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Comparing the effects of acupressure and aromatherapy with peppermint essential oil on the quality of recovery of patients undergoing laparoscopic cholecystectomy: A randomized controlled trial

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ABSTRACT

Introduction: Complementary medicine presents a viable avenue for mitigating side effects after surgery. This study aimed to compare the effects of acupressure and peppermint essential oil on the quality of recovery in patients undergoing laparoscopic cholecystectomy (LC).

Methods: In this clinical trial, 210 patients referred to the Besat and Beheshti hospitals in Hamadan, Iran, were included. After giving their informed consent and completing the demographics survey, they were randomly assigned to 3 equal groups of control, peppermint essential oil, and acupressure. The study primarily assessed recovery quality through a 15-item questionnaire and secondarily evaluated postoperative nausea and satisfaction. Data were analyzed using Kruskal-Wallis, Wilcoxon, and Friedman tests in SPSS 23.

Results: In pre-intervention, there was no significant difference between the groups in the total score of recovery quality, nausea, and demographic data. There was a significant increase in the quality of recovery score in the acupressure group when compared to the peppermint group on the second postoperative day ($P<0.001$). In post-intervention, the mean score of nausea improvement in the control group was significantly less than those of the peppermint and acupressure groups ($P<0.05$). However, neither the acupressure nor peppermint groups displayed a significant reduction in nausea severity ($P=0.439$). Furthermore, the patient's satisfaction in the acupressure group was significantly higher than that of other groups on the second postoperative day ($P<0.001$).

Conclusion: The administration of acupressure was found to be successful in improving recovery quality, patient satisfaction, and mitigating nausea compared to peppermint and standard treatment.

Implication for health policy/practice/research/medical education:
The study's outcomes suggest potential avenues for health policy and clinical practice by advocating the inclusion of complementary interventions like acupressure and peppermint essential oil aromatherapy in postoperative care plans for laparoscopic cholecystectomy patients. These findings also underscore the need for further research and incorporation of these insights into medical education to equip healthcare professionals with holistic approaches to surgical recovery.

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Introduction

Annually, over 750 000 individuals in the United States undergo cholecystectomy surgery (1). Despite being minimally invasive, laparoscopic cholecystectomy (LC) can lead to postoperative discomfort including stomach unease, shoulder pain, nausea, vomiting, and even urinary retention (2,3). The potential impacts of LC, a frequently performed surgical procedure can be describe on three crucial aspects: the quality of recovery, postoperative nausea, and patient satisfaction (4,5). LC, which involves

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minimally invasive techniques to remove the gallbladder, could potentially influence these three factors. The procedure's effect on the quality of recovery might be shaped by factors like the body's response to surgery, anesthesia, and the overall healing process. Similarly, the surgical intervention can potentially trigger physiological changes that contribute to postoperative nausea. Patient satisfaction, in turn, can be influenced by aspects such as pain management, overall hospital experience, and the resolution of pre-surgery symptoms (6-9).

Numerous dietary and medicinal interventions have been explored to improve recovery quality, yet persistent challenges endure (8). Inadequate recovery not only escalates hospital costs but also dampens patient contentment. Thus, adopting strategies can heighten efficacy, mitigate difficulties, and expedite the return to regular activities (10). Recent studies have underscored the significance of non-pharmacological treatments (11,12). These therapies present lower risk, lesser invasiveness, and fewer adverse effects (13). Referred to as complementary medicine, these non-pharmacological interventions encompass modalities such as yoga, acupuncture, music therapy, aromatherapy, distraction, visualization, and massage therapy (14). Among these, acupressure, a non-invasive massage technique with historical roots, has been employed for addressing various issues (15). Its recognition by the World Health Organization (WHO) as a supplementary medical practice further emphasizes its significance (15). Acupressure's traditional objective is to facilitate a harmonious flow of chi energy through meridians – pathways distributing energy throughout the body (15).

