principal investigator, and follow-up is not possible during the investigation.

2.3. Randomization and masking

In this prospective, unblinded, randomized controlled trial, patients were allocated randomly to receive control group ($n = 33$) or Auricular acupressure group ($n = 33$) or combined group ($n = 33$) (Fig. 1). The purpose of the random assignment was to compare the collected information as reliably as possible and was determined by a random check extracted by a computer. Neither patients nor clinicians evaluating the patients were blinded to the group allocation.

2.4. Procedure and interventions

Patients with lower extremity fractures who participated in the study were first evaluated for eligibility for inclusion. 5 patients

younger than 65 years of age and 5 patients who dropped out of postoperative follow-up were excluded. Therefore, a total of 99 patients were included in the analysis. They were randomized into control group, Auricular acupressure group, and combined group ($n = 33$ in each group).

The control group was treated with the usual postoperative analgesic therapy: 100 ml of NS + 30 mg of ketorolac tromethamine injection intravenously for 3 consecutive days, and the analgesic effect of this drug lasted for 4 to 6 hours.

The auricular acupressure group was administered 100 mL of NS + 30 mg of ketorolac tromethamine injection intravenously for 3 consecutive days and received auricular acupressure intervention. Specific methods: selection of points: points were chosen based on the principles of "organs and disease mechanism identification and matching points," and "lesion site to take points."^[8] The selected points included "sympathetic, subcortical, Shenmen, and the corresponding ear points of the surgical parts." Positioning references followed the People's Republic of China national standard GB/T 13734-2008 for ear acupuncture point names and positioning.^[9] Operation method: Patients were instructed to sit or lie down. Sensitive points on the unilateral ear acupuncture points were disinfected with 75% ethanol cotton balls. WangBuLiuXing seeds were attached to adhesive tape and placed on the sensitive points. Patients were instructed to press these points themselves until they felt sensations of heat, distension, or pain. The appropriate pressure was emphasized to avoid displacement or skin irritation. Duration and frequency of auricular acupressure interventions: From the time of awakening from anesthesia in the postoperative period, the patient presses the acupoints 4 times a day (after meals and at bedtime), each time pressing each acupoint 20 times. If the pain at the surgical site increases, the number of auricular compressions can be increased. The treatment lasts for 3 days.

The combined group received intravenous 100 ml of NS + 30 mg of ketorolac tromethamine injection intravenously for 3 consecutive days and received auricular acupressure and EFT interventions. Specific methods: a mission team was established, led by the head nurse of the department. The team comprised 1 national second-level heart counselor, 1 Chinese medicine physiotherapist, 2 nursing postgraduates, 1 chief physician, and 6 senior nursing teachers from the department. Additionally, psychological counselors and Chinese medicine physiotherapists were enlisted as consultants for this mission. The psychological consultant provided guidance on psycho-educational aspects, while the Chinese medicine practitioner ensured quality control, checked, and provided feedback on the intervention program. The nurse in charge and postgraduate students were responsible for implementing the intervention program as well as data collection and analysis. Participants underwent a 7-day training session conducted by counselors and herbalists before implementation. Training covered theoretical knowledge related to EFT, communication skills, implementation methods, and more. At the conclusion of the training, team members underwent assessment, including a simulated completion of EFT steps by the researcher, ensuring proficiency in EFT techniques. On the basis of conventional nursing care and auricular acupressure, EFTs were integrated into the intervention regimen. The EFT sessions commenced upon the patient's awakening from postoperative anesthesia, occurring once daily for 15 minutes over a span of 3 days. Nurses visited the ward daily to provide 1-on-one guidance to patients and facilitate the completion of EFT sessions. The operational procedure for EFT was as follows: preparation stage: patients prepare by washing their hands, trimming their nails, assuming a comfortable position, relaxing their bodies, and closing their eyes to meditate. Patients were instructed to direct their concentration towards current distressing issues, such as pain-induced limitations in daily activities or sleep disturbances. The intensity of negative emotions was assessed using the numerical rating scale,^[10] ranging from 0 (no emotion)

