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The effect of foot reflexology massage on the level of pain during chest tube removal after open heart surgery

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ABSTRACT

Aims: Pain due to the removal of the chest tube is one of the important complications after open heart surgery. In the case of inadequate pain management, sympathetic system is stimulated and can lead to irreversible complications. Studies showed the effect of reflexology massage on pain relief in other cases; so this study had been done with the aim of "determining the effect of foot reflexology on the pain of the patients under open heart surgery during chest tube removal".

Methods: This randomized clinical study with control group was done in the hospitals covered by Baqiyatallah Medical Sciences University in 2013. Ninety samples were divided into three experimental, control and placebo-treated groups based on randomized allocation. Pain level was measured through Numerical Rating Scale (NRS) in all the three groups before intervention. In the experimental group center of the anterior one-third and in the placebo-treated group, Posterior one-third of the left foot was being massaged for ten minutes before chest tube removal. There was no measurement in the control group. After removal of the chest tube, the level of the pain was measured and documented immediately. Data were analyzed by $SPSS_{18}$ software by the help of descriptive and inferential statistics.

Results: Difference in the mean of the quantitative variables including; age, height, weight and level of the body and demographic qualitative variables of the patients including; education status, occupation and marital status was not significant ($p>0.05$).

Expected increasing of the pain due to the chest pain tube removal was not significant in the experimental group ($p=0.08$), while placebo-treated and control groups had significant increase of the pain ($p=0.001$ and $p=0.000$ respectively).

Conclusions: Foot reflexology massage is a useful nursing intervention in chest tube removal after open heart surgery. This intervention improves care level of the patients in the important recovery phase after open heart surgery with the least cost and without any complications.

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1. Introduction

Heart disease is one of the most disturbing diseases which allocated the highest rate of death to itself [1]. One of the available interventions for treating heart diseases is open heart surgery. Open heart surgery can be categorized to five groups including; cardiac-vascular surgery, bypass surgery, valve repair, birth defects repair and other various methods. Coronary Artery Bypass Graft (CABG) is the most common open heart surgery [2].

Heart bypass surgery is a big surgery and it is done in the patients with severe narrowing (abstraction) of the coronary arteries that do not respond to other treatments, it is done as a subsidiary way in the place of narrowed (abstracted) arteries [3, 4]. Thousands of open heart surgery is doing in The Unites States annually that this number regarding heart bypass surgery is estimated 363000 cases annually [5,1].

25 thousand of open heart surgery is doing in Iran that 50 to 60 percent of them is for CABG. In all of these patients, chest tube is built in the pleural space or mediastinum for air, secretions and blood drainage (which are accumulated after surgery). Usually this tube is removed 24 to 48 hours after surgery or when water, air and blood drainage was done well and the produced fluid is less than 150 ml during 24 hours [7, 8].

The pain due to removing chest tube is one of the important complications after open heart surgery which is described by the patients as an painful event during recovery after the surgery and they report that this pain is not managing adequately [9,10].

Acute pain which is not relived can be changed to emotional, psychological and physical distresses that leave negative effect on the prognosis and outcome of the disease and surgery [11].

Pain causes the patients to have less mobility and try to reduce their pain through shallow breathing and less movement of the chest, so they are going to have hypoxemia and pulmonary dysfunction, the patient's recovery is going to be delayed and even his/her life is threatened [10].

Inadequate pain relief also can increase sympathetic response which stimulates cardiac function and increases myocardial oxygen consumption, so patients with limited cardiac reserve and ventricular dysfunction perhaps are not able to increase oxygen supply for keeping appropriate balance between demand and supply of Oxygen and it leads to tissues deprived of oxygen, changes in normal cell function and hemodynamic changes [12,13]; so lack of controlling pain can leave negative effects on individuals' health [14].

Postoperative pain is among the main concerns of the patients under heart surgery and it is one of the most challenging clinical problems for the nurses [15]. Nurses in all the health and treatment units for managing the pain due to the disease and surgeries are often trying to find some ways for helping patients [16].

Successful pain management depends on assessment, pharmacological and non-pharmacological adequate interventions and evaluation of the patient's response. There are different methods for controlling the pain due to chest tube removal; for example; using systematic therapies (narcotic and non-narcotic drugs), methods of local anesthesia) epidural and cry analgesia) and complementary medicine methods (massage therapy and acupuncture) [10].

