ORIGINAL ARTICLE

The Effect of Foot Massage on Postoperative Pain and Anxiety Levels in Laparoscopic Cholecystectomy Surgery: A Randomized Controlled Experimental Study

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Purpose: *This study determined the effect of foot massage on postoperative pain and anxiety levels in patients undergoing laparoscopic cholecystectomy surgery.*
Design: *A randomized controlled trial.*
Methods: *This study was conducted in a general surgery clinic of a university hospital between May 2016 and March 2018. The research sample consisted of 167 patients (85 in the experimental group and 82 in the control group) who met the research inclusion criteria.*
Findings: *The pain intensity of patients in the experimental group was less than in the control group at 30, 60, 90, and 120 minutes after intervention ($P < .05$). A significant reduction was determined in the need for analgesics for the patients in the experimental group compared with the control group ($P < .05$). A significant positive relationship was found between pain intensity and state anxiety levels in patients of the experimental group.*
Conclusions: *Foot massage decreased postoperative pain and anxiety levels in patients undergoing laparoscopic cholecystectomy surgery.*

Keywords: *postoperative pain, postoperative anxiety, foot massage, nursing, laparoscopic cholecystectomy.*

CHOLELITHIASIS IS A FREQUENTLY observed problem treatable via laparoscopic cholecystectomy.[1] Early postoperative abdominal pain after laparoscopic cholecystectomy has led to the need for analgesic therapies.[2] It is a visceral pain usually attributed to surgical manipulation and peritoneal irritation caused by entrapment of dissolved CO_2 in the abdomen.[3] Less frequently, parietal abdominal pain may develop at the trocar insertion sites in the abdominal wall.[3] Insufficient pain treatment in the early stages after laparoscopic cholecystectomy may cause patients to breathe shallowly and quickly because they are afraid of experiencing pain. As a result, pulmonary dysfunction may occur.[4,5] Severe pain can delay early recovery and cause a decline in movement, which increases the risk of thromboembolic complications.[6-8] In addition, pain-induced anxiety increases muscle tonus, which increases oxygen consumption and lactic acid production in

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muscles. The lactic acid accumulation in muscles can cause problems such as pain or cramping.[9,10]

Inadequate pain and anxiety management in the early postoperative period extends the recovery period and increases the risk of complication.[11,12] Therefore, it has been suggested to manage acute pain and anxiety concurrently.[12,13] Pharmacologic and nonpharmacologic complementary therapies can be used to manage pain and anxiety after laparoscopic cholecystectomy. Considering the complications of pharmacologic interventions such as respiratory depression, nausea, vomiting, convulsions, itching, decreased gastrointestinal motility, and urinary retention,[14-17] nonpharmacologic interventions without side effects are crucial.[18,19]

The role of the central nervous system in pain management has gained importance via the gate control theory, which is the only theory to explain the physical and psychological components of pain.[20,21] According to this theory, a gate mechanism exists in the spinal cord where painful stimulants are modulated. This gate is opened through the activation of neurodendrites and painful stimulants reach the level of consciousness. The gate is closed through the activation of thick tendons, which mean that pain is not felt because signals do not reach the level of consciousness.[22,23]

Pain can be relieved with the stimulation of nociceptor nerve endings—by thick fibers—that are located on the skin's surface and trigger signals associated with the perception of pain.[23] As nociceptors are densely located in the hands and feet, hand and foot massage may effectively reduce pain.[8,24]

Studies indicate that postoperative foot massage reduces postoperative pain and use of analgesics, and causes an associated decline in anxiety levels.[12,19-21] However, studies evaluating pain and anxiety levels together after foot massage for this patient population are limited.[22-24] This study was designed to determine the effect of foot massage as an alternative nonpharmacologic pain management method for postoperative pain and anxiety levels in patients undergoing laparoscopic cholecystectomy surgery.

Methods

Study Design, Population, and Sampling

This study was planned and conducted as a randomized controlled trial to determine the effect of foot massage on postoperative pain and anxiety levels in patients undergoing laparoscopic cholecystectomy. The study received ethical committee approval and required permissions from Niğde Ömer Halisdemir University Education and Research Hospital. The research population consisted of patients who underwent laparoscopic cholecystectomy between May 2016 and March 2017. The research sample consisted of 170 patients who met the sampling criteria. The randomization was provided by assigning one patient to the experimental group and one patient to the control group. Eighty-five patients were included in each group.