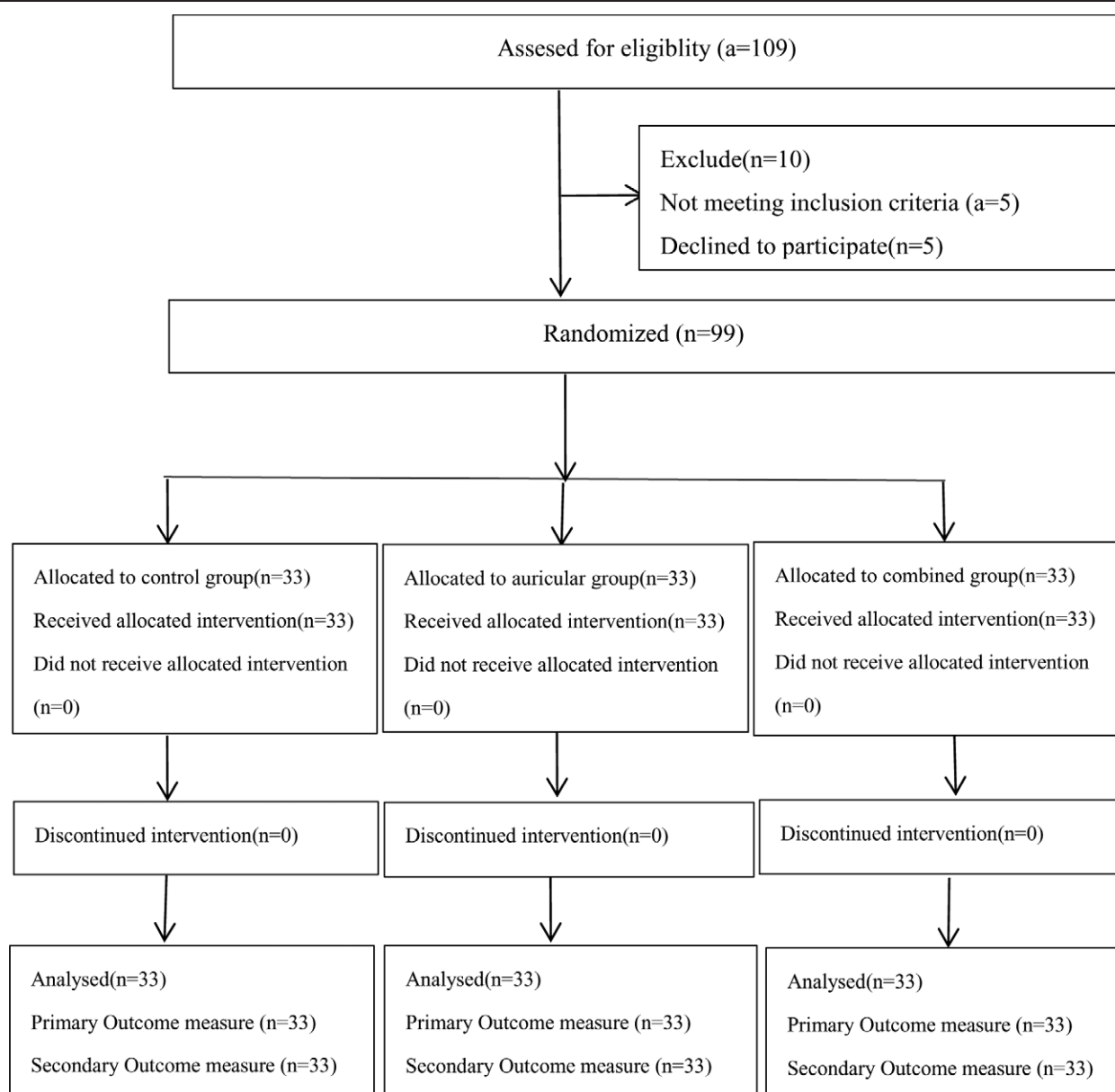


Figure 1. The participant flow diagram.

to 10 (maximum emotional intensity). patients are instructed to tap on the outside of the palm between the root of the little finger and the wrist or to rub 2 to 3 fingers below the midpoint of the clavicle. While tapping, they were instructed to repeat the troubling affirmation, “Even though I am in pain, I deeply and fully accept myself,” aloud 3 times. Taping on acupoints and verbal guidance stage: patients tapped on specific acupoints using the middle fingers of their index fingers, including Zanzhu, Pupil’s Bow, Chengsui, Renzhong, Chengjian, Yufu, Dabao, and Hundred Clubs, with 10 to 15 taps per point in a cyclical manner at a rate of 2 to 3 times per second. While tapping each point, patients verbally affirmed, “Although I am in pain, I deeply and completely accept myself,” repeating it 3 times. This process was repeated for 3 to 5 cycles. The patient was instructed to reassess the intensity of the negative emotion, and if the score remained > 3 , the tapping cycle was continued. As the intensity of negative emotions gradually decreased during subsequent tapping sessions, it was important to continuously adjust the affirmation statement and provide positive guidance. This involved gradually transitioning