Research studies have consistently demonstrated the effectiveness of acupressure in managing various conditions such as pain, sleep disturbances, as well as nausea and vomiting (16-18). Modern acupressure involves the application of pressure using hands, fingers, thumbs, elbows, feet, or specialized tools on specific pressure points across the body (19). A notable advantage of acupressure lies in its user-friendly nature, allowing patients to learn and self-administer the technique (20). Consequently, patients can utilize acupressure for self-care with minimal instruction and easy accessibility (21).

Aromatherapy represents another valuable complementary therapeutic approach (22,23). This practice employs essential oils extracted from various plant components. Essential oils can stimulate the body's innate healing mechanisms when applied through methods such as massage, bathing, ingestion, or inhalation, exerting a holistic impact on the body, mind, and spirit (23). Peppermint, which contains essential oils along with compounds like menthol, menthol esters, beta-thiocholine, carotene, tocopherol, flavonoids, and polymerized polyphenols, boasts antispasmodic properties and facilitates bile flow. Notably, menthol, a major component of peppermint, has anticonvulsant effects and can counteract nausea and vomiting (24).

The study by Jafarimanesh et al explored the influence of peppermint essential oil on nausea and vomiting severity in breast cancer patients undergoing chemotherapy. Their findings indicated that the group exposed to peppermint essential oil exhibited lower mean scores for nausea and vomiting severity compared to the control group (25). In light of these insights, nurses, serving as integral members of the healthcare team, bear the responsibility for implementing post-surgical recovery strategies and patient care. By elucidating the distinctions between these two treatment modalities in terms of recovery quality and nausea management, nurses can adopt these approaches as effective solutions. These interventions hold the potential to ameliorate the challenges experienced by patients' post-surgery, thus elevating the standard of patient care. This proactive approach contributes to symptom relief and enhances patients' satisfaction with their treatment journey. Given the myriad challenges confronted by post-surgical patients and the existing gap in comparative research on the recovery quality of patients undergoing LC when employing acupressure versus peppermint essential oil aromatherapy, our study aims to bridge this gap. Through this investigation, our objective is to establish a comparative framework for evaluating the impact of these two complementary medical interventions on the recovery quality of patients undergoing LC.

Materials and Methods

Research design

This study follows a randomized, controlled, parallel trial design that was included 210 patients who underwent LC between May 2022 to September 2022, in two affiliated hospitals of Hamadan University of Medical Sciences.

Sample size

Sample size determination relied on Noll and colleagues' report, which indicated mean patients' satisfaction levels of 8.2 ± 2.2 in the control group and 9.1 ± 1.5 in the acupressure intervention group. Based on this information and the suggested formula, each group was assigned n=70 participants, targeting a power of 80% and significance level of 5% (8).

Selection criteria

Patients older than 18 years old with an ASA I or II, the ability to understand Farsi, hospitalized for at least one day after surgery and agreeing to participate in the research were inclusion requirements. Carpal tunnel syndrome, an olfactory system disorder, scarring at Pericardium 6 (PC6), Shenmen (HT7), and Sanyinjiao (SP6) acupoints, the use of herbal medications two weeks prior to surgery, allergies to plants and respiratory conditions, alcohol use and smoking, physical disability,

a history of neurological disease requiring hospitalization or specialist or medication were among the exclusion criteria. Additionally, patients who requested to leave the research and those who were discharged prior to the first day were omitted.

Randomization and allocation

Two hundred and ten LC patients from Besat and Beheshti hospitals in Hamadan were selected using convenience sampling and randomly divided into three groups: two experimental and a control groups (with a block size of 6). A random sequence was generated via sealed envelope software, and allocation was determined accordingly. Envelopes containing group assignments were numbered and sealed before being selected as patients entered. The administered interventions were directed by group assignment and supervised by a designated pharmacist consultant.

Outcome measures

The research instruments included a demographic questionnaire and the Quality of Recovery (QoR-15) assessment tool. QoR-15's validity and reliability were established in previous research (6). Each of its 15 items, encompassing factors like pain, nausea, and sleep, was scored on a Likert scale of 0 to 10. The primary outcome was the change in QoR-15 score post-operatively. On the first postoperative day, prior to the first acupressure or peppermint essential oil intervention, a member of the intervention research team delivered QoR-15 from 8:30 to 9:00 AM, and on the second postoperative day, between 7:30 and 8:30 AM.

