

## Comparing the effect of whole body massage by a specialist nurse and patients' relatives on blood cortisol level in coronary patients

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### Original Article

#### Abstract

**BACKGROUND:** Cardiovascular diseases such as acute coronary syndrome and myocardial infarction are often accompanied by severe anxiety over the likelihood of death. Cortisol has been known as a stress hormone. However, there are controversies about the effect of massage therapy on blood cortisol level. Furthermore, no study is available on the difference between massage applied by a nurse specialist or by patients' relatives on blood cortisol level. This study was aimed to compare the effect of massage applied by a nurse specialist and patients' relatives on blood cortisol level among the patients admitted in coronary care unit (CCU).

**METHODS:** In a randomized controlled trial, ninety patients hospitalized at CCU were randomly placed in three groups: massage by a nurse; massage by patients' relatives and control group. The two massage groups received a session of whole body massage. The control group received the routine care. Data were analyzed using analysis of variance, chi-square and Fischer exact tests, Kruskal–Wallis and Wilcoxon Signed Ranks tests.

**RESULTS:** The mean age of participants was  $58.43 \pm 14.23$  years. None of the participants had the history of massage therapy. In the group massaged by a nurse, the median blood cortisol level was 281.90 nanomoles, which were decreased to 197.00 after the intervention ( $P < 0.007$ ). The median blood cortisol level in the group massaged by the patients' relatives and the control group did not affect significantly.

**CONCLUSION:** Massage therapy decreased the blood cortisol level in the group that received massage by a specialist nurse. It can be recommended that massage therapy be used in patients admitted in CCU.

**Keywords:** Massage Therapy, Nurses, Relatives, Acute Coronary Syndrome, Myocardial Infarction, Cortisol

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#### Introduction

Acute coronary syndrome (ACS) and myocardial infarction (MI) are major reasons for admission in coronary care units (CCU).<sup>1</sup> Studies showed that 50-90 % of patients with ACS or MI experience great anxiety over the likelihood of death.<sup>2-7</sup> This anxiety increases the myocardial oxygen demand and also the risk of cardiac dysfunction, dysrhythmia, ischemia, and the likelihood of death.<sup>8</sup>

Given the negative impacts of anxiety on the body, anxiety reduction methods should be used for the relaxation of cardiac patients. Among these methods, medicinal treatments are yet the main method for lowering anxiety in patients admitted in CCU.<sup>9</sup> However, considering the side-effects of

drugs, alternative methods such as massage therapy may be used to decrease anxiety.<sup>10-13</sup>

Some studies have shown that massage therapy could decrease anxiety and consequently reduce the blood cortisol level.<sup>14-17</sup> However, there are contradicting studies in this regard.<sup>18,19</sup> It is believed that circulating levels of stress hormones such as cortisol, before and after exposure to various situations may be reflective of the stressful situation.<sup>20</sup> However, Nijm et al. have reported that normal cortisol pattern is markedly attenuated after coronary artery diseases.<sup>21</sup>

Given the existing controversies about the effect of massage therapy on blood cortisol and also the fact that no study is available about the difference

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of massage therapy applied by nurses or by patients' relatives, the present study was conducted to compare the effect of massage therapy applied by nurse and patients' relatives on blood cortisol level among the patients admitted in CCUs.

### Materials and Methods

This randomized controlled trial study was conducted on 90 patients hospitalized at a CCU in the Kashan University of Medical Sciences, Iran.

The sample size was calculated based on a pilot study on seven subjects in which the mean blood cortisol of 333.89 nanomoles was decreased to 278.77 nanomoles after massage therapy. The difference in the response was  $55.12 \pm 93.25$  nanomoles. Then with a power of 0.80 and the type 1 error of 0.05, a number of 24 patients were estimated to be required in each group. However, a number of 30 patients were selected in each of the three groups.

Sampling was carried out through convenience method and the patients were randomly assigned into the three groups including control group and two intervention groups (i.e. the group received massage by a nurse and the group received massage by patients' relatives) till the sample size were completed in three groups.

For this purpose, the numbers 1-90 were entered in the SPSS for Windows (version 11.5, SPSS Inc., Chicago, IL, USA). Then, using "Random sample of cases," in the "Data menu" and "Select Cases," the numbers were randomly assigned to three groups of 30 random cases (i.e., the control group, group of

massage by a nurse and the group of massage by relatives.