During the data collection process, three patients were excluded because they had bleeding after surgery. Therefore, 167 patients in total participated in the study, 85 in the study group and 82 in a control group.

Power analysis was conducted to determine the sample size, and as a result, the Type I error level was identified as 0.05, whereas the test power was 0.80. The minimum sample size was determined to be 36, 18 in the control group and 18 in the study group, to be able to identify significant differences.

Considering the fact that the study was experimental and that data loss could occur, all patients meeting the sample criteria were approached between May 2016 and March 2017 to increase the power of the study. The criteria for the study group were that patients accepted to participate were greater than 18 years, had no communication or mental insufficiencies, had been given general anesthesia, had hypertension under control, and experienced pain over 4 according to the Visual Comparison Scale; for the study group, patients had to have no contagious foot condition (zoster, fungus, eczema, verruca, or calluses). After the surgical intervention, patients who had any complications such as severe bleeding, nausea, or vomiting, received patient-controlled analgesia, or had at least one drain from the operation site were excluded from the study.

During the data collection process, three patients in the control group were excluded from the study because of postoperative bleeding. Therefore, the study was completed with 167 patients: 85 patients in the experimental group and 82 patients in the control group. In line with the literature, the "descriptive characteristics form," "visual analog scale (VAS)," and "State-Trait Anxiety Inventory" were used to collect data.

DESCRIPTIVE CHARACTERISTICS FORM. This form included questions prepared by the researcher based on the literature concerning the sociodemographic characteristics of the patients in the experimental and control groups such as their age, sex, and marital status.[18,19]

VISUAL ANALOG SCALE. The scale was developed by Price et al[14] to evaluate the severity of a patient's pain. The VAS is a scale in which two ends are named differently on a horizontal line measuring 10 cm (0 = no pain and 10 = severest pain).[14] The patient is asked to indicate the point corresponding to the pain severity he or she feels. The distance between the marked point and the lowest end (0 = no pain) is measured and this numerical value designates the patient's pain severity.[14,15]

STATE-TRAIT ANXIETY INVENTORY. The State-Trait Anxiety Inventory developed by Spielberger to detect the State-Trait Anxiety level is a self-assessment questionnaire consisting of short statements.[25] The questionnaire is a scale of 20 items requiring individuals to describe how they feel themselves in a particular situation and on certain conditions, taking into account their feelings about the situation in which they are present.[26] In a study by Quek et al, the original version of English scale Cronbach's α was found 0.86 between 0.38 and 0.89. The validity and reliability of Turkish scale version were studied by Öner and Le Compte.[27] In these studies, respectively, Kuder Richardson α confidence was between 0.83 and 0.87, test-retest reliability between 0.71 and 0.86, and item remainder reliability between 0.34 and 0.72.[28]

The scale items measure the level of State-Trait Anxiety and are scored as follows: "none" (1), "some" (2), "many" (3), and "entirely" (4). In this section, expressions are separated directly and reversely. The scoring was done with the SPSS program in the computer environment. Initially, two separate scales were prepared for each of the direct and reversed expressions. After being positive for direct expressions and negative for negative questions, the total weighted score for negative expressions is subtracted from the total weighted score for direct expressions. A total score of 50 points is added to the total score obtained in the State Anxiety Scale. The highest score obtained is 80 and the lowest score is 20.[26,28]

Procedure

The admission process for patients who would undergo laparoscopic cholecystectomy occurred on the morning of the surgery. Therefore, data collection started on the morning of surgery.

Patients in the experimental group were asked to complete the descriptive characteristics form before surgery. The scales were explained. The State-Trait Anxiety Inventory was administered. Patients were asked to determine their expected pain intensity on the VAS for the postoperative period at the surgery clinic. After the surgery, patients reported their pain intensity on the VAS after they were admitted to the clinic. Foot massage was provided for the patients who stated their pain severity as greater than 4 on the VAS. A total of 20 minutes of foot massage, 10 minutes for each foot, was applied. The pain intensity level was assessed using the VAS at 5, 30, 60, 90, and 120 minutes after the foot massage. After the foot massage, the State-Trait Anxiety Inventory was readministered at 120 minutes. In the service where the data were collected, nonsteroidal anti-inflammatory drugs were ordered for analgesic treatment postoperatively. In addition to routine analgesic application, physicians ordered that analgesics be given to patients if and when necessary. Patients in the control group received analgesic treatment only; patients in the study group received foot massage in addition to analgesic treatment.