Secondary outcomes, including nausea and patient satisfaction using numerical rating scales from 0 to 10, were assessed at the same time as the QoR-15 survey was administered. The assessment of nausea score was conducted on first postoperative day before intervention, first postoperative day afternoon and second postoperative day. The assessment of satisfaction score was conducted on the second postoperative day.

All the LC surgeries were scheduled to occur between 8 and 8:30 AM. Uniform anesthetic techniques and drugs were used across all groups, and the surgical procedures were consistent in terms of timing and procedure. Antiemetic drugs were administered for none of the patients before or after surgery.

Intervention

The research included three groups: control (A), peppermint essential oil aromatherapy (B), and acupressure (C). Routine nursing care (education, pain management, wound care, and discharge instructions for patients undergoing LC) was provided to the control group.

In group B, participants received an additional intervention alongside standard treatment. Specifically, three drops of 100% peppermint essential oil, provided by Barij Essential Oil Pharmaceutical Company, Kashan, Iran, were placed on a 2 × 2 pad. This pad was then affixed to the patient's neck at a distance of 10 cm from the skin. The peppermint essential oil was diluted to a 1:20 ratio with sweet almond oil before application (26). Patient was instructed to breathe regularly for five minutes while the pad was in place. This procedure was repeated three times on the first postoperative day.

In group C, acupressure was administered at specific acupoints (PC6, HT7, and SP6) in addition to standard medical therapy. The location of these acupoints was defined anatomically: PC6 is found two thumb widths above the wrist crease between the ulna and radius, HT7 is situated at the wrist crease between the ulna and pisiform bone, and SP6 is located 3 cm above the inner ankle of the foot, behind the posterior margin of the tibia (Figure 1) (27,28). The acupressure technique involved applying pressure using the thumb in a specific manner: 2 minutes of pressure followed by a 1-minute rest at PC6 and HT7, and then another 2 minutes of pressure followed by a 1-minute rest at SP6. This process was repeated three times on the first postoperative day. The researcher responsible for applying acupressure underwent training to ensure standardized force application (target pressure between 4000 and 7000 g). Training was conducted over two sessions under the guidance of a licensed acupressure practitioner (29).

The timeline of interventions and assessments is outlined in Table 1. The study stages included the pretest stage (T1), which involved obtaining informed consent and recruiting participants based on inclusion criteria. The day of allocation was marked the first day after surgery when participants were assigned to groups. Thei quality of recovery and nausea scores were measured before any interventions. On the same day, the aromatherapy and acupressure interventions were implemented, and the intensity of nausea was re-assessed. On postoperative day 2, referred to as the close-out stage, the participants' quality of recovery, nausea, and satisfaction scores were measured once again. This comprehensive overview demonstrates

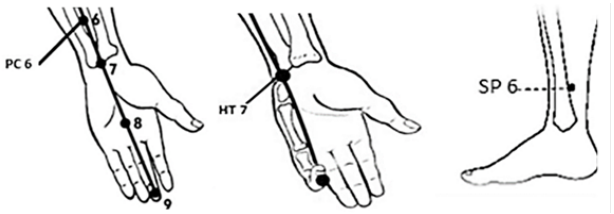

Figure 1. Pericardium 6 (PC6) acupoint is found two thumb widths above the wrist crease between the ulna and radius. Shenmen (HT7) acupoint is situated at the wrist crease between the ulna and pisiform bone. Sanyinjiao (SP6) acupoint is located 3 cm above the inner ankle of the foot, behind the posterior margin of the tibia.

Table 1. A summary of the interventions performed during the study

	Study period			
	Enrolment	Allocation	Post-allocation	Close-out
Timepoint	**T1 (Pretest stage)**	**Postoperative day 1**	**Postoperative day 1**	**Postoperative day 2**
Enrolment	×			
Eligibility screen	×			
Informed consent	×			
Allocation		×		
Intervention:			×	
Control			×	
Peppermint			×	
Acupressure			×	
Assessments:				
Quality of recovery-15 score		×		×
Nausea severity		×	×	×
Patient satisfaction				×

the systematic approach employed in implementing the interventions and evaluating their effects throughout the trial.