from statements like “it hurts” to “it hurts a little.” When the assessed intensity of emotions reached ≤ 2 points, the tapping and chanting were discontinued. Emotional desensitization stage: after tapping ceased, patients continued tapping on the Zhongzhu acupoints while engaging in the following sequence: “eye movements (closing and opening eyes; looking at the lower left and right sides of eyes clockwise and counterclockwise), humming favorite songs, counting numbers (1 to 5), and humming songs again.” This sequence was repeated for 3 rounds. Feedback phase: following each intervention, the implementer communicated with the patient to assess the intervention’s effects and the patient’s experience, encouraging positive expressions.

2.5. Outcome measures

2.5.1. Primary indicators. (1) The general data of patients were collected and analyzed after admission. The pain level of patients was assessed using VAS^[11] before the intervention

Table 1
Patient demographic characteristics.

Variables	Control group (n = 33)	Auricular acupressure group (n = 33)	Combined group (n = 33)	Statistics	P-value
Gender (%)					
Male	8 (24.2)	14 (42.4)	10 (30.3)	2.586*	.274
Female	25 (75.8)	18 (57.6)	23 (69.7)		
Age (yr), mean $\pm$ SD	70.88 $\pm$ 2.60	68.12 $\pm$ 2.49	68.55 $\pm$ 2.34	0.359†	.699
Diagnosis (%)					
Intertrochanteric fracture of the femur	16 (48.5)	10 (30.3)	11 (33.3)	6.413*	.379
Femoral neck fracture	4 (12.1)	12 (36.3)	8 (24.2)		
Fracture of tibia	10 (30.3)	9 (27.3)	12 (36.4)		
Fibula fracture	3 (9.1)	2 (6.1)	2 (6.1)		
Payment method (%)					
Medical insurance	22 (66.7)	17 (51.5)	23 (69.7)	2.676*	0.262
Self-financed	11 (33.3)	16 (48.5)	10 (30.3)		

* Statistics of Pearson chi-square test.

† t-test.

and at 24, 48, and 72 hours post-intervention. VAS consists of a 10-cm straight line, with 1 end representing 0, indicating no pain, and the other end representing 10, indicating extreme pain. The criteria for interpreting VAS values are as follows: 0 points signify no pain, 1 to 3 points indicate mild and tolerable pain, 4 to 6 points denote moderate pain affecting normal sleep, 7 to 9 points represent severe and intolerable pain, and 10 points signify the most severe pain.

(2) The self-rating anxiety scale^[12] was used to evaluate the patients' anxiety state before and 72 hours post-intervention. This scale comprises 20 items, each rated on a 4-point scale ranging from "1 to 4," corresponding to "rarely, sometimes, most of the time, and almost always." Higher scores on the SAS indicate more severe anxiety levels.

2.5.2. Secondary indicators. (1) Upon completion of treatment, patients were surveyed regarding their satisfaction with postoperative care, categorized as "very satisfied," "quite satisfied," or "dissatisfied."

(2) Patients were observed for potential adverse reactions, including dizziness, headache, palpitations, local skin damage, or irritation at auricular acupoint pressure sites, and allergic reactions.

2.6. Quality control

Personnel involved in the study underwent uniform training to ensure adherence to standardized criteria. Study participants were selected strictly based on predefined inclusion and exclusion criteria. The data were checked and entered by 2 individuals to ensure completeness and accuracy. Because of the short duration of the trial, data collection and analysis was carried out uniformly at the end of the trial and no interim analyses were carried out in this study.

2.7. Statistical methods

Data analysis was performed using IBM SPSS Statistics for Windows (version 26.0; IBM Corp., Armonk). Measurement data conforming to a normal distribution were expressed as the mean $\pm$ standard deviation ($\bar{x} \pm s$). One-way analysis of variance (ANOVA) was utilized for multi-sample mean comparisons, with post hoc LSD-t tests for pairwise comparisons. If data did not adhere to normal distribution or exhibited heterogeneity of variance, median and interquartile range (IQR) were used, and comparisons were conducted using nonparametric rank-sum tests. Count data were presented as frequency and percentage (%), and inter-group comparisons

were conducted using the chi-square test. For comparisons within groups across multiple time points, a repeated measures ANOVA was used. The statistical significance level was set at $P < .05$.

