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Comparison of the Effect of Local Cold Therapy and Hand and Foot Massage on Blood Pressure in Post-Operative Patients

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Abstract

Background: Postoperative blood pressure management has an important role in controlling postoperative complications. Local cold therapy and massage, in addition to pharmacotherapy is useful as a safe method to manage blood pressure.

Objectives: The aim of this study was to compare the effect of Local cold therapy versus hand and foot massage on blood pressure of the patients undergoing surgery.

Methods: This Semi-experimental study with three-group, before- after design was conducted on 90 patients undergoing surgery in 2019 at Shahrekord University of Medical Sciences, Iran. Patients entered the study using convenience-sampling method and randomly allocated to intervention (local cold therapy and massage) and control groups. Local cold therapy and massage performed three times a day for 20 minutes for 48 hours. After the intervention, blood pressure changes re-measured by the researcher.

Results: The mean differences of systolic blood pressure before and after the intervention in the massage (p=0.001) and local cold therapy (p=0.002) groups was significant, also mean differences of diastolic blood pressure before and after the intervention in the massage (P<0.001) and local cold therapy (P=0.036) groups was significant. The ANOVA test showed that the mean systolic and diastolic blood pressure was not significant for different groups before (P=0.28) and after (P=0.059) the intervention.

Conclusion: In order to use Local cold therapy and hand and foot massage effectively along with routine care, teaching its use to nurses as well as patients' companions can be useful.

Keywords: Local cold therapy, Hand and foot massage, Blood pressure, Patients, Surgery.

Introduction

Every year, more than 200 million adults worldwide undergo surgery with increasing slop.[1] In Iran, according to the statistics of the Ministry of Health, an average of 1.5 million major surgeries undergone per year.[2] Studies show that 36.57% of patients undergoing surgery have experienced at least one complication in the postoperative period.[3] According to the World Health Organization (WHO), about 10% of patients who have undergone surgery experience complications due to change in blood pressure and heart rate.[4]

Managing postoperative complications and reducing its incidence is one of the necessities of nursing care.[5] Now, the health care provider emphasizes to find and use new therapeutic interventions with more safety, cost-effectiveness and better effects on the vital sign along with lesser complications.[6] Especially in great surgeries where patients face more complications, using these methods along with the routine ones, can play an effective role in achieving patients' health and recovery as well as saving

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the health system costs.[7,8]

Massage and local cold therapy are two non-pharmacological methods, which have good effects on physiological variables while they are short-term measures.[9,10] Massage releases endorphins to reduce many of the symptoms of pain and inflammation then makes the person feel comfortable. Similarly, local cold therapy can reduce pain and tissue inflammation and reduce many of the unpleasant physical symptoms in the affected area. Typically, these methods usually do not cause any side effects, if the patient does not have a specific lesion or underlying disease, so it consider as safe methods to improve patients' status.[11,12]

Its remarkable influence along with low side effects increases the need for these methods in the process of treating and caring process of patients. Routine treatments and medication have many physical and mental side effects in the patients while reducing their problems. In addition to the risk of drug dependence, the use of drugs can cause low blood pressure, impaired vital signs, drowsiness, nausea and vomiting, and in some cases, shock then can impose a high cost on the health care system. Therefore, it is not reasonable to use them in spite of their simpler use, more cost-effectiveness and accessible.[13,14] On the other hand, nowadays there is a great emphasis to activate patients and their family members in postoperative management and care. Using methods such as local cold therapy and massage can easily facilitate this participation to provide better care after the great surgeries.[15]

In spite of various studies conducted about non-pharmacotherapy such as massage and local cold therapy on different physiological parameters, there is a challenge that whether the variety in effectiveness of these methods is due to the severity of physiological symptoms in the study groups or the nature and type of technique used.[17,18] However, it should be borne in mind that the process of performing these methods, even if performed in a standard manner, can inherently lead to differences as a result of implementation by different individuals.[16,19]

