Research Article

The effects of foot reflexology upon pain, anxiety, and patient satisfaction among patients having undergone open-heart surgery

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Abstract

This interventional study was conducted to analyze the effects of foot reflexology intervention upon patients having undergone an open-heart surgery on their pain, anxiety, and satisfaction level. This research was conducted with 70 patients having undergone open-heart surgery in the cardiovascular surgery clinic of a Turkish hospital. Thirty-five patients were assigned to a test group, and 35 patients were assigned to a control group. In this research, patients in the test group were reported to have a statistically significant decrease in the mean scores of the visual analog scale when compared with the scores of patients in the control group (p<0.05). Although no statistically significant difference (p>0.05) was measured between the mean scores of the state-trait anxiety inventory and the visual analog scale of patient satisfaction completed by patients in the test and control groups, it was also noted that both groups were exceptionally satisfied. The findings of this research can be utilized to alleviate pain, lessen patients' anxiety levels during the post-operation phase, and elevate patient satisfaction levels.

Keywords: anxiety, cardiac surgery procedure, pain, patient satisfaction reflexology, pre-operative nursing

1. Introduction

By the year 2030, the United Nations Sustainable Development Goals aim to reduce premature mortality from non-communicable diseases by a third (1). Cardiovascular diseases are the most common diseases globally (2). Medical and surgical procedures are employed in the treatment of cardiac diseases. Open-heart surgery, as a popular method in the surgical treatment of cardiac disease, has been the fundamental treatment implemented in the case of coronary artery disease, cardiac valve disease, treatment of congenital lesions, and heart transplants (2, 3).

The operation (surgery) process induces an extreme level of anxiety in many patients. In the literature, it has been posited that, among adult patients, the incidence of pre-operative anxiety ranges between 11%-80% and that any increase in pre-operative anxiety level would cause delayed recovery from post-operation scars, extended hospitalization length, a need for anesthesia and post-operation analgesic, and elevated rates of morbidity and mortality (3,4). It has been acknowledged that, in modern health care, there has been increased intervention with complementary therapy methods in coordination with conventional methods to ensure physical and emotional healing as well as relaxation. Non-pharmacological complementary therapy methods have been harnessed to magnify the effects of pharmacological methods, primarily on pain and anxiety. An increasing number of studies indicate that one of these methods, reflexology, has

proven to be effective, and its clinical intervention has been highly recommended (4, 5).

In the reflexology method, pressure is applied on reflex points via specific hand and finger techniques to release blocked energy in certain parts of the body, thereby stimulating the self-healing power of the body and leading to physical transformation by alleviating stress (2). Reflexology is a non-pharmacological, non-surgical, and cost-effective method that nurses can safely implement for the management of pain and anxiety after open-heart surgery. A number of studies concluded that, among a variety of patient groups, reflexology proved to be an effective and complementary non-pharmacological method for pain management (5). Hence, it is proposed that reflexology, which is a complementary therapy method that any nurse can apply individually, would contribute to alleviating post-operation pain and lead to a decreased level of anxiety and an increased level of satisfaction among patients who have undergone open-heart surgery (6).

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Despite the existence of several relevant studies in the literature, there is a deficit of research on this subject in Turkey, and there has yet been no study that specifically investigated the effect of reflexology on patients having undergone open heart surgery. It is thus concluded that this study could act as a torchbearer for the future in this field of study.

Based on these data, this research was conducted to analyze the effect of foot reflexology on the pain, anxiety, and satisfaction levels of patients with an open-heart surgery history.

2. Materials and Methods
2.1. Study design
This is an interventional study conducted to analyze the effects of foot reflexology upon the pain, anxiety, and satisfaction levels of patients having undergone open-heart surgery.