Although nowadays upload analgesics are as the basis of managing the pain due to the chest tube removal, but it they are not a satisfying analgesia for relieving pain alone [12] and they have a narrow therapeutic range and complications such as inadequate treatment of pain, respiratory depression and too much of relaxation which make the situation more complicated [9,10].

Considering that most of the heart diseases are going to be more by aging and old patients are mostly exposed to the side effects of systematic analgesia, treating pain should be done with more cautious. Managing pain before the procedure for the elder lies under vascular

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surgery is a challenge for the anesthetists [17, 18]. There are many efforts nowadays to reduce postoperative pain severity and need to narcotic analgesics by other methods [19].

Using complementary medicine methods such as massage have been increased in treatment units in recent years that cause relaxation, pain relief and anxiety decrease. Still there is no scientific consensus regarding mechanism of action of these methods. Massage therapy by manipulating soft tissues brings tissues metabolic balance [14].

Every metatarsus has more than seven thousand nerves. Pundits regarding reflexology believe that a life force or vital energy is flowing along the paths in the legs to all the organs of the body and any kind of dam in this flowing is going to be led to illness at the end; stimulating reflexology points in every leg can break these dams in the channel flow and causes energy release.

These paths in every part of the body are related to metatarsus through neural paths. Touching soft tissue which is doing in massage therapy reduces pain and increases comfort and relaxation of the patients and reduces muscle tension and anxiety.

Massage can release endorphins and enkephalins. Reflexology method is a simple and invasive method which has no complication and can be counted as a part of nursing care in critical care units [3, 20].

The effect of massage therapy on the children's anxiety before intramuscular injection, infants' colic pain, women's back pain, anxiety and heart dysrhythmia in patients under Catheterization and pain due to sternotomy in the patients under heart surgery have been studied in Iran [20,21].

But in reviewing available scientific texts, there was no study in Iran and in foreign countries regarding foot reflexology massage technique in removing chest tube and investigating its effect on pain.

Nature of acute pain due to removing chest pain because of abundant sensory pain fibers in the pleural space is different with the pain due to sternotomy [22].

In a review study which was done by Ernest et al. (2011), clinical evidences showed that massage therapy cannot be an effective intervention for all the conditions and diseases. Effectiveness of massage therapy needs a separate survey [23, 24]; also some religious and cultural beliefs may cause the patients feel uncomfortable, these kinds of interventions should be studied in every culture separately [25].

Considering the importance of taking care of the patients under recovery after open heart surgery in IC open heart, the probability of complications due to these interventions and by considering the importance and benefits of non-pharmacological interventions and alternative medicine and its place among the nursing profession, this study was done with the aim of determining the effect of foot reflexology massage on pain during chest tube removal in IC open heart.

2. Methods

This randomized clinical trials study with control group was done in 2013. The study population in this study was all the patients that were under open heart surgery (Coronary artery bypass and valve surgery) and were hospitalized in ICU open heart of the selected hospitals of Baqiyatallah medical sciences university and they had the necessary criteria for entering the study.

Inclusion criteria included; patients with valve and coronary artery surgery with chest tube after open heart surgery hospitalized in IC open heart that according to the unit criteria chest tube should be removed (with at least one chest tube), male , age range of forty to eighty years old, lack of suffering from sensorimotor disorders, lack of foot deformities (like: corns, burning feet, foot amputation and skin diseases), at least having the literacy of reading and writing, no disturbance of consciousness (GCS=15), no history of chronic pain like arthritis etc, and consuming analgesics, lack of

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psychological problems and the history of psychiatric drugs and also lack of using narcotic drugs four hours before intervention. Samples were excluded from the study in cases such as; death, hemodynamic instability, or not being satisfied with continuing the participation. Permission for the study was taken from ethic committee. In this study by counting α=5%, β=10%, test power=90%, by using Altman Nomo gram and the least expected difference in the means and also the similar studies [3,20] 28 samples were achieved and by counting ten percent of the probable loss of the samples , thirty samples were counted in every experimental, placebo-treated and control groups.

Hospitalized patients were selected through targeted based method, then they were divided into three groups through random assignment; the method was like this that patients entered the study that according to the criteria of that unit, their chest tube should be removed and had the inclusion criteria, and they were divided by lottery respectively into experimental, placebo-treated and control groups with label that A, B and C were written on them.

Method of the work was totally explained to the patient and in the case of his/her willingness to be included in the study, informed consent of entering the study was taken from them. Patients were allowed to be excluded from the study at any part, if they did not like to continue their participation. Samples of the study were ensured that the usual care will be performed for them even if they do not accept participating in the intervention; also they were ensured that their information and files will be remained confidential.