Despite the existence of various studies on the effect of massage and local cold therapy on patients, studies on the effect of this method on blood pressure in patients undergoing surgery were few. Bahramnezhad et al., stated that reflexology foot massage can have a significant effect on physiological parameters in patients with coronary angiography.[21] Yekeh Fallah et al., examining the effect of hand touch on the vital signs of traumatic brain injury patients admitted to the intensive care unit stated that massage can affect blood pressure but not heat.[16] Song et al., in their study on the effect of self-reflection massage on the improvement of vital signs in healthy individuals showed that reflex massage at the sole of the foot did not improve blood pressure.[17] Khoshtarash et al., showed that reflexology massage had no significant effect on physiological parameters of patients after cesarean section.[22] Ebrahimi et al., is investigated the effect of local cold therapy on deep breathing pain and cough after open-heart surgery. They showed that local cold therapy with cold gel on the sternum of these patients was effective to reduce deep breathing pain and cough.[20] Moghimi Hanji et al., also investigated the effect of local cold therapy on labor pain in primiparous women and found that pain intensity and duration of labor diminished and satisfaction with labor in the first and second stages significantly improved.[23] Zgavc et al., after investigating the effect of local cold therapy stated that, if it used in the early stages of the disease, local cold therapy could reduce the inflammatory response and edema of damaged tissue.[24]

Review of the literature reveal that various studies have expressed the effect of various kind of massage and local cold therapy on hemodynamic parameters and their effects in different patients have investigated. Nevertheless, the study gap in this field is that firstly, the effect of massage and local cold therapy on vital signs have expressed using different types of studies and its significant and non-significant effects have reported in a various groups of patients. Second, there have been few studies on the effects of topical massage and local cold therapy, especially in patients undergoing chest and abdomen surgery.

Objectives

Therefore, the present study have designed and conducted to investigate the effect of topical massage and local cold therapy on blood pressure of them.

Methods

Study design

This is a semi-experimental study with a three-group, before- after plan that conducted in 2019 at Shahrekord University of Medical Sciences, Iran. The study population included all patients who underwent chest and abdomen surgery at Ayatollah Kashani Hospital in Shahrekord. Convenience sampling method of postoperative patients until reaching the sample size and according to the inclusion criteria.

Sample size for the present study according to the sample size formula in interventional studies [$n = \frac{2(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta})^2 \sigma^2}{d^2}$] and taking 95% Power and alpha=0.05 ($Z_{1-\alpha/2}$=0.84, $Z_{1-\beta}$=1.96, d=4, σ=5) and according to previous studies[19,16] Twenty-seven people were calculated and 30 people were considered for each group. The sample size according to the formula was 90 people. Inclusion criteria was having thoracic and abdominal surgery, 18- 64 years old with no history of underlying diseases such as hypertension, allergies, immediate postoperative cardiovascular arrhythmias, disorders coagulation and lack of severe mental disorders such as depression, lack of infection diagnosed before surgery and lack of Raynaud's disease. Exclusion criteria was skin complications and allergies, early postoperative complications (acute postoperative infection and fever, cardiac arrhythmia requiring medical intervention, abnormal bleeding, acute pulmonary disorders such as pulmonary embolism, and pneumonia after surgery), the need for reoperation in the first 48 hours after, and simultaneously multiple surgeries. The sampling process was continued daily to reach the final sample size until finally 90 people entered the study (30 people in each group).

Sampling

Patients were randomly allocated to hexagonal blocking method based on the variables of surgery type and selected physician. 210 patients were admitted to Ayatollah Kashani hospital in Shahrekord during 34 days of selected study physicians. 90 patients had the inclusion criteria, which was determined after evaluating 15 blocks. Accordingly, six blocks with a total capacity of 36 people will be assigned to the first physician, four blocks with a total capacity of 24 to the second physician, three blocks with a total capacity of 18 to the third physician, and two blocks with a total capacity of 12 to the fourth. The capacity of each block was obtained by dividing the total sample size by the number of blocks and the capacity of each block was determined to be six people. Because the study consisted of three groups, each block of six was randomly divided into three groups of two. In order to assign patients of each block to experimental group one (local cold therapy), experimental group two (hand and foot massage) and control group, the researcher first based on patients' information about the patient's eligibility to enter the study and which block each patient belongs to type physician. Then, from six papers, which included two letters A (local cold therapy), two letters B (hand and foot massage), two letters C (control) in one envelope, asked the patient to pick up one paper from the envelope. Then, based on the extracted sheet, he/she was placed in the relevant group, and this process continued until the completion of the six-block, and after completing one block, the completion of the next block was done with the same algorithm.