Statistical methods

Demographic characteristics distribution was assessed using chi-square and Fisher's exact tests. Quantitative variables were compared with analysis of variance. Data normality was checked with Kolmogorov-Smirnov. Kruskal-Wallis tested recovery, nausea, and satisfaction ratings across groups, Wilcoxon assessed changes within each group, and Friedman's test evaluated intervention impact on nausea. Mann-Whitney conducted pair comparisons. SPSS 23 was used, with 5% significance level in all analyses.

Results

A total of 220 potential participants were initially considered for the study, from which eight individuals failed to meet the inclusion criteria, and an additional two declined participation. The remaining 210 participants adhered to the study's procedures and were consequently included in the analysis (Figure 2).

Demographic information

An examination of demographic data across the three groups indicated no statistically significant differences, as evident in Table 2 ($P > 0.05$). Demographic variables included age, gender, history of a chronic disease, type of chronic disease, history of surgery, and physical status classification determined by the American Society of Anesthesiologists (ASA). The average ages for the control, peppermint oil, and acupressure groups were 51.47 ± 13.25, 51.92 ± 15.62, and 53.65 ± 13.07 years, respectively. Most participants in each group were female, presented with ASA I classification, and had no prior history of surgery or chronic illness.

Primary outcome

Table 3 offers insight into the primary outcome, highlighting that prior to intervention, the average scores of recovery quality on the first postoperative day were 66.73 ± 7.57 for the control group, 66.80 ± 6.20 for the peppermint essential oil group, and 67.55 ± 5.13 for the acupressure group. These values showed no statistically significant differences ($P = 0.363$). Subsequent to the interventions, the average scores of recovery quality were 107.21 ± 6.46 for the control group, 115.03 ± 5.07 for the peppermint essential oil group, and 118.83 ± 3.83 for the acupressure group ($P < 0.001$). Notably, the Mann-Whitney test highlighted that the increase in mean quality of recovery score was significantly higher in the acupressure and peppermint essential oil groups when compared to the control group. Furthermore, the acupressure group demonstrated a notably greater increase in the quality of recovery compared to the peppermint essential oil group ($P < 0.001$) (Table 3).

Secondary outcomes

The Kruskal-Wallis test revealed that prior to intervention, there were no statistically significant differences in mean nausea scores across the three patient groups ($P = 0.845$). Post-intervention, the mean scores of nausea improvement for the control group were significantly less compared to those of both the peppermint essential oil and acupressure groups ($P < 0.050$). Although the individual acupressure and peppermint oil interventions did not yield statistically significant reductions in nausea severity ($P = 0.439$), a notable difference from the control group was observed (Table 4). Furthermore, the average scores of satisfactions on the second postoperative day were 7.74 ± 1.36, 8.77 ± 1.02 and 9.50 ± 0.79 for the control, peppermint and acupressure groups. The non-parametric Mann-Whitney test reaffirmed this distinction by revealing statistically significant increase in mean satisfaction score of the