Statistical Analysis

Statistical Package for the Social Sciences (SPSS) 22.0 was used to analyze the data. The descriptive characteristics of the patients in the experimental and control groups were compared using the χ^2

test. The comparison of values of the patients in the experimental and control groups was conducted using an independent samples t test and a paired-samples t test. Repeated measures were compared using the variance analysis. The relationships between the Pillai's trace test with the state and trait anxiety inventories and the VAS were determined using Pearson correlation analysis.

Results

Comparing the descriptive characteristics of patients in the experimental and control groups revealed the groups were similar ($P > .05$) (Table 1). The difference between the mean of the expected and reported pain intensity for the postoperative period of patients in the experimental and control groups was not statistically significant ($P > .05$). The mean score of the expected pain intensity for the postoperative period was lower than the initially reported pain intensity score for patients in both groups, and the difference among the groups was statistically significant ($P < .001$) (Table 2).

Comparing the mean pain intensity scores of the groups at 5 minutes after massage, no significant difference was determined ($P > .05$). However, the mean pain intensity scores (VAS) at 30, 60, 90, and 120 minutes of the experimental group were lower than the mean scores of the control group. The difference among the groups was statistically significant ($P < .05$). The mean pain intensity scores of the patients in the experimental and control groups decreased over time. The difference between the mean pain intensity scores among the experimental and control groups over time was higher and statistically significant for the experimental group ($P < .001$), but not the control group (Table 3).

In addition, 28.2% of the experimental group and 91.5% of the control group were given analgesics after the surgery. The need for analgesics for patients in the experimental group who received foot massage was significantly lower than that for patients in the control group ($P < .001$) (Table 4).

The preoperative mean state anxiety score of patients in the experimental group was 49.74 ± 13.54, which was significantly higher than the mean score of patients in the control group ($P < .05$). The postoperative mean state anxiety score of patients in the experimental group was 28.67 ± 9.12, which was significantly lower than the mean score of patients in the control group ($P < .05$). The mean postoperative state anxiety score of the patients in the experimental group was 28.67 ± 9.12, which was lower than the mean preoperative score. In control group patients, the postoperative mean score was 51.84 ± 6.61, which was significantly higher than the mean preoperative score ($P < .05$). The mean trait anxiety scores between and within the groups were not significantly different ($P > .05$) (Table 5).

Statistically positive relationships were noted between the postoperative pain intensity scores and state anxiety levels of the patients in the experimental and control groups ($P < .001$). The decline in anxiety levels correlated with the decline in pain intensity (Table 6).

Discussion

Inadequate pain and anxiety management in the early postoperative period extends the recovery period and increases the risk of complications.[11,12] This study evaluated the effect of foot massage on postoperative pain and anxiety levels. A statistically significant difference between the expected mean pain intensity score and initially reported mean pain intensity score between the groups for the postoperative period was not found. However, the initially reported pain intensity was higher than the expected pain intensity within the group. Initial pain intensity reported after the operation was higher than the expected pain intensity for both patient groups, which might have been because of the fear of anxiety and pain. Ucuzal and Kanan[19] stated that their experimental group of patients expected higher pain intensity than the control group of patients, and the comparison within the group indicated that the initially reported pain intensity was higher than the expected pain intensity.

