THE ACCUMULATING EFFECT OF FOOT MASSAGE IN RELIEVING ACUTE POSTOPERATIVE PAIN IN INDONESIAN PATIENTS AFTER ABDOMINAL SURGERY

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ABSTRACT

Foot massage is a non-pharmacological nursing intervention that can be used as a complementary therapy in relieving acute postoperative pain in patients after abdominal surgery. This study aimed to examine the accumulating effects of foot massage in relieving acute postoperative pain.

Twenty patients after abdominal surgery were selected as subjects. Five hours and seven hours after patients had received Ketorolac 30 mg injection IV, the 30-minute foot massage was applied to the experimental group for two sessions on the first day (24-48 hours) after abdominal surgery. A Visual Numeric Rating Scale (VNRS) was used to measure the pain score.

Pain intensity and pain distress were measured across four time measures: at T1 (before giving the first session of foot massage), T2 (30 minutes after T1), T3 (120 minutes after T1 or before giving the second session of foot massage), and T4 (150 minutes after T1 or 30 minutes after T2). Data were analyzed using non parametric tests including the Wilcoxon match paired rank test and Friedman's test.

The findings revealed that both the pain intensity scores and the pain distress scores in after receiving foot massage (T2 and T4) were lower than those of before receiving the foot massage (T1 and T3) (p<.001). The scores stepped down and the lowest scores were at T4. These findings confirm that foot massage did work in reducing pain intensity and pain distress across times.

Keywords: foot massage, pain intensity, pain distress, abdominal surgery.

Introduction

Pain is a common symptom and the main reason encountered by hospitalized patients in general and surgical settings in particular that causes personal hardship. Tranmer et al. (2003) reported that 74 % of 69 patients including postoperative patients experienced pain. Postoperative pain is caused by tissue damage as a consequence of the surgical procedure. Postoperative pain is very common and develops naturally as a warning symptom (Apfelbaum, Chen, & Mehta, 2003). After surgery, its development can be predicted and should be prevented and treated (Power, 2005). Despite the pain medications and anesthetic techniques available, the prevalence of postoperative pain is still high. The prevalence of postoperative pain is approximately 80%. Among them 86% expressed moderate, severe, or extreme pain (Apfelbaum et al., 2003). Laporte (1999) reported that the percentage of postoperative pain experienced by patients after abdominal surgery varied from 22% to 67% was severe to unbearable pain.

Pain after abdominal surgery has a significant effect on physiological, psychological, and socio-economical aspects of patients. These effects are challenges for health professionals in relieving acute postoperative pain. The nurse is one of the health professionals who has a role to control and relieve acute postoperative pain by administering pain-relieving interventions including both pharmacologic and nonpharmacologic interventions.

Complementary therapy as an adjuvant therapy may have the potential to improve pain management and palliate acute postoperative pain (Piotrowski et al., 2003). Several complementary therapies can increase the effectiveness of medical treatment and enhance the patient's comfort for example massage (Smith, Collins, Cyna, & Crowther, 2003). Massage was chosen as an alternative nursing intervention in relieving acute postoperative pain in this present study.

The foot massage is an appropriate nonpharmacological intervention in relieving acute postoperative pain in patient after abdominal surgery. The feet are easily accessible and can be massaged without disturbing the patient's privacy. To determine the area of massage and additional reflex points, the feet are massaged for two sessions for 30 minutes each session. The researcher had expected the pain score of the patients receiving the foot massage would be stable or decrease until receiving the next pain medication administration. The nurses can complementarily apply the foot massage in managing pain. As a result, it can enhance the body to recover, shorten a hospital stay, and reduce health care costs.

Objectives

The objective of this study was to compare pain intensity and pain distress before and after receiving a foot massage intervention.

Methods

Research design

The study is a pre-post test research design, using repeated measures. The study was conducted at the male surgical ward, Doctor Kariadi Hospital Semarang, Central Java Province, Indonesia.

Subjects

Twenty male patients after abdominal surgery under general anesthesia who are hospitalized at research setting and met the inclusion criteria selected as subjects. The criteria for inclusion are as follows: Age between 18 - 60 years old, major abdominal surgery, including exploratory-laparatomy, colectomy, gastrectomy, choledecoduodenostomy and jejunostomy, midline incision, no history of previous surgery, being Javanese, pain intensity and pain distress score is greater than 3, no allergy to oil massage, received Ketorolac injection intravenous for pain relief, did not have foot ulcer and did not have intellectual or cognitive impairment and communication problems including dyslexia, blindness, or deafness.

