

The effect of reflexotherapy and massage therapy on vital signs and stress before coronary angiography: An open-label clinical trial

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Original Article

Abstract

BACKGROUND: Complementary medicine interventions are now successfully used to reduce stress as well as to stabilize hemodynamic indices within different procedures. The present study aimed to examine the effect of massage therapy and reflexotherapy on reducing stress in patients before coronary angiography.

METHODS: In this open-label clinical trial, 75 consecutive patients who were candidate for coronary angiography were randomly assigned to receive reflexotherapy (n = 25), or massage therapy (n = 25), or routine care (n = 25) before angiography. The Spielberger State-Trait Anxiety Inventory was used to determine the stress level of patients before and after interventions and vital signs were also measured.

RESULTS: Improvement in diastolic blood pressure, heart rate, and respiratory rate was shown in the reflexotherapy group, and similar effects were observed following other interventions including massage therapy and routine resting program. In subjects who received reflexotherapy the level of stress decreased slightly compared with the other two groups. However, following interventions the level of stress in reflexotherapy group was shown to be lower than other study groups.

CONCLUSION: Reflexotherapy before coronary angiography can help to stabilize vital sign as well as reduce the level of stress. The effect of massage therapy was limited to reducing stress.

Keywords: Reflexotherapy, Massage Therapy, Coronary Angiography, Vital Signs, Emotional Stress

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Introduction

Over the past 30 years, major advances have been made in the prevention, diagnosis, treatment, and rehabilitation of cardiovascular diseases. Despite the decline in mortality rate, heart diseases still have a great share in mortality and morbidity entire the world. At the beginning of the 20th century, heart diseases were cause of less than 10% of the total deaths in the world, while at the end of the 20th century, they were reported to be the main reason for half of all deaths in the developed countries and 25% of deaths in developing countries.¹ Also, 25 million annual deaths from cardiovascular diseases are expected by 2020.² Furthermore, about 50% of deaths due to cardiovascular events are associated with cardiac arrhythmias.^{3,4} One of the most common diagnostic and therapeutic interventions in managing the patients with

ischemic heart disease is angiography.⁵ This procedure is the fourth common invasive intervention in Iranian patients.⁶ According to the recent reports, about 80% of patients undergoing angiography have different levels of stress during the procedure⁶ and fear of this procedure and its afterward revascularization have been reported in 60% of patients.⁷ The main reasons for this fear include fear of death, potential problems, lack of knowledge of environmental change, and fear of changes in postoperative lifestyle.⁸ Also, hospitalization and waiting for surgery are major sources of stress and tension in these patients.⁹ Moreover, patients with preoperative stress experience more postoperative pain, less relief of symptoms, reduced physical capacity, dissatisfaction with treatment, more re-admission, lower improvement and lower level of quality of life after

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surgery.¹⁰ High stress before surgery also impairs the patient's coping mechanisms.^{11,12} Hence, coronary angiography can be accompanied with psychological problems in addition to physical complications. Thus, it is necessary to reduce stress in these subjects using appropriate physical and psychological interventions. It is believed that medication might not be the best way to reduce stress because of its related adverse events.^{12,13}

In the past decade, interest in various forms of alternative medicine for patients, families, and health care professionals had been increasing. These complementary medicine interventions can be successfully used to reduce patient stress particularly in anxious patients undergoing interventional procedures.¹⁴ Massage therapy and reflexotherapy are common interventions that are used in alternative medicine to facilitate health promotion and patient care in medical centers.¹⁵ International Center for Complementary and Alternative Medicine has divided interventions in this medicine into five categories of replacement therapy, interventions in mind, body biologic therapy, energy therapy, and therapy based on manipulation of the body manually such as massage therapy and reflexotherapy.¹⁶

Considering the fact that non-pharmacological interventions are used in reducing symptoms of stress especially in patients who are candidate for cardiac interventions, we aimed to examine the effect of massage therapy and reflexotherapy on the management stress in this group of patients.

Materials and Methods

In this randomized clinical trial, 75 consecutive patients were included who were candidate for coronary angiography in Hajar hospital in Shahrekord, Iran, in August 2013. The main inclusion criteria were age older than 18 years, orientation in place, time, and environment, lack of mental retardation, blindness and deafness, absence of active psychological disorders or use of anti-stress drugs within recent 48 hours, absence of severe systemic illnesses, no previous history of hemorrhage, epilepsy, thrombosis, kidney or gall bladder stones, and no history of arthritis, burns, wounds and fractures in the limbs. All subjects provided written informed consent, and the Shahrekord University of Medical Sciences ethics committee approved our protocol.