3. Results

3.1. Participant

In the study, total 99 cases were enrolled and randomly divided into 3 groups, none of which were lost to follow-up, as shown in Figure 1.

3.2. Baseline characteristics

Before the intervention, the differences in the baseline information – such as age, gender, diagnosis, and hospitalization payment method – among the 3 groups were not statistically significant ($P > .05$; Table 1).

3.3. Comparison of VAS pain scores among the 3 groups

Intragroup comparison: The VAS scores for all 3 groups showed a decreasing trend as postoperative time increased. The differences between postoperative time points and presurgical time points were statistically significant ($P < .001$). Comparisons between 24, 48, and 72 hours postoperatively with 12 hours postoperatively also showed highly significant differences ($P < .05$). Similarly, comparisons between 48 and 72 hours postoperatively and 24 hours postoperatively were statistically significant ($P < .05$). However, the difference between 72 and 48 hours postoperatively was not statistically significant ($P > .05$). This suggests that the postoperative conventional group, auricular acupressure group, and combined group all effectively improve postoperative pain for lower limb fractures, with the analgesic effect at 72 hours postoperatively being comparable to that of 48 hours postoperatively. **Inter-group comparison:** The preoperative VAS scores among the 3 groups did not differ significantly ($P > .05$). However, significant differences were observed among the 3 groups at 4, 12, and 24 hours postoperatively ($P < .05$), with the combined group showing a greater decrease in VAS scores. There were no statistically significant differences among the 3 groups at 48 and 72 hours postoperatively ($P > .05$). This indicates that auricular acupressure combined with EFT can effectively enhance the analgesic effect for postoperative patients with lower limb fractures within the first 24 hours.

A within-subjects effect analysis yielded within group $F = 614.182$ ($P < .001$), indicating a significant temporal trend

in VAS scores. The interaction effect between-group and pre- and post-intervention was also significant (F within group * between groups = 5.620, $P < .001$), suggesting that the intervention effect on VAS scores differed among the 3 groups, with the combined group showing a more rapid decrease than the control and auricular acupressure groups.

The analysis of between-subjects effects yielded $F = 13.785$ ($P < .001$), indicating a statistically significant difference in the reduction of VAS scores among the 3 groups (Table 2 and Figure 2).

3.4. Comparison of SAS anxiety scores among the 3 groups

Intragroup comparison: The postoperative SAS anxiety scores of 3 groups showed a decreasing trend over time. The difference between the SAS scores at 72 hours post-intervention and the pre-intervention period was highly significant ($P < .001$). This indicates that the control, auricular acupressure, and combined groups all effectively alleviated patients' postoperative

anxiety following lower limb fracture surgery (Table 3). Inter-group comparison: The pre-intervention SAS scores among the 3 groups did not differ significantly ($P > .05$). However, at 72 hours post-intervention, the SAS scores of the combined group were significantly lower than those of the auricular acupressure and control groups ($P < .05$). Additionally, the SAS scores of the auricular acupressure group were significantly lower than those of the control group ($P < .05$). This suggests that auricular acupressure combined with EFT effectively alleviates anxiety within 72 hours following lower limb fracture surgery (Table 3).

3.5. Comparison of nursing satisfaction scores among the 3 groups

At 3 days post-intervention, the overall satisfaction rate exceeded 80% in the control, auricular acupressure, and combined groups. The total satisfaction rates of both the auricular acupressure and combined groups were higher than those of the control group, with the differences being statistically significant

Table 2

Comparison of VAS pain scores at different time points among the 3 groups ($\bar{x} \pm s$).

	Control group (n = 33)	Auricular acupressure group (n = 33)	Combined group (n = 33)	F-value	P-value
Pre-intervention	5.15 ± 0.62	5.21 ± 0.65	5.33 ± 0.74	0.630	.535
4 h post-intervention	4.27 ± 0.76*	3.70 ± 0.88*	3.55 ± 0.71*	7.813	<.001
12 h post-intervention	3.67 ± 0.85*†	3.27 ± 0.63*†	3.18 ± 0.58*†	4.497	.014
24 h after intervention	3.18 ± 0.81*†‡	2.67 ± 0.69*†‡	2.62 ± 0.57*†‡	8.698	<.001
48 h after intervention	1.48 ± 0.71*†‡§	1.24 ± 0.44*†‡§	1.18 ± 0.39*†‡§	2.993	.055
72h after intervention	1.24 ± 0.44*†‡§	1.21 ± 0.42*†‡§	1.15 ± 0.36*†‡§	0.429	.652
F-value	158.326	192.390	231.748		
P-value	$P < .001$	$P < .001$	$P < .001$		
Between-group effect		13.785, $P < .001$			
Within-group effect		614.182, $P < .001$			
Intra*inter-group		5.620, $P < .001$			

* Comparison with pre-intervention, $P < .05$.