The eligibility criteria were: being male, literate, and hospitalized in CCU, having an established diagnosis of ACS or acute MI, willing to take part in the study. Moreover, the absence of following qualifications were also considered as additional inclusion criteria: a history of cardiac arrest during the recent 72 h, being on Warfarin, having a coagulating disorder, a known psychological disorder, a cardiac pacemaker, an established hepatitis, jaundice, adrenal gland disorder, skin problem, fever, limb amputation, bone fracture in recent 2 months, deep vein thrombosis, a dialysis fistula in limbs, and a history of - massage therapy.

Exclusion criteria were: a reduction in the level of consciousness, hemodynamic instability, decreased heart rate below 60 beats/min, severe dyspnea, and inability to complete the massage therapy session.

The eligible patients were identified through referring to the two CCUs of Shahid Beheshti Hospital, Kashan, Iran, and on reviewing their hospitalization records and consultation with the physician on a daily basis and invited to the study while being briefed about the research objectives. Overall, from 178 patients, which were assessed, 88 ones were excluded due to not meeting the eligibility criteria (22 ones), declining to participate (39 ones) and other reasons (27 ones). Finally, 90 patients were participated in this study. Figure 1 shows the flow diagram of the trial.

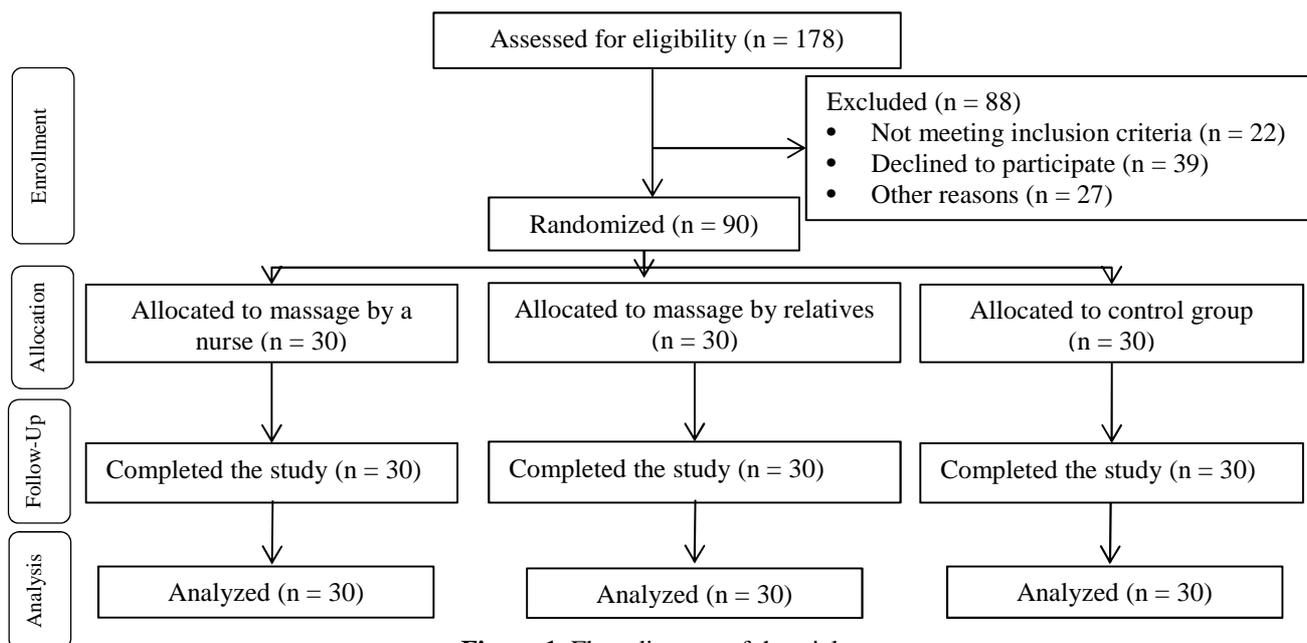


Figure 1. Flow diagram of the trial

The data collection instrument was consisted of seven questions on demographic characteristics (age, marital status, occupation, education level of patient and his selected relatives) and a table for recording the blood cortisol level both before and after receiving the massage. The medical diagnosis and the history of hospitalization of the participants were extracted from the patients' files.