Among the limitations of the study, it can be pointed out to confounders such as relationship of other health staff with the patient and also Broadcasted radio and music sounds from the speakers that were reached to minimum to the possible extent. Patients were in the fowler and comfort situation and in all the three groups some seconds before the intervention the amount of pain was measured and recorded by NRS (ten-score lining from without pain to unbearable pain, that the patient gives a mark from zero to ten based on a subjective feeling of the pain that is experiencing) [26].

NRS is a standard scale and has been used broadly in Iran and in foreign countries. Validity and reliability of this tool is confirmed in the last studies.

In a study which had been done by Donald et al. in 1983, validity and reliability of Numeric pain Rating Scale was confirmed [26], Hawker et al. (2011) had done a study for confirming validity and reliability of NRS in patients suffering from rheumatoid that showed high correlation of this scale with pain five-grade Verbal descriptive scale and as the result validity of this questionnaire was confirmed.

Also test-retest showed that NRS with 94% of correlation has high reliability [27].

After documenting the initial pain in experimental group, center of the anterior one-third of the patient's left foot between the arch of metatarsus and toes, a knuckle under the second finger and big toe (Ball of the foot) was massaged with gentle pressure for ten minutes before removal of the chest tube in rotating form (such as crushing a sugar cane with finger).

The massage was done deeply by the researcher in a way that it does not cause patient’s discomfort and pain.

In the placebo-treatment group, Posterior one-third of the left foot (heel of the foot) was massaged with the same pattern, and no measurement was done in the control group which was the usual and routine method of the Unit [20, 28-30], and then chest tube was dragged by one of the ward nurses.

After dragged chest tube, the amount of pain intensity was measured by NRS immediately.

After collecting information and documenting them in the computer, data analysis was done by SPSS 18 software by the help of descriptive (mean and standard deviation) and inferential statistic (Chi-square, Kolmogorov-Smirnov, paired t tests and one way ANOVA and Tukey test).

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3. Results

Firstly quantitative variables were studied according to the groups of the study regarding normal distribution with Kolmogorov–Smirnov (KS) statistical test that all of them had normal distribution ($p>0.05$) and in the end for data analysis parametric tests were used for data analysis.

In every one of the experimental and control group, one of the patients was excluded from the study due to unwillingness to continue participation in the study.

Totally 88 samples, including 29 patients in experimental group and 30 patients in placebo-treated group and 29 patients in control group were studied that all of them based on the inclusion criteria were male.

Table 1 is comparing the mean of demographic quantitative variables in triple groups including; age, weight, height and body level that based on this table according to ANOVA, the mean of demographic quantitative variables in triple groups do not have significant difference ($p>0.05$), in another word, groups of the study are homogeneous regarding these variables.

Table 2 shows the comparison of the frequency of demographic qualitative variables in triple groups.

Based on this table, demographic qualitative variables such as; education level, according to the chi-square statistical test and occupation according to the exact Fisher test do not have

Table 1: Comparing the mean of demographic quantitative variables in triple groups

Phase / Group	Age (year) M±SD	Weight (kg) M±SD	Height (cm) M±SD	Body level(m^2) M±SD
Treatment	61.17±11.82	76.48±9.33	169.86±6.28	1.87±0.12
Placebo-treated	61.93±11.42	77.03±10.69	169.36±6.47	1.88±0.13
control	61.03±9.56	72.79±9.21	167.58±6.19	1.82±0.15
ANOVA	F=0.058 df=2 p=0.944	F=1.62 df=2 p=0.253	F=0.042 df=2 p=0.357	F=1.264 df=2 p=0.288

Table 2: Comparing frequency of demographic quantitative variables in triple groups

Group / Variable	Treatment Number (percent)	Placebo-treated Number (percent)	Control Number (percent)	Chi-square test
Education				
Lower than Diploma	15 (51.7%)	12 (40.0%)	10 (34.5%)	χ^2=11.78
Diploma	12 (6.9%)	12 (40.0%)	10 (34.5%)	df=6
University education	12 (41.4%)	6 (20%)	9 (31.0%)	p=0.06
Occupation				
Working (self-employed and employees)	11 (37.9%)	3 (10.0%)	3 (10.3%)	χ^2=12.75 df=6 p=0.054
Not working (unemployed and retired)	18 (62.1%)	27 (90.0%	26 (89.6%)	

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significant difference in all the three groups (p>0.05).