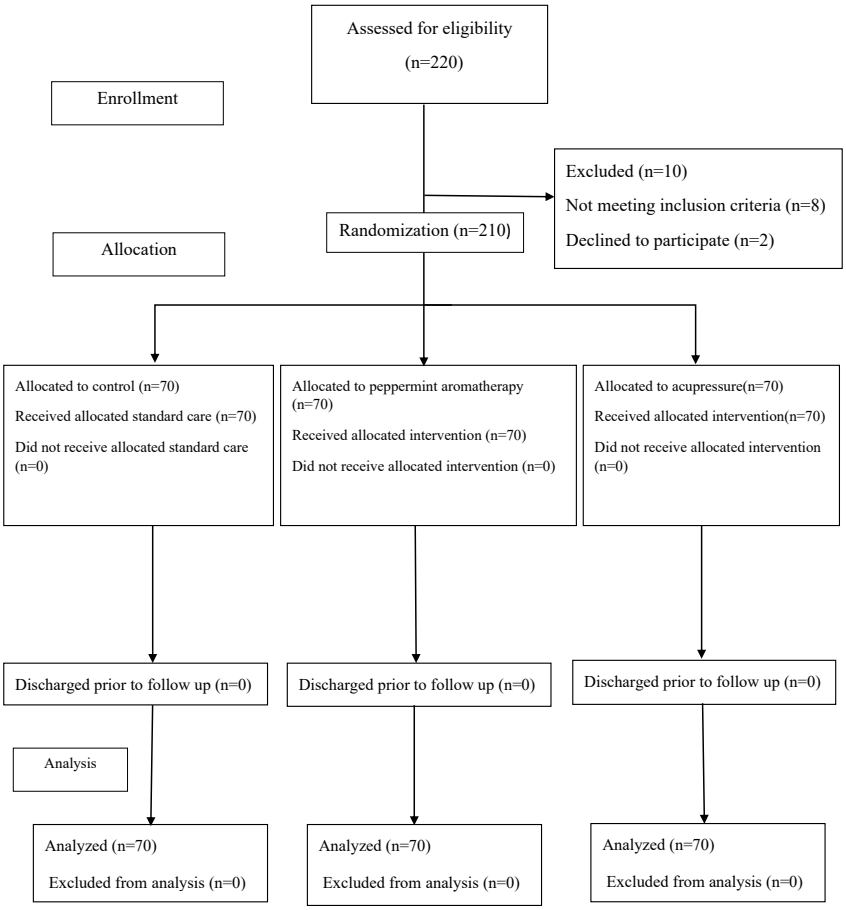

Figure 2. Participants flow-chart.

acupressure group from those of both the peppermint oil and control groups ($P<0.001$) (Table 4).

Discussion

Our study delved into the effects of acupressure and peppermint essential oil interventions on patients post-surgery. We specifically investigated how these approaches influenced factors like recovery quality, postoperative nausea severity, and patient satisfaction. Our findings yielded fascinating insights into the potential of these alternative methods to play a significant role in postoperative care and enhance the overall patient experience.

To ensure the robustness of our results, we took care to ensure that the three groups we studied the control, peppermint oil, and acupressure groups - were well-matched in terms of key demographic variables such as age, gender, previous surgical history, and any chronic illnesses. This meticulous approach allowed us to draw clear connections between the interventions we employed and the outcomes we observed. We were intrigued to discover that both acupressure and the use of peppermint essential oil led to notable improvements in recovery quality scores. Interestingly, acupressure exhibited a more pronounced effect compared to the peppermint oil intervention. Additionally in the present investigation, no significant difference was identified between the degree of nausea in the acupressure and peppermint essential oil group, but a significant difference was found with the control group.

Our investigation unveiled that both acupressure and peppermint essential oil interventions heightened the levels of patient satisfaction. Noteworthy was the finding that acupressure seemed to yield a slightly stronger impact in enhancing patient satisfaction compared to the use of peppermint oil. These outcomes underscore the potential efficacy of these interventions in facilitating smoother recovery, managing post-surgery nausea, and fostering greater overall patient contentment. However, our study also underscores the importance of further research, encompassing larger and more diverse patient cohorts, to confirm and extend these findings across a variety of medical contexts. No work of research had previously compared the efficacy of acupressure and peppermint essential oil aromatherapy on the quality of recovery of these patients.

Interestingly, the study conducted by Noll et al (8), which explored the effects of acupressure on recovery

Table 2. Comparison of the demographic characteristics of the patients undergoing laparoscopic cholecystectomy among the control (A), peppermint (B), and acupressure (C) groups (N=210)