The subjects with the following characteristics were excluded from the study is developing postoperative complications including decreased level of consciousness, or drowsiness, confusion, and severe vomiting and deep vein thrombosis (DVT). In the actual study, there is no subject excluded from the study.

Instruments

Patient information record form

The record form is used for collecting the patient's personal information comprising age, marital status, religion, educational level, occupation, type of abdominal surgery and length of abdominal incision. These data are collected by researcher from the patients' medical records.

Measurement of pain

The pain intensity and pain distress are measured by using the Visual Numeric Pain Intensity Scale adopted from McCaffery & Beebe (1993) and Visual Numeric Pain Distress Scale adopted from Rockville (1992). Each patient is asked to mark on the number that best described how much pain intensity and pain distress he is experiencing at the 5th hour after they received 30 mg of Ketorolac injection intravenously the at the first 24 hours after abdominal surgery and then the number is recorded.

Foot massage guideline

The guideline of the foot massage for postoperative patients in this present study is developed from the massage principle that had been conducted by several researchers (Brewer, 2001; Puthusseril, 2006; Wang & Keck, 2004) and in consultation with three experts in foot massage.

Study procedures

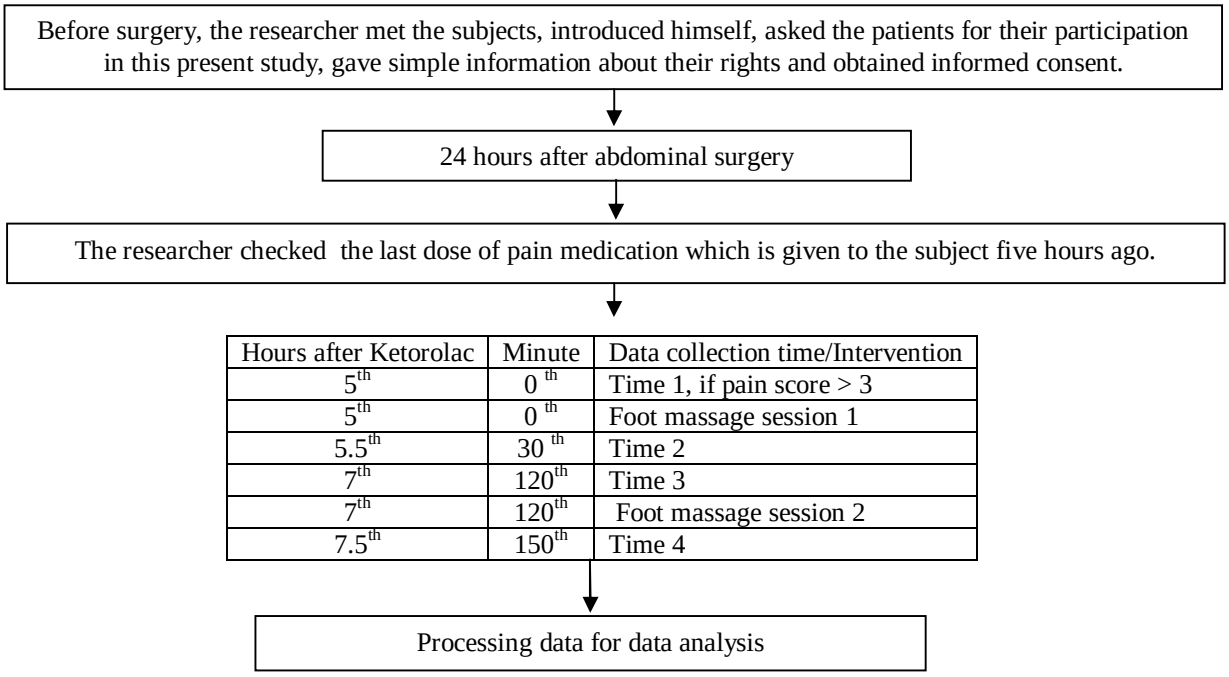

Figure 1
Study Procedures

Data analysis

General information data were analyzed by using frequency, percentage, and mean. The mean and standard deviation were used to analyze the mean scores of the pain intensity and pain distress at each time points. Data were computed using descriptive statistics, including age, gender, marital status, religion, level of education, occupation, types of abdominal surgery and the length of the incision.