In the intervention groups, massage therapy was performed in a private room or after providing a private situation for the patient in the third day of hospitalization (after passing the acute phase of disease) and issuing the permission by the concerned doctor and obtaining the patient's informed consent. Following the selection of patients and filling in the demographic questionnaire, the blood samples were obtained of each patient for measuring the blood cortisol level.

For each individual in the group received massage by a nurse specialist, a session of whole body massage was performed in about 60 min. The process of massage therapy is shown in table 1. The techniques used in massage therapy were consisted of static massage, superficial stretching technique, stretching massage, lymph vacuuming technique, latitudinal rubbing technique and myofascial releasing technique,<sup>22</sup> which were accompanied with effleurage of almond oil.<sup>23</sup>

Thirty minutes before and 15 min after the termination of massage therapy (while patient was relax at least for 15 min), the blood sample was obtained for measuring the cortisol level. For this purpose, 4 mm of blood were taken from the patient's arm in a test tube, which was then immediately kept in an ice box and transferred to the lab. All patients were massaged in the evening work shift. The blood cortisol level was determined by Immunotech Kits (Beckman Coulter Co. Czech) and following the instructions given by the manufacturing company and using the Gama Counter (Genesys Gamma-1TM, LTI Co. (Laboratory Technologies INE, USA). All patients were monitored during the massage therapy session.

In the second group (received massage by a relative), a male relative of each patient was selected through consulting with the patient, which then was trained on massage technique performed it to his patient according to the explained guidelines. All stages for data collection in this group were also the same as the first group. Training each of the relatives was carried out in an individual 2 h session in a private room on a human mannequin by the nurse specialist in massage therapy.

No intervention was done for the control group and the patients in this group received the routine care of the CCU. Blood samples were taken in this group at intervals similar to intervention groups and following completion of the informed consent. All the demographic and clinical data of this group was also obtained as for the intervention groups.

This study was approved by the Institutional Review Board and the Research Ethics Committee of the Kashan University of Medical Sciences. All the participants signed a written informed consent and were assured of the confidentiality of their individual information and of the voluntary nature of participating in the study. Data collection was conducted after coordination with the head nurses and the treating doctor. The research objective was explained to all participants.

Data analysis was performed using SPSS. Shapiro–Wilk test was used to determine if the data (i.e., age and cortisol) are normally distributed. The age of participants was normally distributed but this was not the case for cortisol. Then, analysis of variance was employed to compare the mean age in the three groups. Kruskal–Wallis test was used to compare the cortisol levels of the three groups. Wilcoxon Signed Ranks test was used for comparing the pre- and post-intervention cortisol levels. Chi-square and Fischer's exact tests were used to analyze the nominal and categorized data. In all tests, the level of significance was considered to be  $< 0.05$ .

## Results

The mean age in the group that received massage by the nurse was  $57.5 \pm 11.1$  years, whereas it was  $61.1 \pm 13.6$  and  $56.6 \pm 17.3$  in the group that received massage by relatives and the control group, respectively ( $P = 0.533$ ). Moreover, 93% in the group that received massage by the nurse and 96% and 86.7% of the group that received massage by relatives and the control group were married ( $P = 0.163$ ). Overall, 76.7% of the selected relatives were the patients' sons and the others were their brothers or friends. Also, no significant differences were observed between the three groups in terms of demographic variables ( $P > 0.050$ ) (Table 2).

The median blood cortisol level before the intervention in the group that received massage by the nurse was 281.90 nanomoles, which it was decreased to 197.00 after the intervention ( $P < 0.007$ ). However, the median blood cortisol level did not change significantly either in the control group or in the group that received massage

by the patients' relatives. The Kruskal–Wallis test did not reveal a significant difference between the

cortisol level in the three groups either before or after the intervention (Table 3).