Variables	Variable levels	Control group (n=70)	Peppermint group (n=70)	Acupressure group (n=70)	Test results	*P* value
Age, Mean ± SD		51.47±13.25	51.92±15.62	53.65±13.07	0.47	0.624
Gender, No. (%)	Male	18 (25.70)	21 (30)	23 (32.90)	0.87*	0.647
	Female	52 (74.30)	49 (70)	47 (67.10)		
History of chronic disease, No. (%)	Yes	14 (20)	18 (25.70)	14 (20)	0.89*	0.641
	No	56 (80)	52 (74.30)	56 (80)		
Type of chronic disease, No. (%)	Hypertension	9 (12.90)	10 (14.30)	8 (11.40)	0.26*	0.966
	Diabetes	3 (4.30)	5 (7.10)	4 (5.70)	0.59**	0.931
	Thyroid	0 (0)	3 (4.30)	3 (4.30)	3.32**	0.250
History of surgery, No. (%)	Yes	28 (40)	20 (28.60)	22 (31.40)	2.23*	0.328
	No	42 (60)	50 (71.40)	48 (68.60)		
Number of surgical history, No. (%)	No	42 (60)	50 (71.40)	48 (68.60)	2.57**	0.639
	Once	23 (32.90)	16 (22.90)	19 (27.10)		
	Twice	5 (7.10)	4 (5.70)	3 (4.30)		
Physical status classification determined by the ASA, No. (%)	I	59 (84.30)	61 (87.10)	56 (80)	1.33*	0.513
	II	11 (15.70)	9 (12.90)	14 (20)		

ASA, American Society of Anesthesiologists.
*Chi-square test; **Exact fisher test.

quality, did not yield statistically significant outcomes. It is important to note that variations in patient demographics, study groups, and sample size between their research and ours could account for this discrepancy. Nonetheless, our findings are in harmony with the observation that the acupressure group reported heightened satisfaction levels compared to both the placebo and control groups, aligning well with our own results.

The study conducted by Kiani et al (30) highlighted how peppermint essential oil played a role in boosting patient satisfaction, which resonates with our own findings. Interestingly, in our investigation, while we did not find a significant difference in nausea severity between the acupressure and peppermint essential oil groups, there was a clear distinction when compared to the control group. The research by Joulaeerad et al (31) echoed our results in that they observed noteworthy levels of nausea and vomiting severity within their intervention groups, yet these differences didn't stand out when compared to the placebo groups – a pattern that closely mirrors our study. Furthermore, the work by Karsten et al (32) suggested that aromatherapy using peppermint oil could be a valuable tool in addressing postoperative nausea and vomiting. Likewise, Tara and colleagues' study (33) indicated that acupressure on the PC6 point effectively alleviated nausea in pregnant women.

Our study holds significant implications. Firstly, the use of a substantial sample size bolsters the credibility of our results. Secondly, our choice to focus on a common surgical procedure acknowledges the variations in recovery quality across different types of surgeries. Thirdly, we employed a reliable assessment tool, the QoR-15, which captured not only primary but also secondary variables such as nausea and patient satisfaction. From a therapeutic perspective, our research strongly supports the notion that acupressure — a cost-effective and low-risk approach — surpasses aromatherapy with peppermint essential oil in terms of enhancing recovery quality, mitigating nausea, and boosting patient satisfaction. Consequently, these findings offer practical insights into the recovery strategies for LC patients, advocating for the integration of acupressure as a valuable component of postoperative care.

While our study provides significant insights into the effects of acupressure and peppermint essential oil interventions on postoperative outcomes, it does have certain limitations that warrant consideration. The basic differences between acupressure and aromatherapy using peppermint essential oil prevented the researchers from implementing blinding effectively, potentially introducing bias into the study. Additionally, our study design focused exclusively on patients undergoing LC, which might curtail the broader applicability of our findings to a wider array of surgical procedures. It is important to note that all participants selected for this study shared ASA I or II classifications, contributing to the homogeneity of the sample. However, this homogeneity could limit the generalizability of the results to patients with higher ASA classifications. Furthermore, while the large sample size was a strength of the study, it did pose challenges in terms of follow-up, potentially hindering comprehensive long-term observations. Lastly, the sampling was confined to two

Table 3. Primary endpoint of quality of recovery scores in the studied groups (control (A), peppermint essential oil (B) and acupressure (C))

Variable	Total	Control	Peppermint	Acupressure	Kruskal-Wallis test	*P* value	C & P* (*P* value)	C & A** (*P* value)	P & A*** (*P* value)
Quality of recovery									
Postoperative day 1	67.03±6.36	66.73±7.57	66.80±6.20	67.55±5.13	2.03	0.363			
Postoperative day 2	113.69±7.12	107.21±6.46	115.03±5.07	118.83±3.83	103.26	< 0.001			
Change in quality of recovery score (0-150)	46.66±6.52	40.48±4.94	48.22±4.65	51.27±4.48	102.45	<0.001	< 0.001	< 0.001	< 0.001
Wilcoxon test	12.56	7.275	7.277	7.277					
P value	< 0.001	<0.001	<0.001	<0.001					

*Control & Peppermint; **Control & Acupressure; ***Peppermint & Acupressure.