† Comparison with 4 h post-intervention, $P < .05$.

‡ Comparison with 12 h post-intervention, $P < .05$.

§ Comparison with 24 h post-intervention, $P < .05$.

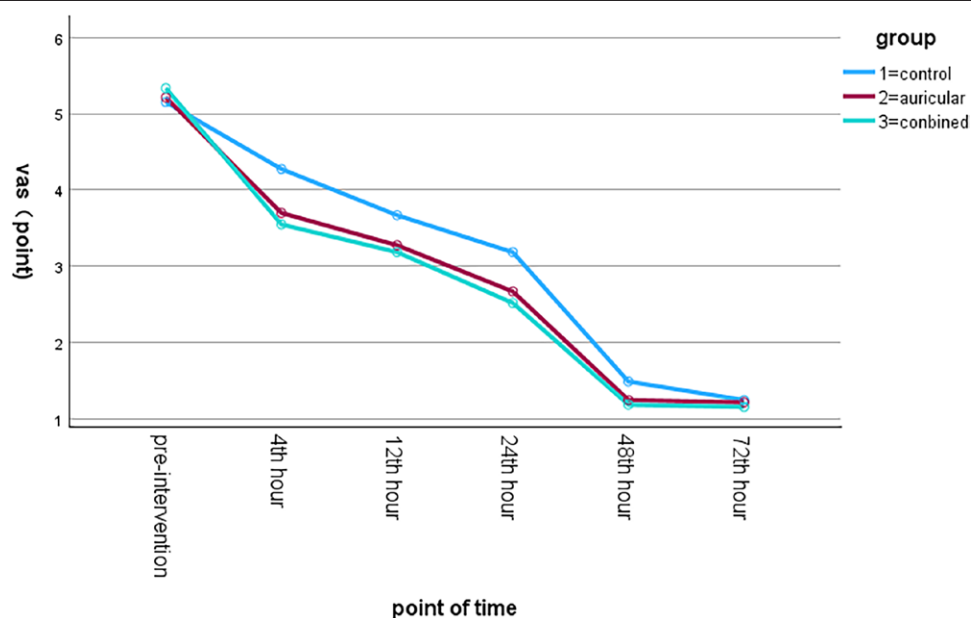


Figure 2. Contours of the interaction effect of VAS pain scores for the 3 groups of patients: The different colored folds in the legend represent the different patient groups; the contour lines in the figure indicate the interaction of VAS pain scores between the different patient groups. VAS = visual analog scale.

(($P < .05$; Table 4). Additionally, the satisfaction rate of the combined group was higher than that of the auricular acupressure group, with the difference also being statistically significant ($P < .05$; Table 4).

3.6. Incidence of adverse reactions

No patients experienced adverse reactions such as dizziness, headache, palpitations, local skin damage, breakage at the auricular acupoint, or allergic reactions pre- or post-intervention.

4. Discussion

4.1. Auricular acupressure combined with EFT reduces postoperative pain in patients with lower limb fractures

Pain is a subjective sensation in the body, representing an unpleasant sensory and emotional experience caused by tissue damage or the potential for tissue damage in the organism. Following lower limb fracture surgery, pain typically manifests acutely, imposing significant psycho-physiological stress and metabolic disturbances on patients, consequently diminishing their quality of life. Studies indicate that postoperative pain and anxiety interact with each other, ultimately impacting patient survival and prognosis.^[13,14] The expert consensus on postoperative pain in adults advocates for standardized pain management, effective analgesia, and minimized adverse effects to enhance patient satisfaction.^[15] Hence, the application of auricular acupressure combined with EFT in postoperative patients with lower limb fractures holds significant clinical importance, offering a safe and effective analgesic approach for patients.