The study subjects were randomly assigned to receive reflexotherapy, massage therapy, or no intervention as the control (with an ineffective

massage and reflexotherapy) before angiography. In the first group, the procedure of reflexotherapy was first described to the patients and before the starting the procedure, vital signs were measured by a nurse who was aware of the type of the intervention. Reflexotherapy was done for each patient for 30 minutes, first for the left foot and then for the right foot (15 minutes each). Initially, the relaxation method was used from the footstalk toward the sole (plantar surfaces) at the beginning of the session. Then, four major plantar reflexology points (solar plexus, pituitary, heart and liver) were put under pressure using the thumbs.¹⁷ Other reflexology parts of the plantar surface of the foot were also massaged and the intervention was put to an end with massaging the solar plexus by the researcher. The vital signs were measured again after finishing the intervention.¹⁸ In the second group, massage therapy was done by similar physiotherapist throughout the protocol and consisted of neck, shoulder and back massages for 20 minutes. The massages were started with light compression by the inner regions of the fingers and progressed to hard compression. Manual kneading, friction (i.e., digital compression with the thumb) on trigger points, cervical traction, followed by organization in all planes (e.g., front, back, and sides). The massage was finished with light manual compression. Vital signs were also assessed at the beginning and the end of the maneuvers. The control group received only routine intervention including resting for 30 minutes before angiography. The study was registered in Iranian Randomized Control Trial (IRCT) (IRCT2016101719316N3).

The preoperative medical measurements consisted of obtaining information regarding the patients' demographics, personal characteristics, and duration of disease using a special questionnaire. The Spielberger State-Trait Anxiety Inventory was used to determine patient stress level before any intervention. The questionnaire included 20 items on the basis of 4-point scale with the scores ranging from 0 (absence) to 3 (severe). The cutoff scores for stress are as follows: < 20 no anxiety; 20-39 mild; 40-59 moderate, and > 60 severe.¹⁹ The validity and reliability of the questionnaire were assessed by Hazavehei et al.,²⁰ and Rymazewska and Kiejna.²¹ The test-retest reliability ($r = 0.97$) and validity of the Persian version of the questionnaire was described by Molavi Vardanjani et al.²² The vital signs of the subjects (body temperature, pulse rate, respiratory rate, blood pressure were) were also measured immediately before and after angiography

and recorded in third study questionnaire.

Temperature was measured orally using classic glass thermometer. The heart rate was determined using a software peak detector. Blood pressure was measured through the catheter at cath lab. Respiratory rate was measured by counting breathes for 60 s using a timer.

Results were presented as mean \pm standard deviation (SD) or median (interquartile range, IQR) for quantitative variables and were summarized by frequencies and percentages for categorical parameters. Continuous variables were compared using one-way analysis of variance (ANOVA) or non-parametric Kruskal-Wallis test whenever the data did not appear to have normal distribution or when the assumption of equal variances was violated across the groups. Normal assumption was tested with Kolmogorov-Smirnov test. Categorical variables were compared using chi-square test or Fisher's exact test when more than 20% of cells with the expected value of less than 5 were observed. The difference in study variables after interventions was compared using the paired t-test or Wilcoxon test. The statistical software SPSS software (version 20.0, IBM Corporation, Armonk, NY, USA) was used. P-values of 0.05 or less were considered statistically significant.

Results

The study groups who received reflexotherapy, massage therapy, or routine intervention were similar in terms of baseline characteristics including male gender distribution (36.0%, 56.0%, and 60.0%, respectively, $P = 0.215$, Table 1). Regarding vital signs at baseline, the mean systolic blood pressure was significantly similar in the three study groups

both before and after the interventions (Table 2). Although means of three indices of diastolic blood pressure, heart rate, and respiratory rate were significantly higher in those patients who received reflexotherapy compared with other two groups before interventions, but there were no differences in these parameters across the three groups after interventions. Improvement in vital parameters of diastolic blood pressure, heart rate, and respiratory rate was shown in the reflexotherapy group.

The mean body temperature was comparable in the three groups before interventions, while it was significantly lower in the two groups which received reflexotherapy or massage therapy compared with the control group (Table 2). With regard to the changes in stress level, the subjects who received reflexotherapy had higher level of stress compared with other two groups at the baseline, however, following interventions the level of stress in reflexotherapy group decreased slightly in comparison with other study groups (Table 2). Furthermore, applying reflexotherapy and massage therapy led to reduced stress level in the two groups (Figure 1).