2.2. Sample and setting
The research was conducted between the dates of March 1, 2016 and August 31, 2016 in the cardiovascular surgery clinic of a university hospital in Turkey. Seventy patients were detected to be included in the study based on reference studies and by using Open-Epi program in 95% confidence interval and 90% power. Random samples method was used in the study and the study was completed with 70 patients (35 in test group and 35 in control group) who agreed for participation and who met inclusion criteria (7). In order to avoid from the patients' affecting each other, the study was started with control group and continued with the test group). 73 patients in total were approached, but three patients were excluded from the research since one patient was transferred for a second operation and two patients had diabetes.

The inclusion criteria for the research were being age 18 and older; the ability to conduct verbal communication; the capability of recognizing people, place and time; and the willingness to be included in the research. Exclusion criteria for the research were having a previous history of open-heart surgery, having an open foot wound, being suspected of having a fracture or burn, having a pace maker, being visually impaired, being afflicted with a malignity, having a psychiatric-disorder or using a psychiatric drug, having a history of epilepsy, being afflicted with deep vein thrombosis, having insulin-dependent diabetes, having neuropathy, or having used a narcotic drug within four hours of the intervention.

2.3. Data collection method and instruments
In this research, data were collected using a questionnaire form developed by the researchers using the relevant literature, a State-Trait Anxiety Inventory (STAI), a Visual Analog Scale (VAS), and a Visual Analog Scale of Patient Satisfaction (VASPS).

2.4. State-Trait anxiety inventory (STAI)
The State-Trait Anxiety Inventory (STAI) is a self-assessment survey formed by short statements in order to identify state and trait anxiety levels individually. The inventory that was implemented for this study was developed by Spielberger et al. (8) and adapted for Turkey by the validity and reliability analysis of Öner and Le Compte (9). The STAI measures the anxiety level of teenagers over age 14 and adults. As a type of self-assessment, this inventory includes 40 items with short statements. The 20-item State Anxiety Inventory and the 20-item Trait Anxiety Inventory are independent of each other. In the State Anxiety Inventory, each item is scored in four Likert type responses as follows: none: 1, a little: 2, a lot: 3, and completely: 4; in the Trait Anxiety Inventory, each item is scored in four Likert type responses: almost never: 1, sometimes: 2, most of the time: 3, and almost always: 4. Higher scores indicated a higher level of anxiety whereas low scores indicated that the anxiety level was low.

2.5. Visual analog scale (VAS)
This is a 10-cm scale with the response "no pain" at one end and the response "max. pain" at the other end. In this scale, individuals are asked to point at their experienced pain level on a 0 to 10 score line. It had been reported that for measuring pain severity VAS is more precise and reliable than other one-dimensional scales (10).

2.6. Visual analog scale patient satisfaction (VASPS)
Developed by Kılınçer and Zileli (11), VASPS is formed by combining the features of two frequently used and widely recognized scales. One of them is the Visual Analog Pain Scale (a sliding scale version of the Visual Analog Scale of Patient Satisfaction) located on a horizontal axis and formed by a 100-mm straight line with no partitions while the other one is the Wong-Baker Percentage Scale. In this scale there is a vertical straight line, and the patient puts a cross (X) on the point on the vertical line corresponding to the level of satisfaction with the provided medical care provided. On this scale, the score range varies from 1 to 10. Score 1 means "not satisfied at all" and score 10 indicates "extremely satisfied" (11).

2.7. Procedure
Prior to this study, the researcher received a qualification for foot reflexology therapy, the Certificate for Clinical Reflexology. Next, to avoid any interaction among patients, the control group was formed before the test group. To ensure that hemodynamic changes, pain levels, and vein narcotic analgesics would not interfere with the study results, the reflexology intervention was performed on the second post-operative day.

2.8. Control group

On the second day, post-operative patients in the control group were administered the patient information form, the STAI, the VAS, and the VASPS. Next, on the third post-operative day, the VAS was used to measure the level of pain experienced by the patients. On the fourth post-operative day, the STAI, the VAS, and the VASPS were used. Patients in the control group were not administered foot reflexology intervention. Instead, these patients received the standard/routine healthcare provided in the clinic.