Prior to the interventions, blood pressure was measured by a SA Iran Portable monitoring device, the cuff of which was tied to the patient's left arm and the hand was at the level of the heart. The researcher made sure of the calibration before using the device and at the same time the patient's blood pressure was measured by a mercury sphygmomanometer. A monitoring device was used for all patients. After full awareness of the patients, the patient's blood pressure was measured and recorded by the researcher. In the intervention group, in addition to routine care, superficial massage of the hand and foot from the toe (each toe, sole and back of the hand, foot and wrist) was performed in four five-minute intervals for each patient limb for a total of 20 minutes. The intervention was performed three times a day for 48 hours for these patients and during all this time the researcher was present at the patient's bedside and took care only of the intervention. The steps of the massage were as follows: first, the base of each finger was held between the thumb

and the other fingers, and along each finger, it was pulled to the tip and rotated outwards. The client's toes are stretched along each toe and then bent back and forth while stretching. The sole of the patient's foot was rubbed from the heel to the bulge under the toes with the thumb. While the patient's foot was facing up, pressure was slowly applied between the wrist and toe tendons using the thumb or other fingers.[25] First, right and then left foot massage, as well as right and left hand massage were performed. For the massage, a same sex massager performs the procedure for each sex, whose agreement coefficient was previously measured (91%). For the local cold therapy group, in addition to routine care, topical local cold therapy performed in the form of a standard frozen Pack (Cold Pack) made in Germany. Cold pack is taken out of the refrigerator and after measuring its temperature (4 degrees Celsius), according to the size of the dressing (small, medium and large sizes) was placed on the dressing site (dressing should be a maximum of two layers) for 20 minutes. During it, the researcher was present at the patient's bedside and cared only about the cold. He was doing therapy himself. In order to perform the intervention and attend the religious issues, a female colleague cooperated to perform the intervention for female patients. This intervention performed three times a day (every 8 hours) for 48 hours. After the intervention, blood pressure changes re-measured by the researcher and same sphygmomanometer. The control group received routine care only according to the treatment protocol and no intervention was made by the researcher. 48 hours later, a questionnaire was completed by the researcher with a question from the patient and the patients' blood pressure was reviewed and recorded.

Ethical considerations

In order to conduct the research, after obtaining the necessary permits from the competent centers of the university and presenting them to Ayatollah Kashani hospital of Shahrekord, first the study method and its objectives explained to patients and their companions. The patient's demographic data form was completed. Institutional Review Board approval (code: IR.SKUMS.REC.1398.110) was obtained. The informed written consent was obtained from the volunteers to participate in the study and freedom to enter and leave the study, as well as the name of the questionnaires and emphasis on secrecy and confidentiality of data were taken into consideration. The study was conducted in accordance with the Declaration of Helsinki.

Statistical analysis

The continuous variables were expressed as the mean ±SD, and the categorical variables were presented as a percentage and frequency. The Chi-square, t-test, paired t-test, ANOVA test were used for analysis the data. All statistical analyses were performed with SPSS (version 16.0, SPSS Inc, Chicago, IL, USA). A “P-value” less than 0.05 was considered significant.

Results

The demographic data were not significantly different between the two groups (P>0.05) (Table 1).

T-test showed that the mean systolic blood pressure before the intervention was not significant in terms of different intervention and control groups (p=0.28). Mean diastolic blood pressure was not significantly different between two interventions and control groups before the intervention (p=0.447). Mean systolic blood pressure after intervention was not significant according to different interventions and control groups (p=0.059). Mean diastolic blood pressure after intervention was not reported to be significant for different intervention and control groups (p=0.174).