Comparisons of pain intensity and pain distress before and after receiving the foot massage were conducted using the Wilcoxon match paired signed rank test. Comparisons of pain intensity and pain distress across four-time measures used the Friedman's test. The hypothesis testing is set at a significant α value of .05.

Results

Part I: Demographic characteristics and surgical-related data

Table 1. Frequency, Percentage, Mean and Standard Deviation of Demographic Characteristics and Surgical-Related Data

Characteristics	n	%
Age (years)	M=43.8, SD=13.12 Min-Max= 22 – 59	
Marital status		
Single	5	25
Married	15	75
Religion		
Muslim	20	100
Christian/Catholic	0	0
Level of education		
Junior high	7	35
Senior high	5	25
Diploma	2	10
Bachelor	0	0
Occupation		
Government employee	0	0
Farmer/Gardener	4	20
Private employee	16	80
Retired	0	0
Type of abdominal surgery		
Laparotomy	9	45
Cholecystectomy	3	15
Colectomy	4	20
Gastrectomy	2	10
Jejunostomy	1	5
Choledecoduodenostomy	1	5
Length of incision (cm)	M=16.9, SD=4.67 Min-Max= 7 – 20	

Part II: Effects of foot massage on pain intensity and pain distress

Hypothesis 1: The pain intensity scores and the pain distress scores of the experimental group immediately after receiving a foot massage are lower than those of before receiving a foot massage. This hypothesis was completely supported. For pain intensity (Table 2), at the first massage session, after the massage the pain intensity score (*Mdn* = 3.0) was lower than before the massage (*Mdn* = 5.5), $Z = 3.99$, $p < .001$). Similarly, at the second massage, the pain intensity score (*Mdn* = 1.0) was lower than before the massage (*Mdn* = 1.0), $Z = 3.36$, $p < .001$. For pain distress, the findings were similar to pain intensity (Table 4). At the first massage session, after massage the pain distress score (*Mdn* = 3.0) was lower than before massage (*Mdn* = 6.0), $Z = 3.97$, $p < .001$. Indeed, at the second massage, the pain distress score (*Mdn* = 1.0) was also lower than before the massage (*Mdn* = 1.0), $Z = 3.02$, $p < .001$. Not surprisingly, these differences were not found in the control group for both pain intensity and pain distress ($p < .05$).

Hypotheses 2: There are differences of pain intensity and pain distress across the four-time measures. This hypothesis also was supported. Table 4 shows that both the pain intensity scores and pain distress scores at T2, T3, and T4 were significantly lower than those of T1, $\chi^2 = 55.16$, $p < .001$ and $\chi^2 = 55.43$, $p < .001$, respectively. The scores stepped down and the lowest scores were at T4 in both pain intensity and pain distress.

Table 2. Comparison of Pain Intensity Before and After Receiving Foot Massage at the First Session (T1-T2) and the Second Session (T3-T4) Using Wilcoxon Matched-Pair Signed Rank Test

Different Pain Intensity Scores	*n*	*Mdn (IQR)*		Mean Rank	Sum Rank	*Z*	*p*
T2-T1 (After-Before the First Massage Session)		T1	T2				
	20	5.5 (3)	3.0 (2)	-	-	3.99	.000
After < Before	20	-	-	10.5	210.0		
After > Before	0	-	-	0.0	0.0		
After = Before	0	-	-	-	-		
T4-T3 (After-Before the Second Massage Session)		T3	T4				
	20	2.0 (2)	1.0 (1)	-	-	3.56	.000
After < Before	14	-	-	7.50	105.0		
After > Before	0	-	-	0.0	0.0		
After = Before	6	-	-	-	-		

Table 3. Comparison of Pain Distress Before and After Receiving Foot Massage at the First Session (T1-T2) and the Second Session (T3-T4) Using Wilcoxon Matched-Pair Signed Rank Test