2.9. Test group

On the second post-operative day, patients in the test group were administered the patient information form, the STAI, the VAS, and the VASPS. Afterwards, a 20-minute session of foot reflexology therapy was administered, 10 minutes for each patient's foot. At the end of the procedure, the VAS was applied again. On the third post-operative day, prior to the reflexology procedure, the VAS for foot reflexology was applied, and, next, the VAS was administered. On the fourth post-operative day, the VAS was administered before the foot reflexology intervention. At the end of the procedure, the VAS, the STAI, and the VASPS were applied.

2.10. Data analysis

Kolmogorov-Smirnov test was used for normality distribution besides descriptive statistical methods including percent, mean, standard deviation and median (25th -75th percentile). For comparison of non-normally distributed variables, Mann-Whitney U test, Kruskal Wallis variance analysis, Friedman test, Wilcoxon paired samples test and chi-square test were used. A p level of <0.05 was accepted as statistically significant.

2.11. Ethical considerations

Approval for the study was granted by the X University Faculty of Medicine Ethics Committee (date: February 2, 2016, decision no:171). The study was conducted in compliance with the ethical standards specified in the Helsinki Declaration.

3. Results

In this study, it was identified that 91.6% of patients in the test group were male, 40.0% of patients were between 59 to 70 years old, 91.6% of the patients were married, 91.4% of patients were elementary school graduates, 45.8% of patients lived in the city center, 60.0% of the patients were retired, and 88.6% of the patients had coronary artery disease. In the control group, 68.6% of patients were male, 42.8% of patients were between 59 to 70 years old, 100% of the patients were married, 91.4% of the patients were elementary school graduates, 54.4% of patients lived in the city center, 65.8% were retired, and 80.0% of patients had coronary artery disease. A statistically significant difference was not detected between test and control groups with regard to descriptive statistics (p>0.05). Test and control groups were similar (Table 1).

In patients of both the test group (before and after foot reflexology intervention) and the control group, it was observed that a statistically significant difference was measured in the VAS mean scores of the second, third, and fourth post-operative days (p<0.001). Also, in patients in both the test and control groups, a statistically significant difference was measured in the VAS mean scores of the second (p=0.002), the third (p=0.001), and the fourth days (p=0.001) post-operative (Table 2).

Table 1. Socio-demographic features of the patients in test and control groups

Soci-demographic features	Test Group n (35) %		Control Group n (35) %		P
Age Group					
27-58	9	25.6	11	31.4	
59-70	14	40	15	42.8	0.540*
71 and older	12	34.4	9	25.8	
Gender					
Female	3	8.4	11	31.4	0.536**
Male	32	91.6	24	68.6	
Marital status					
Married	32	91.6	35		0.309**
Single	3	3	0	100	
Education level					
Elementary school	32	91.4	32	91.4	
High school	2	5.8	2	5.8	0.337*
University	1	2.8	1	2.8	
Residency					
City	16	45.8	19	54.4	
Town	8	22.2	11	31.4	0.159*
Village	11	31.4	5	14.2	
Job					
Self-employed	3	8.6	3	8.4	
Retired	21	60	23	65.8	0.169*
Employed	7	20	9	25.8	
Unemployed	4	11.4			
Diagnosis					
CAD[a]	31	88.6	28	80	
MI[b]	1	2.8	5	14.2	0.271*
AD[c]	3	8.6	2	5.8	

[a]CAD: Coronary artery disease; [b]MY: Mitral Insufficiency; [c]AD: Aort Dissection; *Kruskal Wallis; **Mann-Whitney U test

Table 2. Second, third and fourth post-operative days for patients in the test and control groups comparison of daily mean scores of the visual analog scale (VAS) (n=70)

Groups	Days	VAS * Mean scores Median (min-max)	P
Test group	**2nd day**		
	Pre-intervention	8.0 (3-10)	p<0.001 **
	Post-intervention	5.0 (1-8)	
	3rd day		
	Pre-intervention	6.0 (2-8)	p<0.001 **
	Post-intervention	3.0 (1-6)	
	4th day		
	Pre-intervention	3.0 (1-8)	p<0.001 **
	Post-intervention	1.0 (0-6)	
Control group	2nd day	6.0 (0-10)	
	3rd day	5.0 (0-8)	p<0.001 **
	4th day	3.0 (0-7)	
Test and control groups	2nd day		p=0.002 **
	3rd day		p=0.001 **
	4th day		p=0.001 **

