

Effects of Foot and Hand Massage on Pain of Open Heart Surgery Patients in Intensive Care Units

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□ ABSTRACT □

Recovery from cardiac surgery is associated with severe chest pain at the site of sternotomy and limb pain at the site of conduit harvesting. Patients routinely report mild to moderate pain even though they were administered sedative drugs. The integration of massage therapy into the team approach in patient care constitutes a move forward that recognizes pain as the fifth vital sign after pulse, blood pressure, temperature, and respiratory rate.

This study was performed on patients who had open heart surgery and had the inclusion criteria for entering the study in ICU in Bassel Center for disease and heart surgery in Lattakia. A sample of 30 male and female patients was randomly divided into two groups: control group, experimental massage group. The experimental group received hand and foot massage after surgery.

Our findings demonstrate that the mean score of pain severity in both groups was not significantly different at the beginning of the study. This means that pain severity was similar in both groups at the beginning of the study before applying any intervention. Results showed that there was a significant difference between the mean score of pain severity of the intervention group and the control group, after applying hand and foot massage together. The study concludes that foot and hand massage is one of the available interventions in complementary medicine and treatment which provides an opportunity for nurses to care for their patients.

Keywords: Foot massage, Hand massage, Open heart surgery, Pain.

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تأثير تدليك القدم واليد على الألم لدى مرضى جراحة القلب المفتوح في وحدات الرعاية المركزة

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□ ملخص □

يترافق التعافي من جراحة القلب مع ألم صدري شديد في موقع القص وألم الطرف في موقع الصافن، يسجل هؤلاء المرضى بشكل روتيني تدرجات خفيفة الى معتدلة من الألم على الرغم من إعطاء العقاقير المهدئة. يشكل دمج العلاج بالتدليك في نهج فريق رعاية المرضى خطوة إلى الأمام حددت الألم كعلامة حيوية خامسة بعد النبض، وضغط الدم، ودرجة الحرارة، ومعدل التنفس. وقد أجريت هذه الدراسة على عينة قوامها 30 مريضاً أجريت لهم جراحة القلب المفتوح في وحدة الرعاية المركزة في مركز الباسل لأمراض وجراحة القلب في اللاذقية. تم تقسيم العينة بشكل عشوائي إلى مجموعة ضابطة ومجموعة تجريبية. تلقت المجموعة التجريبية تدليك اليد والقدم بعد الجراحة بينما تركت المجموعة الضابطة لروتين المشفى. أظهرت نتائجنا أن متوسط درجة شدة الألم في كلا المجموعتين لم تختلف بشكل ملحوظ في بداية الدراسة. وهذا يعني أن شدة الألم كانت متماثلة في المجموعتين في بداية الدراسة قبل تطبيق أي تدخل. وأظهرت النتائج أن هناك فرق ذو دلالة إحصائية في متوسط درجة شدة الألم في مجموعة التدخل والسيطرة ، بعد تطبيق تدليك اليد والقدم معاً. تدليكالقدم واليد هي واحدة من التدخلات المتاحة في الطب التكميلي والعلاج الذي يقدم فرصة للمرضى لرعاية مرضاهم. العلاج بالتدليك هو نهج علاجي يدوي تستخدم لتسهيل الشفاء والصحة ويمكن استخدامها من قبل الممرضين في أي مكان تقريباً.

الكلمات المفتاحية: تدليك القدم، تدليك اليد، جراحة القلب المفتوح، الألم

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Introduction:

Pain has been pointed out as one of the primary sources of concern to ICU patients especially, cardiac surgery patients as well. ⁽¹⁾ Recovery from cardiac surgery is associated with severe chest pain at the site of sternotomy and limb pain at the site of conduit harvesting. ⁽²⁾ These patients routinely report mild to moderate pain even though they were administered sedative drugs. ^(1, 3) Pain may be caused by incisions, intra-operative tissue retraction and dissection, multiple intravascular cannulations, chest tubes insertion after surgery, and multiple invasive procedures that patients undergo as part of their therapeutic regimen. ⁽⁴⁾ On the other hand, Cardiac surgery patients often complain of back, shoulder, and neck pain from manipulation of the body during the surgical procedure and from physical manifestations of tension and stress. ⁽⁵⁾ Physiological response to pain may cause harmful effects that prolong the body's recovery after cardiac surgery. ⁽⁶⁾ Uncontrolled postoperative pain may lead to a variety of complications in cardiovascular, immunity, ⁽⁴⁾, respiratory, ⁽⁷⁾ metabolic, endocrine, ⁽³⁾ mentality systems ⁽⁸⁾ and also increase immobility, thrombosis, emboli, ⁽³⁾ lengthened hospitalization and increased costs. ⁽⁷⁾