For both groups of patients the pain intensity level was assessed after surgery using VAS at 5, 30, 60, 90, and 120 minutes after the foot massage. The mean pain intensity scores at 30, 60, 90, and 120 minutes in the experimental group were

Table 1. Descriptive Characteristics of Patients in the Experimental and Control Groups

	Groups							
	Experimental (n = 85)		Control (n = 82)		Total (167)			
Descriptive Characteristics	n	%	n	%	n	%	χ^2	*P* Value
Age								
≤ 30	10	11.8	8	9.8	18	10.8	1.394	.707
31-40	17	20.0	12	14.6	29	17.4		
41-50	20	23.5	24	29.3	44	26.3		
51 y and older	38	44.7	38	46.3	76	45.5		
Sex								
Female	61	71.8	56	68.3	117	70.1	0.240	.626
Male	24	28.2	26	31.7	50	29.9		
Education status								
Illiterate	4	4.7	11	13.4	15	9.0	7.638	.177
Literate	3	3.5	0	0	3	1.8		
Primary school	43	50.6	43	52.4	86	51.5		
Secondary school	9	10.6	7	8.5	16	9.6		
High school	17	20.0	16	19.5	33	19.8		
Higher education	9	10.6	5	6.1	14	8.4		
Marital status								
Married	80	94.1	76	92.7	156	93.4	0.140	.709
Single	5	5.9	6	7.3	11	6.6		
Place of residence								
Village	16	18.8	12	14.6	28	16.8	1.475	.688
Town	13	15.3	18	22.0	31	18.6		
City	56	65.9	52	63.4	108	64.7		
Profession								
Civil servant	7	8.2	11	13.4	18	10.8	3.316	.506
Worker	9	10.6	10	12.2	19	11.4		
Housewife	43	50.6	45	54.9	88	52.7		
Retired	18	21.2	11	13.4	29	17.4		
Self-employed	8	9.4	5	6.1	13	7.8		
Smoking								
Yes	13	15.3	13	15.9	26	15.6	0.010	.921
No	72	84.7	69	84.1	141	84.4		
Prior surgery								
Yes	24	28.2	25	30.5	49	29.3	0.102	.749
No	61	71.8	57	69.5	118	70.7		

significantly lower than in the control group. The comparison within the groups indicated that there was a reduction in the mean pain intensity scores of the patients in the experimental and control groups at 30, 60, 90, and 120 minutes. However, the differences between the mean pain intensity

Table 2. Visual Analog Scale Mean Scores Within and Between the Groups

	Groups			
	Experimental	Control		
Visual Analog Scale Scores	$\overline{X}$ ± SD	$\overline{X}$ ± SD	*t*	*P* Value
Expected score for the postoperative period	5.66 ± 1.18	5.37 ± 1.05	1.693	.092
Initially reported score in the postoperative period	6.18 ± 1.23	6.28 ± 1.36	0.519	.605
Test	$t = -3.133$; $P = .000$	$t = -3.865$; $P = .000$		

Table 3. Visual Analog Scale Mean Pain Assessment Scores Within and Between the Groups After Foot Massage

	Groups			
	Experimental (85)	Control (82)		
Pain Assessment times* (min)	$\overline{X}$ ± SD	$\overline{X}$ ± SD	*t*	*P* Value
5	6.18 ± 1.23	6.28 ± 1.36	0.519	.605
30	5.28 ± 1.32	5.96 ± 1.53	3.092	.002
60	4.12 ± 1.36	5.12 ± 1.29	4.897	.000
90	2.91 ± 1.30	4.46 ± 1.43	7.415	.000
120	1.26 ± 1.15	3.60 ± 1.41	11.767	.000
Test	$F = 11.756$; $P = .000$	$F = 8.365$; $P = .074$		

F, Variance analysis in repeated measures, Pillai's trace test.

*The 5, 30, 60, 90, and 120 minutes indicate the observations done for both groups of patients after the massage applied to the patients in the experimental group.

scores of patients in the experimental and control groups over time were higher and statistically significant in patients in the experimental group. Abbaspoor et al[26] determined the pain intensity immediately and 90 minutes after foot and hand massage. The pain intensity was reduced after intervention compared with before the intervention. Similarly, in our study, the pain intensity was significantly reduced after the intervention. Youssef and Hassan[4] found that hand and foot massage was significantly associated with the reduction in pain and anxiety of patients who had abdominal surgery (36.7% had cholecystectomy).

A significant difference was found in the analgesic administration rates in the patients of experimental and control groups in the postoperative period. The analgesic needs of the patients who received postoperative foot massage were significantly lower than the analgesic needs of the control group. Analgesics were provided to almost all patients in the control group (91.5%), but were provided at very low rates (28.2%) to patients in the experimental group. Similarly, Abbaspoor et al[26] also found that foot and hand massage can be considered a complementary method to effectively reduce the pain from cesarean section and to decrease analgesic consumption.