Paired t-test showed that the mean systolic blood pressure before and after the intervention was significant in the massage group (p=0.001). Mean systolic blood pressure before and after the intervention in the local cold therapy group was also significant (p=0.002). Mean diastolic blood pressure before and after the intervention was significant in the massage group (P<0.001). Mean diastolic blood pressure before and after the intervention in the local cold therapy group was also significant (P=0.036). The results are shown in Table-2.

Table 1. Frequency of demographic characteristics of patients undergoing surgery according to different groups of massage, local cold therapy and control (N=90)

Demographic data		Massage N (%)	Local cold therapy N (%)	Control N (%)	Significant level
Age	18-25	3(10)	4(13.3)	1(3.3)	P: 0.208
	26-35	6(20)	4(13.3)	2(6.6)	F: 1.427
	36-45	6(20)	4(13.3)	3(9.9)	
	46-55	9(30)	9(30)	11(36.6)	
	>56	6(20)	9(30)	13(43.3)	
	Total	30(100)	30(100)	30(100)	
Gender	Male	17(56.7)	19(63.3)	16(53.3)	P:0.727
	female	13(43.3)	11(36.7)	14(44.7)	X^2:1.23
	Total	30(100)	30(100)	30(100)	
Type of physician	1	12(40)	13(43.3)	13(43.3)	P:1
	2	9(30)	9(30)	8(26.6)	X^2:1.005
	3	5(16.7)	4(13.3)	5(16.7)	
	4	4(13.3)	4(13.3)	4(13.3)	
	Total	30(100)	30(100)	30(100)	
Type of surgery	Abdominal	23(76.7)	23(76.7)	23(76.7)	P:0.98
	Thoracic	27(23.3)	27(23.3)	27(23.3)	X^2:0.54
	Total	30(100)	30(100)	30(100)	
Type of anesthesia	General	28(93.3)	30(100)	28(93.3)	P:0.553
	Spinal	2(6.7)	0	2(6.7)	X^2:2.11
	Total	30(100)	30(100)	30(100)	

Table 2. Comparison of mean blood pressure of patients undergoing surgery in massage, local cold therapy and control groups before and after the intervention (n=90)

Variables		Massage (M±SD)	Local cold therapy (M±SD)	Control (M±SD)	ANOVA
Systolic blood pressure	**Before**	122.12±8.7	125.7±12	120.14±5	P:0.28 F:4.55
	After	118.8±11.1	121.1±11.2	115.5±14	P:0.059 F:1.134
	Paired t-test	P:0.001 t:1.162	P:0.002 t:3.008	P<0.001 t:3.176	-
Diastolic blood pressure	**Before**	76.8±5.8	79.6±3.4	78.8±8	P:0.447 F:5.54
	After	72.8±1.1	75.7±5.1	74.8±5	P:0.174 F:4.096
	Paired t-test	P<0.001 t:2.003	P:0.036 t:3.114	P:0.007 t:2.304	-

Discussion

The aim of this study was to compare the effect of hand and foot massage versus topical local cold therapy on blood pressure of the patients undergoing thoracic and abdominal surgery. The results showed that despite the lack of significant differences in blood pressure between different interventions and control groups before and after intervention, systolic and diastolic blood pressure after massage and local cold therapy intervention was significantly different from before.

Abdi et al., in the study of the effect of foot massage on blood pressure and pulse rate in patients admitted to the intensive care unit stated that massage has caused a significant change in blood pressure and pulse rate in these patients.[26] Yekeh Fallah et al., in the study of the effect of hand massage on vital signs in patients with concussion admitted to the intensive care unit stated that massage had a significant effect on breathing and blood pressure of patients.[16] Bahramzadeh et al., also examined the effect of foot reflexology massage on fatigue, pain and physiological parameters of patients after coronary angiography and stated that foot reflexology massage can reduce fatigue and effect on systolic and diastolic blood pressure and pain after coronary angiography.[21] Azami et al., in the study of the effect of short-term foot massage on arterial blood oxygen saturation stated that a significant increase in arterial blood oxygen saturation occurs because of foot massage. Maybe after the foot massage, changes in metabolism occur and oxygen consumption decreases as a result.[27]