Pain management within the acute care setting is a concern that is being carefully examined not only by individual hospitals, but also by accreditation organizations across the United States. ⁽⁹⁾ Therefore reducing patients' pain is one of the main medical goals which is often executed by giving them narcotic drugs. ⁽¹⁰⁾ When, with cardiac surgery patients, opioid medications are initially necessary, the continued use of large doses can delay the recovery process and lead to prolonged hospitalization. ⁽⁵⁾ Nurses' fear of patient's addiction to drugs and drug's side effects and also considering this surgery as a nonaggressive operation, leave patients with unhealed pain; and the only factor for releasing these patients from hospital is reduced pain severity. ⁽¹¹⁾ So these drugs must be used less or be replaced by other methods. ⁽¹⁰⁾ Today nursing is focusing on holistic health care and it is believed that complementary therapies are also a part of holistic nursing. in 10. Nurses have used complementary therapies for many years to reduce or alleviate pain. ^(1, 3)

The integration of massage therapy into the team approach in patient care constitutes a move forward that recognizes pain as the fifth vital sign after pulse, blood pressure, temperature, and respiratory rate. ⁽¹²⁾ Although each patient's healing process is unique. ⁽¹³⁾ Research has documented the use of massage therapy as an effective tool for pain management, with the added benefit of producing few adverse reactions. The gate-control theory of pain postulates that massage may be effective in "closing the gate"—that is, inhibiting the transmission of noxious stimuli by stimulating large nerve fibers that have been shown to alter pain perception. In addition, the relaxation response elicits physiological changes, including lower blood pressure and heart rate, decreased oxygen consumption and muscle tension, and lower levels of cortisol and noradrenaline. ⁽¹⁴⁾

A nurse researcher wrote that the foot massage is a way to enhance the nurse-patient interrelationship as a nurse can easily and practically use massage. It offers a strategy to fulfill the goals of human touch and holistic care. It can be performed at any location, is a non-invasive and does not interfere with patient's privacy. ⁶ hand and foot massage is based on the principle that the hands and feet are mirrors of the body and they have reflex points that correspond to each of the body's gland, structure and organs. It is believed that when a reflex area is massaged, it stimulates the corresponding organs in that zone. ⁽¹⁵⁾

Few studies of massage have focused on pain management. ^(16, 17, 18) Panyim and Pongpiyapiboon ^(19, 20) carried out two studies of foot massage on pain reduction in Thailand. Another study showed that the five minute foot massage had the potential effect

of increasing relaxation as there were physiological changes after the intervention of foot massage. ⁽²¹⁾ Won and colleagues found that there was significant difference in systolic blood pressure, diastolic blood pressure, pulse rate, general fatigue, and mood status after giving foot massage, ⁽²²⁾ implied that foot and hand massage might induce effective pain management after surgery. ⁽²³⁾

Overall, the results from these studies neither strongly support nor oppose the effect of foot or hand on pain reduction. In summary, most studies of the effect of foot massage on pain relief have been carried out with small sample sizes, limited justification for duration or type of intervention, very specific patient groups and/or untested outcome measures, lacked control groups or non-intervention groups for comparison. Therefore, there is still insufficient data to prove scientifically the effects of foot and hand massage on reducing pain after surgery.

Important and goals of research

To date, there is no strong scientific evidence to support the claim that foot and hand massage can reduce pain. Although a number of researchers have investigated the benefits of foot massage and hand massage on pain reduction, as identified above, none has rigorously examined the benefit of foot and hand massage together on pain reduction in Syria. Using the mixed methods, the present study was conducted to determine whether foot and hand massage could produce reductions in pain among postoperative cardiac surgery patients.