This study demonstrates that auricular acupressure combined with EFT effectively alleviates acute postoperative pain in patients within the first 24 hours postoperatively. Moreover, the combined group exhibits superior and sustained analgesia compared to the auricular acupressure group over time. In traditional Chinese medicine, postoperative pain from a lower limb fracture is conceptualized as a disturbance in the flow of qi and blood within the body's veins and channels. This disruption can lead to conditions such as blood stagnation, blockage of heat due to stasis, and an inability for stasis to pass smoothly, resulting in pain. Additionally, postoperative trauma

can lead to a loss of blood and local moisture, exacerbating the sensation of pain. This concept is often described as “does not glorify the pain.”^[16] In this study, we targeted specific auricular points such as shenmen, subcortical, sympathetic, along with points corresponding to the surgical site. By leveraging the inherent regulation of meridians, our aim was to reconcile yin and yang, harmonize qi and blood, and achieve therapeutic effects including calming and tranquilizing the mind, promoting blood circulation, removing blood stasis, and alleviating pain.^[2,4,17] Therefore, auricular acupressure presents itself as a viable postoperative intervention for lower limb fractures due to its advantages in pain relief, simplicity, and safety. However, it is noteworthy that auricular acupressure alone did not significantly impact patients' pain perception. It has been suggested that pain perception correlates with the severity of pain.^[18]

In this study, we incorporated EFT into auricular acupressure to address patients' misperceptions about pain, thereby enhancing pain relief. EFT uses neurolinguistic programming techniques, guiding patients to verbalize the affirmation “Although I am in pain, I deeply and completely accept myself” following the identification of their pain issues. By doing so, patients subconsciously engage in reprocessing the pain event, correcting erroneous pain perceptions, and subsequently reducing their pain perceptions.^[19] EFT can increase serotonin and endorphin production through the stimulation of acupoints *via* tapping, thus providing pain relief. Additionally, it can modulate the activity of the limbic system in the brain and inhibit the transmission of painful stimuli within the nociceptive system of the brain, ultimately alleviating the severity of pain in patients.^[20,21] In summary, the combination of auricular acupressure and EFT effectively diminishes pain levels in postoperative patients with lower limb fractures, offering valuable insights for clinical practice.

4.2. Auricular acupressure combined with EFT improves patient anxiety

This study demonstrates that 72 hours post-intervention, the combined group was more effective in reducing anxiety compared to the auricular acupressure group, resulting in a more rapid alleviation of patient anxiety. Auricular acupressure's effectiveness in relieving postoperative anxiety following lower limb fracture surgery can be attributed to several factors.

Table 3

Comparison of SAS anxiety scores among the 3 groups ($\bar{x} \pm s$).

	Control group (n = 33)	Auricular acupressure group (n = 33)	Combined group (n = 33)	F-value	P-value
Pre-intervention	61.55 $\pm$ 5.03	61.82 $\pm$ 4.44	62.23 $\pm$ 2.70	0.223	.800
72 h post-intervention	50.95 $\pm$ 4.67*	49.28 $\pm$ 2.56*†	47.55 $\pm$ 1.99*‡	13.868	<.001

SAS = self-rating anxiety scale.

* Compared with pre-intervention, $P < .05$.

† Compared with the control group, $P < .05$.

‡ Compared with the auricular group, $P < .05$.

Table 4

Comparison of patient satisfaction between the 2 groups (cases, %).

Group	n	Very satisfied, n (%)	More satisfactory, n (%)	Dissatisfied, n (%)	Total satisfaction rate (%)
Control group	33	11 (33.3)	16 (48.5)	6 (18.2)	81.8
Auricular acupressure group	33	23 (69.7)	8 (24.2)	2 (6.1)	93.9*
Combined group	33	25 (78.8)	7 (21.2)	1 (3.0)	97.0*†

Note: multiple comparisons were made using the chi-square test.

* Compared with the control group, $P < .05$.

† Compared with the auricular group, $P < .05$.

According to auricular acupoint theory, Shenmen, subcortical, sympathetic, and heart points possess calming and tranquilizing effects on the mind and spirit.^[22] The combination of all these acupoints helps balance qi and stabilize the mind and spirit. Additionally, it has been observed that pain levels are positively correlated with anxiety levels.^[18,23] In this study, we found that auricular acupressure reduced the pain levels of patients after lower limb fracture surgery, subsequently alleviating their anxiety, which aligns with findings by Olshan-Perlmutter et al.^[24] Thus, auricular acupressure emerges as an effective intervention for improving postoperative anxiety. EFT offers patients interventions such as distraction and positive suggestion through techniques like emotional desensitization and verbal guidance, enhancing physiological and psychological comfort while soothing emotions.^[25,26] Anxiety levels in patients correlate positively with cortisol levels.^[27] By tapping acupoints, EFT regulates the endocrine system and reduces cortisol hormone levels,^[25,28] thereby relieving anxiety. Therefore, the combination of auricular acupressure and EFT in addressing postoperative anxiety following lower limb fracture surgery yields a synergistic effect, providing better anxiety relief for patients.