Different Pain Distress Scores	*n*	*Mdn (IQR)*		Mean Rank	Sum Rank	*Z*	*p*
T2-T1 (After-Before the First Massage Session)		T1	T2				
	20	6.0 (3)	3.0 (2)	-	-	3.97	.000
After < Before	20	-	-	10.5	210.0		
After > Before	0	-	-	0.0	0.0		
After = Before	0	-	-	-	-		
T4-T3 (After-Before the Second Massage Session)		T3	T4				
	20	2.0 (1)	1.0 (1)	-	-	3.02	.003
After < Before	16	-	-	8.5	136.0		
After > Before	1	-	-	17.0	17.0		
After = Before	3	-	-				

Table 4. Comparison of Pain Intensity and Pain Distress Across Four-Time Measures of the Experimental Group Using Friedman's Test

Time	Pain Intensity					Pain Distress				
	Mdn	*IQR*	Mean Rank	χ^2	*p*	*Mdn*	*IQR*	Mean Rank	χ^2	*p*
T1	5.3	3	4.00	55.16	.000	6.0	3	4.00	55.43	.000
T2	3.0	2	2.82			3.0	2	2.80		
T3	2.0	2	1.98			2.0	1	2.05		
T4	1.0	1	1.20			1.0	1	1.15		

Discussion

The findings revealed that both the pain intensity scores and the pain distress scores after receiving a foot massage were lower than those of before receiving a foot massage. The scores stepped down and the lowest scores were at T4. These findings confirm that a foot massage did work in reducing pain intensity and pain distress across times.

Test of hypothesis 1. This hypothesis was accepted. The pain intensity scores and the pain distress scores of the experimental group immediately after receiving a foot massage were lower than those of before receiving a foot massage. It indicated that foot massage was good technique in relieving acute postoperative pain in patients after abdominal surgery. This technique was appropriate to apply to the patients. This technique has a relaxation effect. According to the researcher's observation, most patients fell asleep while receiving the foot massage intervention. According to the gate control theory of pain and biochemical theory of pain, the effect of foot massage has a mechanism in relieving acute postoperative pain.

Patients after abdominal surgery have tissue damage that leads to the inflammation response. The chemical mediators released during the inflammatory response give rise to the typical findings associated with inflammation. The chemical mediators actively sensitize the nociceptor to noxious stimuli. Furthermore, generating pain impulses from pain local sensation. The local pain sensation has systemic effects on pain receptors and nerve impulses that are transmitted via nerve fibers A-Delta and C to the central nervous system which has the gate control system. Subsequently activating the T-cells, as a result the gate is open. Therefore, the pain message reaches the brain. Patients after abdominal surgery experience acute postoperative pain. When postoperative pain occurs, the human body has simultaneous systemic to control pain. Pain can be inhibited through pain modulation. Through the pain modulation mechanisms, the foot massage was applied to inhibit pain to block the transmission of pain impulses, and therefore produce analgesia. Therefore, the pain level after receiving the foot massage intervention decreased.

Testing hypotheses 2: This hypothesis was accepted as well. There were differences of pain intensity and pain distress across the four-time measures (T1, T2, T3 and T4). The pain scores at T4-T3 (after-before the second massage) were lower than at T2-T1 (after-before the first massage session). It demonstrated that the administration of foot massage for two sessions had a stronger effect than one session.

The administration of foot massage for two sessions may provide an additive effect or accumulating effect of foot massage in relieving pain intensity and pain distress. The additive effect is the term used when two or more drugs are taken at the same time and the action of one plus the action of the other results in an action as if just one drug had been given (Ruth, 2008). Similar to foot massage as a complementary therapy in relieving pain intensity and pain distress, the additive effect of foot massage refers to the combined effect produced by the action of two sessions of foot massage, being equal to the sum of their separate effects.

In addition, a foot massage as a nonpharmacological intervention in pain management needs time to reach the maximum effect dose in relieving both pain intensity and pain distress. The result showed that the efficacy of a foot massage at 90 minutes after foot massage session 1 (T4) was stronger than at 30 minutes after foot massage session 1. It indicated that the administration of a foot massage for two sessions was better than one session. There are several reasons underpinning the positive outcomes of this present study.

When the foot massage was applied at the second session, the mechanism was similar to the first session. Foot massage techniques activate inhibitory interneurons and also inhibit excitatory interneurons. Foot massage generates stimuli on tactile and pressure receptors. When these receptors were stimulated by touch and pressure, the nerves impulses were transmitted to the gate stronger than the first session. As a result, the gate control of pain was closed and the pain score was lower than before.