Material and methods

Setting

This study was performed on patients who had open heart surgery who had the inclusion criteria for entering the study in ICU in Bassel Center for disease and heart surgery in Lattakia in 2013 between 1 May, 2013, and 1 February, 2014.

Sample and sampling

A sample of 30 male and female patients that met the inclusion criteria were recruited in the study by convenient sampling technique. Inclusion criteria included postoperative patients who were 20 years of age or older; full consciousness; able to understand written and verbal instructions; and able to verbally or nonverbally report their pain intensity. Patients were excluded from this study if they had hands and feet amputation, diseases (arthritis), inflammation, phlebitis, or edema, burn wound, lesion or fractures in hands and feet; had any problem related to vessels and blood, diabetes, visual disorders, hearing disorders and also hypersensitivity to hand and foot massage. After receiving written consents from the patients, they were randomly allocated into two groups: control group (15 patients), experimental massage group (15 patients). The experimental group received hand and foot massage after surgery.

Material

Tool I: was prepared by reviewing the literature and with the help of guide. It has three parts as discussed below:

1. The first part included demographic data such as age, sex, marital status, occupation, patient's education, patient's medical diagnosis and history of hospitalization, and clinical data such as nutrition, surgery performed (type and date), level of

consciousness, history of analgesic use included medication name, its dosage, and the last time it was given.

2. The second part included observation checklist to record the physiological parameters.

3. The third part included Protocol for 'hand and foot massage' technique consisted of steps which were followed while applying the technique. The various steps followed were sweeping and rubbing, thumb walking, toe rotation, kneading and cupping.

Tool II: McGill visual pain scale was used for measurement of pain intensity. McGill visual pain scale is a horizontal ruler divided from 0 to 10 and measures pain intensity. In this ruler, 0 is painless and 10 shows very severe pain. ⁽²⁴⁾

Methods

The massage components included petrissage, friction, and kneading. Petrissage is the movement of the balls of the fingers and thumbs to apply direct pressure in a slow and rhythmic fashion to the soft tissue underlying the skin of the foot and hand. Friction is the movement of the knuckles in an up-and-down motion to stroke the sole. Kneading is the movement of the thumb and forefinger to knead the heel and ankle.

At first, hands and feet were massaged from the base of fingers to the wrist, using the thumb and other fingers of one of the researchers (thumb kneading and finger kneading). Then massage continued on the hand and foot with the thumb transversing than the length of the base of the fingers to the wrist for heart massage (thumb kneading).

At the next stage, fingers and toes were massaged, after which each finger between two fingertips was rotationally massaged in tension (finger kneading). Finally, the hands and feet, both ventral and dorsal, were massaged to the heart by palms (stroking).

Prior to the massage, the feet and hands were given a general visual inspection for swelling, color, ulcerations, wounds, areas indicating pressure, toe deformities, cleanliness, odor, and condition of the nails and skin. Each patient was helped to a comfortable and unconstrained position in the bed and was assisted to a lying or half-lying position. Patients were asked to refrain from conversation while the intervention was conducted. The intervention group received two sessions of a 20 min foot and hand massage, 5 min for each extremity at a time, 4 hours, and 7 hours after patients had received analgesics on the first day of surgery.

Control group received routine nursing care and rested in the bed for the same time (20 min) while researcher was beside them (for emotional consideration). Then, pain intensity measured by visual analogue scale (VAS) and other variables were measured by check list before and after each session of massage in two groups.