*VAS: Visual analog scale; **Mann-Whitney U test

A statistically significant difference was detected between test and control groups with regard to Trait Anxiety Mean Score (TAMS) (p=0.028) and State Anxiety Score Means (SAMS) (p=0.001) scores on post-operative day 2, the scores of test group were found to be lower. While a statistically significant difference was not detected between groups with regard to TAMS scores (p=0.630), a significant difference was found in SAMS scores, they were lower in test group (p=0.003). A statistically significant difference was found between TAMS scores on days 2 and 4 following foot reflexology in test group (p=0.000). In control group, there was not a statistically significant difference between TAMS scores on post-operative days 2 and 4 (p=0.084) (Table 3).

Table 3. Comparison of test and control groups patients' mean scores on the state/trait anxiety scale on the second- and fourth-days post-operative (n=70)

	2nd day post-operative		4th day post-operative	
	Test group	Control group	Test group	Control group
	Median (min-max)	Median (min-max)	Median (min-max)	Median (min-max)
SAMS*	38.0 (32-52)	41.0 (33-48)	42.0 (36-52)	42.0 (34-52)
P value	p=0.028 ***		p=0.630 ***	
TAMS**	43.0 (33-49)	47.0 (39-58)	44.0 (34-49)	47.0 (40-58)
P value	p=0.001 ***		p=0.003 ***	

*SAMS: State Anxiety Mean Score; **TAMS: Trait Anxiety Mean Score; ***Mann-Whitney U test

A statistically significant difference was found between VASPS scores before and after foot reflexology on days 2 and 4 in test group (p=0.004). In control group, there was not a statistically significant difference between VASPS scores on post-operative days 2 and 4 (p=0.163). A statistically significant difference was not found between VASPS scores on post-operative days 2 (p=0.214) and 4 (p=0.479) in test and control groups (p=0.214) (Table 4).

Table 4. Comparison of the mean scores of the visual analog scale of patient satisfaction (vasps) for patients in the test and control groups on the second and fourth post-operative days (n=70)

VASPS* mean scores			
Patient groups	Days	Median (min-max)	P
Test group (*n*=35)	2. day 4. day	9.0 (5-10) 9.1 (5-10)	**0.004****
Control group (*n*=35)	2. day 4. day	9.0 (5-10) 10.0 (6-10)	0.163**
Test and control groups (*n*=70)	2. day 4. day	*	0.214** 0.479*

*VASPS: Visual Analog Scale Patient Satisfaction; **Mann-Whitney U test

Although not included in the table, a statistically significant difference was not found between VAS scores on post-operative days 2 and 4 before and after foot reflexology with regard to age groups, gender and education level in test and control groups (p>0.05). In test group, on post-operative days 2 and 4, a statistically significant difference was found between VAS scores with regard to marital status, VAS scores were higher among the married (p<0.05).

In test and control groups, on days 2 and 4 post-operatively, a statistically significant difference was not detected between state-trait anxiety scores before and after foot reflexology with regard to age, gender and marital status (p>0.05). In test group, before foot reflexology application on post-operative days 2 and 4, a statistically significant difference was not found between state-trait anxiety scores with regard to education status (p>0.05). In control group, the difference in state-trait anxiety scores were found to be statistically significant with regard to education status on post-operative day 4, scores were higher in graduates of elementary school (p<0.05).

The difference between VASPS scores with regard to age, gender, marital status and education status was not statistically significant on days 2 and 4 post-operatively in test and control groups (p>0.05).