4.3. EFT combined with auricular acupressure can improve patient care satisfaction

The implementation of auricular acupressure combined with EFT intervention for postoperative patients with lower limb fractures in this study not only reduced pain and anxiety levels but also provided more comprehensive nursing care. This approach fostered nurse-patient trust and ultimately enhanced patient satisfaction with the nursing outcome. Erden et al.^[29] highlighted that early pain control significantly impacts postoperative patient satisfaction. Therefore, in managing postoperative analgesia, it is imperative to strengthen communication regarding patients' emotions, educate patients about analgesic modalities, and provide timely feedback on pain control. Such measures contribute to improved patient satisfaction.

5. Conclusions

In conclusion, auricular acupressure combined with EFT proves effective in reducing postoperative pain levels among patients with lower limb fractures, alleviating anxiety, and enhancing nursing care satisfaction, with no reported adverse reactions. Nonetheless, it is important to note that the sample size in this study was relatively small. Future studies should consider conducting multicenter, large-sample studies to further validate the clinical efficacy of this intervention.

Acknowledgments

We would like to acknowledge the everyone for their helpful contributions on this paper.

Author contributions

Conceptualization: Xianglong Zhou, Dandan Chen, Huiping Yao, Qi Wang.

Data curation: Xianglong Zhou, Guoqin Zhang.

Formal analysis: Xianglong Zhou, Dandan Chen.

Methodology: Xianglong Zhou, Dandan Chen, Huiping Yao, Qi Wang.

Project administration: Xianglong Zhou, Dandan Chen, Huiping Yao, Qi Wang.

Supervision: Dandan Chen, Huiping Yao, Qi Wang.

Writing – original draft: Xianglong Zhou.

Writing – review & editing: Guoqin Zhang.