Results and discussion

Results

Table 1- Samples' demographic characteristics

| Demographic characteristic | Control (n=15) | Experimental (n=15) | P value |
|----------------------------|----------------|---------------------|---------|
| Male | (8) 50% | (8) 50% | 1.00 |
| Age (y) | 66.6 ±11.7 | 66.8 ± 11.3 | 0.93 |
| Married | (26) 89.7% | (29) 96.7% | 0.49 |
| Medical diagnosis | | | |
| Acute coronary syndrome | 10 (66,7) | 11(73,3) | 0.34 |

| | | | |
|-----------------------|-----------|-----------|------|
| Myocardial infarction | 5 (33,3) | 4 (26,7) | |
| Level of education | | | |
| Elementary | 11 (73,3) | 11 (73,3) | 1.00 |
| Secondary or higher | 4 (26,7) | 4 (26,7) | |

Table 1 shows that the two groups were compared. The age average and age standard deviation of the studied units in the 2 groups of test, control was 66.6 ± 11.7 and the experimental group was 66.8 ± 11.3 . The number of men and women were the same in the two groups (8) 50%. Most of participants were married and elementary, and they were undergoing open-heart surgery for Acute coronary syndrome in two groups. Results of t test showed that there was no significant difference between both groups, so they were similar in all variables.

Table 2:. Patient's physiologic parameter in Pre- vs. Post-massage

| Variables | | Experimental | Control | Statistic |
|--------------------------|---------------------------------|--------------------|--------------------|-----------|
| Pulse rate | Before the intervention | 78.33 ± 7.34 | 78.56 ± 7.35 | 0.079 |
| | After the intervention | 68.25 ± 8.56 | 77.76 ± 10.10 | 0.001 |
| | <i>P</i> (Paired <i>t</i> Test) | 0.001 | 0.124 | |
| Respiratory rate | Before the intervention | 22.99 ± 4.01 | 20.89 ± 3.95 | 0.248 |
| | After the intervention | 19.98 ± 4.12 | 20.90 ± 3.86 | 0.263 |
| | <i>P</i> (Paired <i>t</i> Test) | 0.001 | 0.129 | |
| Systolic blood pressure | Before the intervention | 124.97 ± 27.88 | 131.81 ± 18.68 | 0.478 |
| | After the intervention | 122.01 ± 12.91 | 125.06 ± 17.12 | 0.392 |
| | <i>P</i> (Paired <i>t</i> Test) | 0.022 | 0.149 | |
| Diastolic blood pressure | Before the intervention | 78.16 ± 8.98 | 77.11 ± 11.01 | 0.181 |
| | After the intervention | 77.01 ± 9.01 | 78.01 ± 11.64 | 0.601 |
| | <i>P</i> (Paired <i>t</i> Test) | 0.159 | 0.287 | |

The mean of pulse rate of the intervention group was 78.33 ± 7.34 before massaging and reached 68.25 ± 8.56 after the intervention ($P = 0.001$). The mean of the pulse rate of the control group at the beginning and the end of the study did not change significantly. An independent sample t-test was used, and a significant difference was observed between the pulse rates of both groups at the end of study. The respiration rate mean of the intervention group was 22.99 ± 4.01 before the intervention that reached 19.98 ± 4.12 after massage ($P = 0.001$). The respiration rate mean did not differ significantly in the control group at the end of the study. No significant difference was observed between the respiration rate mean in the two groups, both before and after the intervention. The pre intervention mean of

systolic and diastolic blood pressure of the intervention group were 124.97 ± 27.88 and 78.16 ± 8.98 respectively which changed to 122.01 ± 12.91 and 77.01 ± 9.01 respectively ,after the massage therapy session ($P = 0.022$ and $P = 0.159$ respectively). The mean of systolic and diastolic blood pressure of the control group did not change significantly at the end of the study

Table 3: Pain intensity average before and after intervention in each group

| | Experimental (n=15) | Control (n=15) | Statistics |
|---------------------|---------------------|----------------|------------|
| | Mean \pm SD | Mean \pm SD | |
| Before intervention | 5.4 ± 1.3 | 5.9 ± 1.4 | $p > 0.05$ |
| After intervention | 3.96 ± 1.6 | 5.7 ± 1.8 | $p < 0.05$ |
| Paired T-test | $p < 0.001$ | $p > 0.05$ | |

With regard to the research goals, the pain intensity average was 5.4 ± 1.3 in experimental group, 5.9 ± 1.4 in control group. Paired t-test showed no difference between 2 groups about the pain intensity before the intervention ($p > 0.05$). The pain intensity in the two groups were 3.96 ± 1.6 , 5.7 ± 1.8 respectively after intervention, respectively. Paired t-test showed significant statistical difference between the average scores in experimental group before and after the intervention; but there was no significant difference in control group.