Table 4. Secondary endpoints of nausea and satisfaction scores in the studied groups ((control (A), peppermint essential oil (B) and acupressure (C))

Variable	Total	Control	Peppermint	Acupressure	Kruskal-Wallis test	*P* value	C & P* (*P* value)	C & A** (*P* value)	P & A*** (*P* value)
Nausea									
Baseline (0-10)	5.64±1.69	5.70±1.75	5.63±1.64	5.58±1.72	34/0	0.845			
Postoperative day 1 (0-10)	7.88±1.28	7.30±1.33	8.09±0.97	8.25±1.32	18.08	<0.001			
Postoperative day 2 (0-10)	9.16±1.08	8.75±1.23	9.30±0.92	9.43±0.97	14.73	<0.001			
Changes in nausea score (0-10)	3.52±1.53	3.06±1.21	3.67±1.70	3.84±1.53	11.84	0.003	0.01	0.001	0.439
Friedman's test	382.05	130.51	123.05	129.5					
Satisfaction									
Postoperative day 2 (0-10)	8.67±1.29	7.74±1.36	8.77±1.02	9.50±0.79	64.73	<0.001	<0.001	<0.001	<0.001

*Control & Peppermint; **Control & Acupressure; ***Peppermint & Acupressure.

hospitals affiliated with Hamadan University of Medical Sciences, which, while ensuring certain consistency in patient demographics, could limit the transferability of the findings to different healthcare settings.

Despite these limitations, the study significantly contributes to the understanding of acupressure and peppermint essential oil interventions in postoperative care. It serves as a valuable foundation for future research endeavors to address these concerns and extend the scope of their application. Further investigations encompassing a broader range of surgical procedures and longer follow-up periods could offer a more comprehensive perspective on the effects of these interventions. Expanding the study to multi-center settings could enhance the external validity of the results. By acknowledging these limitations and building upon the insights gained, researchers can continue to refine the utilization of these complementary approaches for enhancing the recovery experience of surgical patients.

Conclusion

This study explored the effects of acupressure and peppermint essential oil aromatherapy on recovery quality, postoperative nausea, and patient satisfaction in individuals undergoing LC. Both acupressure and peppermint oil interventions led to significantly enhanced recovery quality compared to standard treatment alone. Acupressure exhibited a more pronounced impact than peppermint oil in improving recovery quality, patient satisfaction, and mitigating nausea severity. These results underscore the potential of complementary interventions to ameliorate postoperative outcomes in LC patients. However, further research is warranted to ascertain the broader applicability and generalizability of these findings across diverse patient populations and healthcare settings.

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Formal analysis: Salman Khazaei.
Funding acquisition: Behzad Imani.
Investigation: Fatemeh Zare.
Methodology: Fatemeh Zare.
Project administration: Behzad Imani.
Resources: Fatemeh Zare.
Software: Salman Khazaei.
Supervision: Behzad Imani.
Validation: Behzad Imani, Salman Khazaei.
Visualization: Behzad Imani, Salman Khazaei.
Writing–original draft: Fatemeh Zare.
Writing–review & editing: Behzad Imani, Fatemeh Zare, Salman Khazaei.

Conflict of interests

The authors declare no conflict of interest.

Ethical considerations

The ethics committee of Hamadan University of Medical Sciences, Hamadan, Iran approved the research project and it was assigned the ethics code number IR.UMSHA.REC.1401.136. Additionally, the study was registered at the Iranian Clinical Trial Center (identifier: IRCT20220515054852N1; https://www.irct.ir).

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