References

- [1] Cholak D, Saberski E, Lowenberg DW. Approach to complex lower extremity reconstruction. *Semin Plast Surg.* 2022;36:233–42.
- [2] Li P, Chen H, Fu X, Zhou H, Lai F. Clinical effects and safety of auricular acupressure as an adjunct therapy on postoperative pain among patients with hip fracture: a meta-analysis. *Pain Res Manag.* 2023;2023:5077772.
- [3] Osagie L, Shaunak S, Murtaza A, Cerovac S, Umarji S. Advances in 3D modeling: preoperative templating for revision wrist surgery. *Hand (New York, NY).* 2017;12:NP68–72.
- [4] Lin Y, Wu Y, Zhou X, Shen B, Lv C. Observation of the therapeutic effect of auricular bean pressing on early knee osteoarthritis pain: a randomized controlled trial. *J Back Musculoskelet Rehabil.* 2023;36:815–22.
- [5] Yaqian Z. Clinical observation of auricular acupoint pressing for postoperative pain of lower limb fracture. Hunan University of Traditional Chinese Medicine, 2020.
- [6] Bach D, Groesbeck G, Stapleton P, Sims R, Blickheuser K, Church D. Clinical EFT (emotional freedom techniques) improves multiple physiological markers of health. *J Evid Based Integr Med.* 2019;24:2515690X–18823691.
- [7] Church D, Stapleton P, Mollon P, et al. Guidelines for the treatment of PTSD using clinical EFT (emotional freedom techniques). *Healthcare (Basel).* 2018;6:146.
- [8] Sheng P, Yuling W, Shiqing Z, et al. Analysis of the selection pattern of auricular pressure points for postoperative pain based on data mining. *J Nurs.* 2021;28:21–5.
- [9] General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China, Standardization Administration of the People's Republic of China. Naming and Positioning of Auricular Points: GB/T 13734-2008[S]. Beijing: China Standard Press, 2008:5–8.
- [10] Menold N. Rating-scale labeling in online surveys: an experimental comparison of verbal and numeric rating scales with respect to measurement quality and respondents' cognitive processes. *Sociol Methods Res.* 2020;49:79–107.
- [11] Shafshak TS, Elnemr R. The visual analogue scale versus numerical rating scale in measuring pain severity and predicting disability in low back pain. *J Clin Rheumatol.* 2021;27:282–5.
- [12] Liu Z, Qiao D, Xu Y, et al. The efficacy of computerized cognitive behavioral therapy for depressive and anxiety symptoms in patients with COVID-19: Randomized controlled trial. *J Med Internet Res.* 2021;23:e26883.
- [13] Husni M, Jahrami H, Shenawi H A, et al. Postoperative patient pain severity and its association with anxiety, depression, and sleep quality. *Cureus.* 2024;16:e54553.
- [14] Kaynar AM, Lin C, Sanchez AG, et al. Surxgwell: Study protocol for a randomized controlled trial of telemedicine-based digital cognitive behavioral intervention for high anxiety and depression among patients undergoing elective hip and knee arthroplasty surgery. *Trials.* 2023;24:715.
- [15] Wang TK, Wang YY, Ku MC, et al. A retrospective comparison of clinical efficacy between multimodal analgesia and patient-controlled epidural analgesia in patients undergoing total knee arthroplasty. *Medicina (Kaunas).* 2023;59:2137.
- [16] Tanitsookarn R, Suwannarurk K, Sangvatanakul P, Lertvuttivivat S, Pattaraarchachai J, Bhamarapratana K. Effectiveness of auricular point acupressure with magnetic plate for pain management in acute postpartum cesarean section patients in Thammasat university hospital: a randomized clinical controlled trial. *J Tradit Chin Med.* 2022;42:611–6.
- [17] Huffman C, Olson J, Evans JK, et al. Nurse initiated auricular acupressure for post-operative pain control in patients undergoing tka or tha: a randomized controlled trial. *Int J Orthop Trauma Nurs.* 2024;52:101035.
- [18] Avila L, da Silva MD, Neves ML, et al. Effectiveness of cognitive functional therapy versus core exercises and manual therapy in patients with chronic low back pain after spinal surgery: randomized controlled trial. *Phys Ther.* 2024;104:pzad105.
- [19] Stapleton P, Kip K, Church D, et al. Emotional freedom techniques for treating post traumatic stress disorder: an updated systematic review and meta-analysis. *Front Psychol.* 2023;14:1195286.
- [20] Church D, Feinstein D. The manual stimulation of acupuncture points in the treatment of post-traumatic stress disorder: a review of clinical emotional freedom techniques. *Med Acupunct.* 2017;29:194–205.
- [21] Peta S, Oliver B, Tom O, Bhuta S. Neural changes after emotional freedom techniques treatment for chronic pain sufferers. *Complement Ther Clin Pract.* 2022;49:101653.

- [22] Zhang X, He B, Wang H, Sun X. Auricular acupressure for treating early stage of knee osteoarthritis: a randomized, sham-controlled prospective study. *QJM*. 2022;115:525–9.
- [23] Yazıcı G, Yılmaz K, Bulut H, et al. The prevalence of pain in the first 24 hours after surgery: a multicenter study. *J Perianesth Nurs*. 2022;37:122–9.
- [24] Olshan-Perlmutter M, Carter K, Marx J. Auricular acupressure reduces anxiety and burnout in behavioral healthcare. *Appl Nurs Res*. 2019;49:57–63.
- [25] Stapleton P, Crighton G, Sabot D, O'Neill HM. Reexamining the effect of emotional freedom techniques on stress biochemistry: a randomized controlled trial. *Psychol Trauma*. 2020;12:869–77.
- [26] Nicosia GJ, Minewiser L, Freger A. World Trade Center: a longitudinal case study for treating post traumatic stress disorder with emotional freedom technique and eye movement desensitization and reprocessing. *Work*. 2019;63:199–204.
- [27] Łoś K, Waszkiewicz N. Biological markers in anxiety disorders. *J Clin Med*. 2021;10:1744.
- [28] Church D, Stapleton P, Vasudevan A, O'Keefe T. Clinical eft as an evidence-based practice for the treatment of psychological and physiological conditions: a systematic review. *Front Psychol*. 2022;13:951451.
- [29] Erden S, Güler S, Tura I, Başibüyük IF, Arslan UE. Evaluating patient outcomes in postoperative pain management according to the revised American pain society patient outcome questionnaire (aps-poq-r). *Appl Nurs Res*. 2023;73:151734.