Discussion

Since variables like age, marital status, educational status and employment might have effects on pain severity in patients, so both groups were evaluated to be similar regarding these variables. Results of statistical tests showed that there was no significant difference between both groups, and both groups were similar regarding these variables.

In terms of the sympathetic responses, the results of the present study showed that massage therapy decreases pulse rate. This finding is consistent with some of the previous studies. Lindgren *et al.* have examined the physiological responses of healthy people to massage. They reported that pulse rate significantly reduced at 5 minutes after massage and this reduction continued for one hour. ⁽²⁵⁾ Shaban *et al.* have also studied the effect of foot massage on vital signs of patients admitted in intensive care unit and reported that the mean of heart beats reduced after the intervention. ⁽²⁶⁾ Hajhosseini *et al.* ⁽²⁷⁾ and Degirmen *et al.* ⁽²⁸⁾ have also reported that massage can decrease the heart rate. However, Degirmen *et al.* have found that this effect is over after 90 minutes. The reduction of pulse rate after the massage may also be related to the anxiolytic and parasympatomimetic effects of massage therapy. ⁽²⁹⁾ The most studied samples even in control group felt security and comfort, in spite of receiving no intervention, which may be due to presence of caregivers at their bedside, consecutive evaluations and crating contact with them.

No significant difference was observed between the respiration rates in the two groups, both before and after the intervention. However, in the massage therapy group, the respiration rate significantly decreased after the intervention. Degirmen *et al.* have also reported that massage therapy in post caesarean women reduced the mean of respiration rate and this effect has lasted for 90 minutes. ⁽²⁸⁾ Such an effect has lasted for one day in the study by Hajhosseini *et al.* ⁽²⁷⁾

The mean of systolic and diastolic pressure of the patients in the present study did not significantly change after the massage therapy session. This finding is consistent with the findings of Combron *et al.* who studied the changes in blood pressure after various forms of therapeutic massage and reported that massage therapy did not reduce the diastolic blood pressure significantly. ⁽³⁰⁾ Park and Cho did not find any significant differences in diastolic blood pressure and LDL cholesterol level between the foot reflexology group and the control group, though, the intervention was effective in decreasing systolic blood pressure and triglycerides and in improving the life satisfaction amongst the patients. ⁽³¹⁾ However, Hajihosseini *et al.* and Degirmen *et al.* have reported that massage therapy of feet and hands have reduced the mean of diastolic blood pressure in comatose, ⁽²⁷⁾ and post caesarean patients. ⁽²⁸⁾

Quattrin *et al.* conducted a study on the anxiety level of the cancer patients and effect on their vital signs such as systolic blood pressure, diastolic blood pressure, heart rate and respiratory rate with reflexology. These were significantly decreased in vital signs after 30 minutes of reflexology. ⁽³²⁾ Moeini *et al.* showed that the average systolic and diastolic blood pressure between the two groups of intervention and control had a significant difference after conducting the reflexotherapy and foot massage. But, for the heart rate and respiration rate, the average changes in these parameters showed no significant statistical difference between the two groups. However, the results showed that in intervention group, the average heart rate and respiratory rate per minute had slightly decreased after the reflexotherapy. ⁽³³⁾ Frankal found that reflexology and foot massage group showed significantly greater reduction in baroreceptor reflex sensitivity as compared to control group. The frequency of sinus arrhythmia after reflexology and foot massage was increased by 43.9% and 34.1% respectively. ⁽³⁴⁾

Results of pain severity in the control group showed that there was no significant difference between the mean score at the beginning of the study and after massage. It means that their pain severity didn't change significantly after 20 minutes. In a similar study which was conducted to assess the effect of massaging on the pain severity of patients in special wards, results showed that the mean score of pain severity in the control group didn't change significantly after 10 minutes ⁽³⁵⁾ we believe that the mean score of pain severity didn't change in the control significantly after 20 minutes because routine treatments were not enough to reduce patient's pain and couldn't reduce their pain severity significantly.