4. Discussion

Gender plays a critical role as one of the risk factors of coronary artery disease. It has been acknowledged, that compared to women of the same age, males aged forty and older are at greater risk of developing coronary artery disease. In our study, almost the entire list of patients was male. Echoing our findings, studies of patients with an open-heart surgery history conducted by Kadda et al. (12) (74.0%), Gligor et al. (13) (66.6%), Momeni et al. (14) (61.5%), and Hosseini et al. (6) (57.8%) indicated that the majority of patients were men. Hence, our study is in line with relevant literature.

Coronary artery disease is the most pervasive cardiovascular system disease. As humans live longer, pathologic changes in coronary arteries with the potential to develop coronary artery disease rise correspondingly (13). It was seen that nearly half of the patients in this study were aged from 59 to 70. In our research, the mean age was in line with other studies of patients who had undergone open-heart surgery, particularly those of Babajani et al., (15), Vardanjani et al., (16), Yüksel et al., (17) and Motomatsu et al. (18). In the literature, it has been reported that in males age 45 and above and females age 55 and above have increased risk factors for developing coronary artery disease. Our findings are also in line with these findings in the literature.

Almost all patients in our study were married. In line with our study, Vardanjani et al. (16) in their studies on patients who had undergone open-heart surgery indicated that nearly all of the patients were married. This finding leads to the assumption that since patients in our study were from a culture with a traditional family structure, the number of married patients was higher.

In this study, one fifth of all patients graduated only from elementary school. Unlike in our study, Vardanjani et al. (16), Babajani et al. (15) and Hosseni et al. (6) concluded that patients who had only graduated from elementary school were fewer in number. Since patients in our study were only

elementary school graduates, it is safe to assume that during school age, they lived in villages and had to work at rural chores.

In our study, it was posited that four in five of all participants had coronary artery disease. Findings in the literature echo our findings (4, 14). The literature review indicates that coronary artery disease is the most pervasive cardiovascular system disease. Our findings are in line with relevant literature. It was detected that four in five patients had undergone coronary artery bypass graft surgery within the scope of open-heart surgery. Similarly, in studies of patients who experienced open-heart surgery reported that more than half of all patients had undergone coronary artery bypass graft surgery (17, 18). Unlike our research, in a study among patients who had open-heart surgery, Kadda et al. (12) indicated that more than half of all patients had undergone cardiac valve surgery. These results show that in the surgical treatment of cardiac diseases, both methods are selected for different patient groups.

Another finding of this research was that patients of test group who were administered foot reflexology got lower VAS mean scores on the second, third, and fourth days, and there was a statistically significant difference in the VAS mean scores before and after the intervention. Likewise, it was seen that the difference in the VAS mean scores among control group patients was statistically significant on the second, third-, and fourth-days post-operative. On the other hand, it was found that the VAS mean scores of test group patients were lower than the scores of control group patients. This finding indicates that after foot reflexology intervention on the fourth day, the pain levels of the test group patients were lower than in patients in the control group. In line with this research, in studies conducted by Candy et al. (19), and Babajani et al. (15) on patients having undergone open-heart surgery concluded that reflexology intervention significantly lowered experienced pain levels. Similarly, in studies conducted among different patient groups, it was indicated that foot reflexology intervention substantially lowered pain level (19, 20).

The high risk of complication and a long recovery period are potential anxiety triggers for patients who have undergone open-heart surgery. In patients in both the test and control groups, there was a rise in both state anxiety mean scores and trait anxiety mean scores on the fourth day compared to the second day while it was observed that trait anxiety mean scores for the test group were below the scores of the control group. It was also observed that the state anxiety mean scores of both test and control group patients were identical. In their studies of patients having undergone open-heart surgery, Navaee et al. (4) and Ahmadi et al. (21), concluded that reflexology intervention lowered anxiety levels. In relation to this subject, identical findings were obtained in studies conducted among various groups (20, 22, 23).

The high anxiety levels of the patients in our study signaled that there was need for psychological assistance in tandem with provided medical care.