**Table 1.** The massage protocol

Preparations	
All patients were massaged in the evening shift (between the 16-19 pm., while the patient was lying in prone and then supine position)	
Each part of the body was effleuraged with almond oil before the massage	
A standardized massage protocol was used for all patients	
The pressure applied for a massage was based on the patient's request	
A few strokes (with palm or the outer margin of the hand) were applied on each part after the massage	
Each part was wrapped in/covered with a towel after the massage.	
The patients were recommended to have a shower after three hours or after the night sleep	
<b>Back massage (including scapular and auxiliary region)</b>	
Symmetrically pressing the patient's back in several points with palm of hands (both sides of the vertebral column, from iliac crest up to shoulders and back to the iliac crest (3 times)	
Symmetric, triple, branched and back and forth thumb massages across the back muscles	
Triple, branched thumb massage in the posterior side of axilla	
The peri-scapular muscles are massaged with branched thumb movements (with the opposite hand)	
Symmetric, triple, branched thumb massages of peri-scapular muscles with both of hands	
<b>Hand massage</b>	
Stretching thumb massage from the wrist up to shoulder and back to the wrist (3 times)	
Triple, branched and back and forth, thumb massage from the wrist up to shoulder and then from to shoulder to wrist	
Paw the palm (7 times). Then, branched thumb massage from the wrist down (7 times)	
Triple stretching massages of each finger from the first phalange to the tip of the finger	
Triple back and forth and 'M' shape massage on the dorsal side of the hand	
Triple 'O' movement on each phalange	
Pressure on the co4 point for 5 s	
<b>Leg massage (the posterior side, in prone position)</b>	
Pressing the posterior side of thigh and leg with palm of hand. Start from the ankle up to hip and back to the ankle (3 times)	
Stretching thumb massage on the posterior side of thigh and leg. Starting from the ankle up to hip and back to the ankle (3 times)	
Massaging the posterior side of thigh and leg muscles with triple, branched, and back and forth thumb movements	
Massaging the plantar surface of the foot with wolf paw and 'C' shape movements of thumb (each for 7 times) and stretching thumb massage from ankle to the fingers and back to the ankle (3 times). Apply triple thumb pressures to all pressure points on the plantar surface of the foot (each for 5 s)	
<b>Leg massage (the front side)</b>	
Pressing the anterior side of thigh with palm of hand. Starting from knee up to hip and back to the knee (3 times)	
Stretching thumb massage of anterior side of thigh and leg. Starting from the ankle up the inguinal region and back to the ankle (3 times)	
Massaging the anterior side of thigh and leg with triple, branched, and back and forth thumb movements	
Massaging the plantar surface of the foot with wolf paw and 'C' shape movements of thumb (each for 7 times) and stretching thumb massage from fingers to ankle and back to the fingers (3 times). Then massaging the tips of fingers with 'O' shape movements of thumb and again apply triple thumb pressures to all pressure points on the plantar surface of the foot (each for 3 s)	
Triple semi-circular movements around the malleolar areas with the thumb (6 times)	
Massaging the posterior side of foot with branched, oblique and 'M' shape movements of the thumb (each for 3 times)	
Pressing all the pressure points in the outer margin of the foot (each for 5 s)	
Smooth downward massage from knee to the fingers tip with palm of hands (7-10 times)	
<b>Massage of abdomen and axilla</b>	
Smooth pressing on the suprapubic region with palm of hand. Keep for ten seconds	
Stretching thumb massage across the rectus abdominal muscle from the rib cage down to the pubis and then back toward the rib cage (3 times)	
Circular abdominal massage with both palms of the hands (10 times)	
Massaging the lateral side of the chest with branched movements of thumb. Start from the last rib up to the arm pit and back to the last rib (3 times)	
<b>Neck and shoulder massage</b>	
Smooth front to back massage on the neck and shoulder (10 times)	
Stretch the neck muscles from the mastoid down to the shoulder (7 times)	
Triple pressures on all the pressure points with thumb. Start from the shoulder joint to the occiput and back to the shoulder joint	

**Table 2.** Comparison of the participants' characteristics between intervention and control group

Variables	Group			P
	Massage by nurse n (%)	Massage by relatives n (%)	Control n (%)	
Medical diagnosis				
Acute coronary syndrome	28 (93.3)	19 (63.3)	25 (83.3)	0.342
Myocardial infarction	2 (6.6)	11 (36.6)	5 (16.6)	
Patients' level of education				
Elementary	20 (66.7)	21 (70.0)	21 (70.0)	0.533
High school or higher level	10 (33.3)	9 (30.0)	9 (30.0)	
History of hospitalization				
Yes	25 (83.3)	18 (60.0)	19 (63.3)	0.501
No	5 (16.7)	12 (40.0)	11 (36.7)	
Companions' level of education				
Elementary	-	4 (13.3)	-	-
High school	-	26 (86.6)	-	
Satisfaction of massage				
Very much	24 (80.0)	15 (50.0)	-	0.073
Highly	4 (13.3)	14 (46.7)	-	
Moderately	2 (6.7)	1 (3.3)	-	
Age (year) (mean ± SD)	57.5 ± 11.1	61.1 ± 13.6	56.6 ± 17.3	0.432