All of the subjects in this present study underwent a midline incision. Burger, Riet and Jeekel (2002) stated that the midline incision is associated with increasing postoperative pain compared to other incisions. The result of this present study showed that the level of pain was moderate to severe pain. On the other hand, during the intervention no subjects dropped out from the study. The pain score after receiving the foot massage for two sessions was lower than

the first session. It supports the effectiveness of a foot massage in relieving acute postoperative pain.

The finding was supported by Wongsdara, (2004). The researcher used local back massage in relieving the pain intensity of patients after abdominal surgery for two sessions. The pain intensity was significantly different at T2 and T4. The mean of pain intensity in the experimental group after receiving a local back massage for two sessions (T4) was lower than after receiving a local back massage for one session only (T2). Another study by Hulme (1999) found that there was a significant difference within the group when the mean pain scores were analyzed overtime. Similarly two studies were conducted by Han et al. (2005) and Kim et al. (2002). Han et al. (2005) stated that the experimental group after receiving a foot reflexology massage at the 12 hours had lower pain scores than 6 hours after gastrectomy. Kim et al. (2002) stated that the severity of pain scores in patients after abdominal surgery was decreased following a foot massage for two sessions.

This indicated that foot massage worked in relieving postoperative pain. The researcher had expected foot massage could reduce acute postoperative pain intensity and pain distress in patients after abdominal surgery in managing pain, therefore, the patients will be free from postoperative pain until they receive their next pain medication. The foot massage is effective, low risk or safe for patients with no need of additional equipment. As a result, it can enhance the body to recover; shorten a hospital stay, and reduce health care costs.

In conclusion, the pain scores at T4-T3 (after-before the second massage) were lower than at T2-T1 (after-before the first massage session) and are related to the additive effect of foot massage. The administration of a foot massage for two sessions had a stronger effect than one session which supports the effectiveness of foot massage.

Conclusion

The findings of this present study are summarized as follows:

Demographic characteristics and surgical-related data of the sample of the 20 subjects are shown in Table 1. The mean age of the subjects was 43.8 years (SD=13.12). The majority of the subjects were married (75%). All of the subjects were Muslim. Only 10% of subjects had an education level higher than high school. There were subjects (80%) worked as a private employee.

For the surgical-related data, nearly half of the subjects were undergoing a laparotomy (45%). The mean length of the abdominal incision was 16.90. The effects of a foot massage on pain intensity and pain distress, after receiving a foot massage in both sessions (5 hours and 7 hours after Ketorolac injection or T2 and T4), the pain intensity scores and the pain distress scores were significantly lower than those of before receiving a foot massage (T1 and T3) ($p < .001$). Similarly at across four-time measures both the pain intensity scores and pain distress scores at T2, T3, and T4 were significantly lower than those of T1 ($p < .001$).

Implications and Recommendations

The findings of this study have important implications for the nursing profession and health care professionals. Nurses should apply foot massage as a nursing activity to reduce pain intensity and pain distress and to complement other medical treatment. In addition, the foot massage intervention can be used as a guideline in relieving pain intensity and pain distress; nurses also can teach the patient's family to apply the foot massage as a complementary therapy in relieving pain intensity and pain distress.

Foot massage should be included in to the nursing curriculum in order to teach nursing students, how to use it to reduce pain after abdominal surgery. Thus, it can be one of the nonpharmacological strategies and can be combined with pharmacological strategies to have a more positive effect on postoperative pain in patients after abdominal surgery and also this therapy does not have any side effects or harm to patients during the intervention.

This study provides some evidence of the effect of foot massage in relieving pain intensity and pain distress in patients after abdominal surgery. However, the results of this study cannot be generalized to all patients because of the limitation in the number of subjects. For a future study on the effect of foot massage on acute postoperative pain in patients after abdominal surgery it should be conducted with a higher number of subjects and higher homogenous criteria of the subjects. In addition, a future study should be conducted to

investigate the effect of foot massage with other groups of patients. For example, a comparative study on the effect of foot massage in postoperative pain patients with a midline incision (vertical) and in those with oblique and transverse line incisions (horizontal). Or the effect of foot massages in postoperative pain patients after chest surgery. And also it may be able to be applied to investigate the effect of foot massage on power extremity in stroke patient.

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