Discussion

According to our findings of this study and regarding beneficial results of reflexotherapy on vital sign following angiography, improvement in some of vital parameters including diastolic blood pressure, heart rate, and respiratory rate was shown in the group that received reflexotherapy, while these effects were not clearly observed following other interventions including massage therapy and routine care.

Table 1. Baseline characteristics of the study participants stratified by intervention group

Characteristics	Reflexotherapy	Massage therapy	Routine method	P
Age (year)	67.2 \pm 11.8	67.0 \pm 11.1	64.7 \pm 12.1	0.702
Disease duration (year)	4 (1.5-8.5)	3 (1.0-4.0)	4 (1.5-5.0)	0.273
Gender [n (%)]				0.215
Male	9 (36.0)	14 (56.0)	15 (60.0)	
Female	16 (64.0)	11 (44.0)	10 (40.0)	
Occupation state [n (%)]				0.057
Housekeeper	14 (56.0)	11 (44.0)	10 (40.0)	
Self-employed	3 (12.0)	12 (48.0)	8 (32.0)	
Employed	2 (8.0)	0 (0.0)	2 (8.0)	
Retired	6 (24.0)	2 (8.0)	5 (20.0)	
Education level* [n (%)]				0.073
Illiterate	17 (68.0)	14 (56.0)	10 (40.0)	
Sub-diploma	3 (12.0)	9 (36.0)	12 (48.0)	
Diploma	2 (8.0)	2 (8.0)	2 (8.0)	
College degree	2 (12.0)	0 (0.0)	1 (4.0)	

Analysis of variance and chi-square test were used; P-values of 0.05 or less were considered statistically significant

* Tukey's post hoc analysis was used

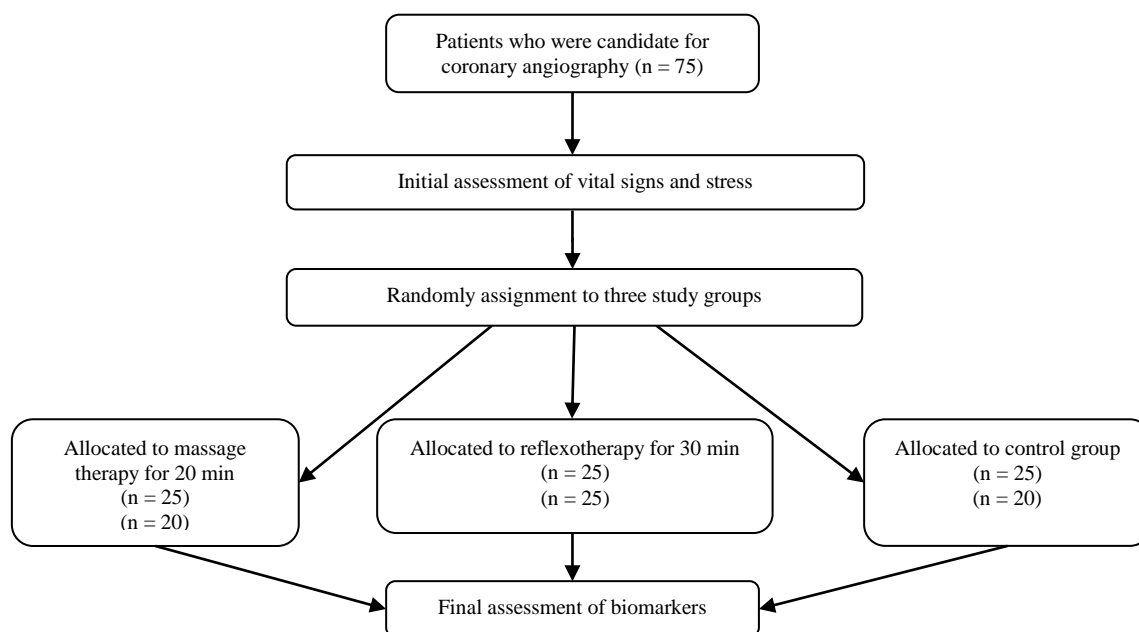
Table 2. The difference in the vital signs before and after study interventions