The preoperative anxiety mean score of patients in the experimental group was significantly higher than the mean score of patients in the control group. This may be based on individual differences.[23]

The postoperative state anxiety mean score for patients in the experimental group was significantly lower than for the patients in the control group. Thus, foot massage decreased the postoperative anxiety level.[4,23,29] Comparing the state anxiety scores within the groups, the postoperative mean score of the experimental group was lower than their preoperative mean score. In the control group, the postoperative

Table 4. Application of Analgesics Between the Groups as a Necessity to Relieve Pain After Surgery

	Groups							
	Experimental (85)		Control (82)		Total (167)			
Analgesic After Surgery	n	%	n	%	n	%	χ^2	*P* Value
Applied	24	28.2	75	91.5	99	59.3	69.123	.000
Not applied	61	71.8	7	8.5	68	40.7		

Table 5. Preoperative and Postoperative State and Continuous Anxiety Inventory Scores of the Groups

State and Continuous Anxiety Scores	Groups			
	Experimental (85)	Control (82)		
	$\overline{X}$ ± SD	$\overline{X}$ ± SD	*t*	*P* Value
Preoperative state anxiety	49.74 ± 13.54	43.67 ± 8.11	3.499	.001
Postoperative* state anxiety	28.67 ± 9.12	51.84 ± 6.61	18.737	.000
Test	$t = 14.569$; $P = .000$	$t = 10.154$; $P = .000$		
Preoperative continuous anxiety	41.51 ± 9.17	42.54 ± 6.77	−0.824	.411
Postoperative* continuous anxiety	40.61 ± 8.12	41.15 ± 6.15	−0.744	.384
Test	$t = 0.724$; $P = .671$	$t = 0.605$; $P = .556$		

*In the experimental group, the last observation was 120 minutes after the massage applied to the patients. In the control group, the last observation was at 120 minutes after the massage applied to the experimental group.

mean score was higher than their preoperative mean score. Therefore, foot massage reduced the pain intensity, which also reduced the state anxiety levels. Bagheri-Nesami et al[30] assessed the effects of foot reflexology massage on patients' anxiety after surgery and found that foot massage does reduce patients' anxiety levels. Moyer et al[31] conducted a meta-analysis of 37 randomized controlled studies and found that postoperative massage effectively reduces anxiety and pain levels. Youssef and Hassan[4] also found that foot and hand massage is associated with a reduction in anxiety levels for patients who had abdominal surgery.

In this study, no statistically significant difference was determined in the mean trait anxiety scores among and within the groups. It is considered that continuous anxiety is based on an individual's tendency to experience anxiety and appears with higher and persistent states of anxiety.[17,23]

The mean state anxiety score of patients in the experimental group was lower than the mean score of patients in the control group. In addition, statistically positive relationships were determined between the VAS and state anxiety levels of the patients in the experimental and control groups in the postoperative period. Therefore, a decline in pain intensity after foot massage is also associated with a decline in the state anxiety level. Thus, foot massage is effective for pain management and successful pain management is associated with lower anxiety levels in the patients. Supporting these findings, Sidar et al[12] stated that there was a positive significant relationship between the pain intensity and state anxiety and pain distress levels. Previous studies support an association with decreased anxiety levels and the reduction in postoperative pain intensity.[12,22-24]

Conclusions

Foot massage is effective to reduce postoperative pain and anxiety levels for patients undergoing laparoscopic cholecystectomy surgery. Postoperative pain and anxiety levels decreased at 5, 30, 60, 90, and 120 minutes after

Table 6. Relationship Between Preoperative and Postoperative Pain Intensity Measurements and State Anxiety Levels of the Groups

Pain Intensity Measurements		Preoperative State Anxiety	Postoperative State Anxiety
Postoperative*	*r*	−0.122	0.579
Experimental group (n = 85)	*P*	.118	.000
Postoperative*	*r*	0.120	0.381
Control group (n = 82)	*P*	.124	.000

*In the experimental group, the last observation was at 120 minutes after the massage applied to the patients. In the control group, the last observation was at 120 minutes after the massage applied to the experimental group.

foot massage. A direct relationship was determined between postoperative pain and state anxiety levels.

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