Our findings demonstrate that the mean score of pain severity in both groups wasn't significantly different at the beginning of the study. This means that pain severity was similar in both groups at the beginning of the study before applying any intervention. Results showed that there was a significant difference between the mean score of pain severity of the intervention group and the control group, after applying hand and foot massage together. This difference shows that massaging could reduce the pain severity in the intervention group's patients. Massage stimulates nonpainful nerve fibers and releases endorphins; it has the potential ability to assist in pain relief. ⁽⁶⁾ Massage is a coetaneous stimulation that uses touch and movement of muscle, tendon and ligament without manipulation of joints for pain relief. ⁽¹⁵⁾ Researcher believes that the difference between mean scores of pain severity is significant in the intervention group because of the specified time duration considered for massaging patients in this group. Probably the time duration of massaging in this study was enough to see the parasympathetic respond and functioning of endocrines which increase the secretion of endorphins and could reduce pain severity in patients.

This agrees with Wang and Keck, who studied effects of hand and foot on pain severity after general surgeries (urology, gastrointestinal, gynecology, head and neck) in India. The patients experienced moderate pain after they received pain medications. This pain was reduced by the massage; the effectiveness of massage in postoperative pain management was supported.⁽⁶⁾ In Bagheri et al study which was conducted to assess the effect of massage therapy on the pain severity of stroke patients, results showed that the mean score of pain severity was reduced from 2.3 to 1.3 after 20 minutes of massage therapy (independent t test with $p < 0.01$).⁽³⁶⁾ Kim et al. studied the effect of foot reflex massage on menstruation pain relief. The results showed that the foot reflex massage has affected the menstrual pain of high school girls.⁽³⁷⁾ The performed studies by Stephenson et al. about the massage effect on patients' cancer pain are similar to the findings of this study. They studied the effect of foot reflex massage on pain relief of patients suffering from breast and lung cancer. This massage decreased the pain in one third of patients. On the other hand, this treatment had resulted in anxiety decrease in these patients.⁽¹⁷⁾

Brent et al. conducted a similar clinical trial on 113 patients (62 massage, 51 control). Massage group showed significant decrease in pain, anxiety, and tension after the intervention and they were highly satisfied and no major barriers to implementing massage therapy were identified. These researchers suggested massage therapy may be an important component of the healing experience for patients after cardiovascular surgery.⁽³⁸⁾ Chang's findings also suggest that massage is a cost-effective nursing intervention that can decrease pain and anxiety during labour in 60 primiparous women, where there is need to use sedative drug ($p = 0.00$).⁽³⁹⁾ This result is similar to that of Eghbali et al study in Iran. They studied the effects of hand and foot massage on postoperative patients who underwent arthroscopic knee surgery patients ($p = 0.001$).⁽⁴⁰⁾

In contrast, Hulme, Waterman, and Hillier did not obtain significant results on pain intensity scores from a 5-minute foot massage⁽⁴¹⁾. Hattan et al. applied a similar 20-minute foot massage intervention to patients after cardiac surgery. Compared with a control group ($n = 7$), the pain intensity scores of the massage group ($n = 9$) were not significantly reduced. The researchers claimed that the small sample size caused a large variance in pretest scores and might contribute to a lack of statistical results on some of the variables, such as pain intensity. They suggested that other studies should be performed with more research sample size. It seems that in the study of Hatta and King, the small sample size was a reason for non significant results.⁽⁴²⁾

Conclusions and recommendations

The findings from the study indicated that foot and hand massage significantly reduced pain intensity resulting from incisional pain on the first postoperative day. This study suggest that foot and hand massage appears to be an effective, inexpensive, low-risk, flexible, and easily applied strategy for postoperative pain management. It is a cost-effective nursing intervention that can decrease pain

Foot and hand massage is one of the available interventions in complementary medicine and treatment which provides an opportunity for nurses to care for their patients. Massage therapy are manual therapeutic approaches used to facilitate healing and health and can be used by nurses in almost any setting.

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