SD: Standard division

**Table 3.** The median and interquartile range of the blood cortisol level in the three groups before and after the intervention\*

Time	Group			P**
	Massage by nurse	Massage by relatives	Control	
Before, median (Q3-Q1)	281.90 (530.32-171.05)	303.90 (465.07-182.72)	265.40 (434.60-124.00)	0.677
After, median (Q3-Q1)	197.00 (383.77-142.32)	211.55 (383.07-165.97)	296.70 (441.42-137.87)	0.502
Test results***	P = 0.007 Z = -2.70	P = 0.102 Z = -1.55	P = 0.848 Z = -0.19	

\* Nanomoles; \*\* Kruskal–Wallis test; \*\*\* Wilcoxon Signed Ranks test

## Discussion

This study was aimed to compare the effect of massage applied by a nurse specialist and the patients' relatives on blood cortisol level among the patients admitted in CCU. Findings of the present study show that whole body massage given either by the nurse or patient's companion decrease the blood cortisol level. However, no statistically significant difference was found among the three groups after the intervention. This finding was congruent with Billhult et al. who reported no significant difference between the salivary cortisol level in the control and intervention groups.<sup>18</sup> In addition, by examining the effect of massage therapy on blood cortisol, Moyer et al. reported that massage therapy had only little effect on blood cortisol level.<sup>14</sup> The decrease in blood cortisol level seen in the intervention groups of the current study suggests that the method applied has been clinically effective; however, the sample size may seem too small to reveal a significant difference among the three groups. Moreover, other variables might have been involved, which were out of the researcher's control and were effective on the level of cortisol.

The present study indicates that blood cortisol level was significantly decreased after the massage therapy in the group, which received massage by a nurse. This finding was in line with Field et al. who indicated that massage leads to a decrease in blood cortisol level.<sup>16</sup> Besides, Lindgren et al. examined the physiological responses to massage among the healthy individuals and reported that salivary cortisol was significantly decreased after massage compared to the pre- and 1 h post-massage.<sup>15</sup>

Although changes in blood cortisol level did not find to be statistically significant in the group, which received massage by patient companion, the cortisol level was decreased compared to the pre-intervention time. The difference seen in this case might be relevant to the difference in massage givers' skill.

In general, the findings indicate that massage as an external stimulant may decrease the cortisol level as a stress hormone. Then, it could be expected that this modality may be effective for decreasing patients' anxiety. In the agreement with our study, previous studies have also reported that hypothalamus-hypophysis-adrenal axis is activated

during the anxiety related to internal and external stimulants.<sup>24</sup> Thus, it could be supposed that massaging may alleviate anxiety, which then leads to a decrease in the blood cortisol level.<sup>14</sup>

#### **Limitations and recommendations for further studies**

While the person who performed massage was the same for the group that received massage by a nurse, the other intervention group was massaged by their relatives and these relatives may have different characters, which may biased the results in this group. Moreover, we measured the blood cortisol level 15 min after the application of massage, but as the changes in blood cortisol level may be seen in different time point after the application of massage, it is recommended that another study be conducted for examining the blood cortisol level several times after massaging. Doing in this way, the durability of blood cortisol reduction is pinpointed. In this study, firstly the participants were selected through convenience sampling and then they were randomly assigned into the three groups. Hence, a study with randomized block sampling is recommended.

#### **Conclusion**

This study indicated that after massage therapy, the cortisol level decreased significantly in the group that received massage by a nurse. Regarding the effects of the massage therapy on lowering anxiety and cortisol levels and also its relaxing effect, it could be recommended that massage therapy, as a non-pharmacological method be used in patients admitted in CCU. Moreover, as an educational suggestion it is recommended that this theme can be added to the nursing curriculum.

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#### **Conflict of Interests**

Authors have no conflict of interests.

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