Also all the samples regarding marital status were married, so the groups of the study were homogeneous in these variables.

Table 3 (comparing the mean of amount of pain before and after intervention) shows that before intervention, the mean of pain in the three groups are not different (p>0.05).

So groups are not homogeneous in these variables. While the mean of pain after intervention shows significant difference (p=0.001); Tukey post hoc test showed that this difference is related to the difference of control group with the other two groups and experimental and placebo-treated groups were not different with each other.

In comparing the mean before and after intervention separately, every paired t-test showed that in two placebo-treated and control groups this difference was significant (p=0.001 and p=0.000) respectively), but it was not significant in experimental group (P=0.008) and it means that ascending pain in placebo-treated and control groups was significant, but it was not significant in the experimental group and it shows experimental group suffered less pain in compare with the other two groups.

4. Discussion

Placebo-treated groups suffered less pain in compare with the other groups.

Therefore foot massage in the reflexology point related to the heart and chest in anterior one-third of the left metatarsus was effective in reducing ascending pain due to chest tube removal in compare with the placebo-treated and control groups. So the research hypothesis based on reduction of ascending pain due to chest tube removal by foot reflexology massage in patients after open heart surgery was confirmed.

These findings were in consistent with the findings of Mi Suk Han (2012). He investigated 25 patients in massage group and 25 patients in control group in a study with the aim of studying the effect of massage on the degrees of pain in patients after Gastrectomi surgery.

In the experimental group, the first five days after surgery, patients were massaged every day for 10 minutes. Degrees of the pain were significantly reducing during the days after surgery [31].

Choudhary (2004) also during studies with the title of determining the effect of foot reflexology massage on pain after patient's surgery in the form of case-control, in sixty patients who had reflexology massage following a twenty minutes massage (immediately after surgery, 2, 6, and 24 hours after surgery) they achieved this result that foot reflexology massage reduces patients' pain after surgery and also reduces using analgesics remarkably [32].

Bozorgzad et al. (2010) had done a semi-experimental study for determining the effect of foot reflexology massage on pain intensity due to Esternotomi after CABG.

After analyzing data they achieved this result that the mean of pain intensity before and after intervention in triple groups was significant.

Mean and standard deviation of pain intensity showed more reduction in experimental group in compare with control group [20].

In this study, reflexology area of experimental and placebo-treated group was in one area of

Table 3: Comparing the mean of the amount of pain before and after intervention

Phase / Group	Before intervention M±SD	After intervention M±SD	Paired t-test
Treatment	5.13±1.99	5.89±2.07	t=1.81, df=28, p=0.080
Placebo-Treated	4.50±1.96	5.86±2.16	t=3.89, df=29, p=0.001
Control	4.55±1.99	7.37±1.69	t=6.57, df=28, p=0.000
ANOVA	F=0.44, df=85, p=0.64	F=7.75, df=85, p=0.001	F=0.44, df=85, p=0.64

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the foot and the only difference of these two groups was being right and left foot of the samples, in another word the massage area in both groups was reflexology points related to chest and mediastina.

Study of Stephenson (2003) had different results with the findings of this study. In a study with the aim of studying the effect of foot reflexology massage on pain of the patients suffering from metastatic cancer, he did reflexology massage two times a day with time intervals of 24 hours on these patients, but he did not observe any significant effect in the level of pain in 3 and 24 hours after intervention [33].

It can be assumed that the difference of his study with the present study is due to the long distance between the intervention and the time of measuring pain, this probability arises when according to the findings of that study; the level of pain immediately after intervention in experimental group was less than control group. It seems that the effects of foot reflexology massage according to the amount of the pressure, situation and the place of massage, durability and time is different.

Anyhow the effect of massage may differ due to the influence by automatic nervous stimulation from different areas of the body. Gentle touch pressure may activate parasympathetic response, while low pressure activates sympathetic response.

Anyhow the path of massage physiologic effects is not clear but research evidences suggest that touch can be useful in patients of Cardiac care units [34].

5. Conclusions

Foot massage in reflexology point related to the chest and mediastina is effective in reducing pain due to chest tube removal.

Foot reflexology massage is a useful nursing intervention in dragging the chest tube after open heart surgery. This intervention improves care level of the patients in the sensitive stage of recovery after open heart surgery with the least cost and with no complications.

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