It was seen in our study that the VASPS mean scores for the test and control group patients were analogous, and their satisfaction levels were high. In parallel with our research, Brent et al. and Lesley et al. in their studies analyzing patients who had undergone open-heart surgery revealed that massage therapy elevated patient satisfaction (24, 25). In the literature, we have found no research on the connection between foot reflexology intervention and patient satisfaction. Thus, our study needs to be contrasted with the findings of studies investigating different types of massage.

Among the patients in the test group having received foot reflexology, it was reported that on the second, third, and fourth days the VAS mean scores lowered with respect to age, gender, marital status, and education level; and the difference between marital status and the VAS mean scores was statistically significant. However, it was also reported that the VAS mean scores of the test group was lower than the scores of the control group. Differing from our study, Özdemir et al. (26) indicated that female patients' pain levels were lower than those of male patients, and yet there was not any statistically significant difference between age groups and pain levels.

Prior to an operation, a patient's anxiety level can be affected by his/her personal traits, age, gender, education level, and the type of operation to be undergone. For the patients in our study, in both test and control groups, there was no statistically significant difference between the mean scores of state anxiety and trait anxiety on the second and fourth days with respect to gender and marital status while, in the patients in the control group, there was a statistically significant difference in the mean scores of trait anxiety. Among patients in the test and control groups, the mean scores of state anxiety increased on the second, third, and fourth days with respect to gender, marital status, and education level; but it was also observed that the mean scores of trait anxiety for patients in the test group were below the scores of the control group. Echoing our findings, Vardanjani's (16) study indicated that there was no statistically significant difference with respect to age, profession, education level, and degree of measured anxiety (16).

In their study investigating the connection between patients' age group and anxiety level, Fekrat et al. (27) observed that younger patients were even more anxious than older ones (27). In the literature, observed differences in mean scores between age groups and the mean scores for levels of anxiety can be attributed to the existence of family, friends, and other assistive people around the patients and the presence of post-operative complications.

In some studies, it was reported that an increase in education level would elevate the anxiety level while some studies showed that education level had no effect on anxiety level. As in our study, when the mean scores of state anxiety and trait anxiety were compared with respect to education level, it was revealed that, on the fourth post-operative day, the mean scores of trait anxiety for patients in the control group who had only graduated from elementary school were statistically higher than the mean scores of high school and higher educated patients. Kyohara et al. (28) indicated that patients' education level had no effect on their anxiety level. Particularly related to patients having undergone open-heart surgery, being in an older age group, having a deficit of information, not having access to information, having communication with the medical care team, and the presence of risk factors during surgery could be interconnected with the educational level. In light of these factors, it is suggested that previous studies manifested a variety of findings on this particular issue.

In our study, with respect to age, gender, and marital status, the VASPS mean scores of patients in both the test and control groups displayed no statistically significant difference on the second and fourth days. On the second and fourth days, the VASPS mean scores were analogous, and satisfaction levels were high with respect to gender, marital status, and education level. The findings in the literature indicate that an increase in age corresponds to elevated patient satisfaction. The finding of higher satisfaction levels among elderly patients could be attributed to the more tolerant and compassionate character of elderly individuals. Kyohara et al. (28) identified no statistically significant difference between the satisfaction levels of female and male patients. The findings of our study suggest that, irrespective of being in the control or the test group, any interaction between the healthcare team and patients for any reason could increase patient satisfaction level, and, in particular, the white coat of physicians could create a placebo effect in patients.

The findings of our research indicated that patients in the test group having received foot reflexology had, compared to the patients in the control group, had a lower level of experienced pain. Also, while anxiety levels increased in both groups, it was still lower in test group. As for satisfaction level, scores were identical and high in each group. Reflexology is one of the noninvasive and easily applicable complementary therapies in which nurses can become directly involved. Foot reflexology intervention particularly applied to patients who had undergone open-heart surgery would lower the experienced pain and anxiety of patients and speed their recovery process, thereby shortening the length of hospitalization. Taking into account the positive effects of reflexology intervention on patients, it is suggested that nurses be encouraged to perform this intervention on patients with a history of open-heart surgery during the post-operative period.

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