Song et al., in Korea in a study that examined the effect of self-reflection massage on the improvement of vital signs in healthy individuals reported that foot reflexology massage did not improve blood pressure.[17] Khoshtarash et al., by examining the effect of foot reflexology massage on pain after cesarean section showed that this method had no significant effect on physiological parameters of patients.[22] Mohammadpour et al., have not reported significant effect of massage on physiological parameters.[28] Sayari et al., in the study of the effect of foot massage on physiological parameters of patients with acute myocardial infarction has stated that massage has a significant effect on physiological parameters (blood pressure, pulse and temperature and heart rate).[29]

Regarding differences in the results of different studies on the significant and non-significant effects of massage on blood pressure; it should be said that this can be influenced by various factors. Perhaps this different range of results can be related to the nature of massage itself. The massage itself includes different techniques and methods and is done by different people that are different in terms of depth, intensity and time. It should also be said that the nature of the disease can cause various changes in their vital signs and therefore affect their effectiveness of the massage method.

Various studies have directed on the effect of local cold therapy on vital variables, but less on blood pressure. Khorshid and Demir stated that the use of local cold therapy with analgesics in patients undergoing surgery before and during the removal of the chest tube showed that local cold therapy did not have a positive effect.[30] Shakoori et al., in a study of the effect of local cold therapy on pain control in patients undergoing open-heart surgery stated that this method has a positive effect on reducing pain in these patients.[19] In his study, Moghimi Hanji also investigated the effect of local cold therapy on labor pain in primiparous women and the results showed that pain intensity and duration of labor was diminished and satisfaction with labor in the first and second stages were significantly improved.[23] Khalkhali et al., in the study of the effect of using cooling gel at the sternal incision site on patients' anxiety has stated that local cold therapy can reduce the anxiety caused by coughing and deep breathing in patients undergoing surgery.[31]

According to our knowledge, no study was found to investigate the effect of local cold therapy on patients' blood pressure after surgery to compare these results with our results. Having no effect of topical local cold therapy in our sample can be due to various factors, including the short duration of use of local cold therapy.

Regarding the limitations of the present study, the available non-random sampling method should be mentioned, which tried to control this limitation by random allocation method. Also, in this study, blindness was not possible.

Conclusions

Regarding the use of these results, it should be said that massage and local cold therapy as a complementary medicine method can be considered as a care method along with other treatment methods by health care providers. Therefore, the use of these methods in in-service training programs is recommended. Because, massage and local cold therapy as non-pharmacological approaches being economical, in almost all cases do not have any serious side effects, are simple to perform and accepted by the patient. Therefore, these methods can perform by family members or the patient without the need for a professional caregiver at home and can be effective in improving the physiological symptoms of patients and this is suitable for nurses to include these methods in pre-discharge education for the patients and their families. Further studies about the effect of massage and local cold therapy with different groups of patients are recommended.

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Competing interests

The authors declare that they have no competing interests.

Abbreviations

World Health Organization: WHO

Authors' contributions

Study design: Davoodvand, Masoudi and Miri; Execute and data collection: Miri; Data analysis: Kheiri, Writing the original draft: Roshanzadeh. Reviewing the final edition: Roshanzadeh, Davoodvand. All authors read and approved the final manuscript. All authors take responsibility for the integrity of the data and the accuracy of the data analysis.

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Role of the funding source

None.

Availability of data and materials

The data used in this study are available from the corresponding author on request.

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Institutional Review Board approval (code: IR.SKUMS.REC.1398.110) was obtained from Shahrekord University of Medical Sciences. The present study did not interfere with the process of diagnosis and treatment of patients and all participants signed an informed consent form.

Consent for publication

By submitting this document, the authors declare their consent for the final accepted version of the manuscript to be considered for publication.

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