Characteristics		Reflexotherapy	Massage therapy	Control group	P
Systolic blood pressure	Before intervention	144.40 ± 27.60	140.80 ± 16.00	132.60 ± 16.70	0.129
	After intervention	139.60 ± 26.40	137.80 ± 15.20	132.60 ± 16.40	0.443
	Difference	4.80 ± 3.67	3.00 ± 3.22	0.00 ± 1.44	< 0.001
	P	< 0.001	< 0.001	> 0.999	
Diastolic blood pressure	Before intervention	86.60 ± 13.50	76.40 ± 12.10	77.80 ± 8.20	0.005
	After intervention	82.40 ± 13.00	75.40 ± 11.30	76.60 ± 8.38	0.064
	Difference	4.20 ± 5.89	1.00 ± 2.88	1.20 ± 3.61	0.017
	P	0.002	0.096	0.110	
Temperature	Before intervention	36.90 ± 0.27	36.90 ± 0.22	37.00 ± 0.14	0.068
	After intervention	36.80 ± 0.26	36.80 ± 0.22	37.00 ± 0.15	0.008
	Difference	0.70 ± 0.13	0.06 ± 0.11	0.02 ± 0.21	0.543
	P	0.009	0.016	0.574	
Respiratory rate	Before intervention	20.80 ± 2.10	20.10 ± 1.90	18.20 ± 0.80	0.608
	After intervention	18.60 ± 1.40	18.50 ± 1.30	18.20 ± 0.80	< 0.001
	Difference	-2.30 ± 1.30	-1.60 ± 1.10	-0.04 ± 0.90	< 0.001
	P	< 0.001	< 0.001	0.824	
Heart rate	Before intervention	82.40 ± 4.70	79.80 ± 4.40	78.20 ± 5.50	0.013
	After intervention	76.20 ± 4.80	75.00 ± 4.30	77.80 ± 5.50	0.163
	Difference	6.30 ± 2.56	4.76 ± 2.79	0.40 ± 2.50	< 0.001
	P	< 0.001	< 0.001	0.438	
Stress	Before intervention	60.60 ± 7.20	51.40 ± 6.80	47.80 ± 9.60	< 0.001
	After intervention	34.70 ± 4.70	39.70 ± 4.80	46.50 ± 9.20	< 0.001
	Difference	25.90 ± 5.94	11.70 ± 5.00	1.40 ± 1.80	< 0.001
	P	< 0.001	< 0.001	0.438	

P-values of 0.05 or less were considered statistically significant;

In fact, reflexotherapy could effectively reduce diastolic blood pressure, heart rate and also respiratory rate leading to higher level of relaxation in these patients as well as lower risk of hemodynamic instability during this procedure.

However, the change in systolic blood pressure was not significant following reflexotherapy. Similar to our results, Molavi Vardanjani et al. showed reflexology can decrease the stress level before coronary angiography.²²

**Figure 1.** Consort chart for the study

The influence of reflexotherapy in hemodynamic parameters has been reported to be unclear. Moeini et al. similarly showed that the average heart rate and respiratory rate per minute had slightly decreased after reflexotherapy.²³ McVicar et al. indicated significant decrease in the systolic blood pressure and heart rate, but not diastolic blood pressure after reflexotherapy.²⁴ Park et al. also showed that reflexotherapy resulted in decreased systolic blood pressure but not diastolic blood pressure.²⁵ Besides, Quattrin et al. in a study on patients with cancer indicated significant decrease in all indices including systolic blood pressure, diastolic blood pressure, heart rate and respiratory rate after 30 minutes of reflexotherapy.¹⁶ According to the central role of autonomic system on regulating vital signs in response to physical, psychological, and environmental stimulates, it is suggested that the effects of reflexotherapy on improvement of these vital parameters are via parasympathetic processes. Kuhn et al. believed that reflexotherapy causes relaxation in hyperactive areas of the body and stimulates the passive areas and consequently causes a balance and relaxation of the body.²⁶ Furthermore, Fritz revealed that manipulating foot in reflexotherapy induces the activity of the parasympathetic nervous system.²⁷ Moreover, the slight effects of massage therapy on improving vital signs can also be related to its impact on autonomic system. Results of Fritz study showed that massage therapy promotes a significant decrease in cortisol level from the baseline (31% on average) and increases active neurotransmitters such as serotonin (28% on average) and dopamine (31% on average).²⁷ Mean stress score was 60.6 ± 7.2 before intervention which is much less compared to the 91.4 ± 21.2 reported in a study done by Quattrin et al.¹⁶ McVicar et al. demonstrated that reflexotherapy has an effect on anxiety and could be able to decrease the stress,²⁴ that was a predictable result, since anxiety, unlike state type, is not a short-term state and needs long-time intervention. In this research also the stress reduced after reflexotherapy. Another study was designed to evaluate the effect of reflexotherapy on mental stress. Their study revealed that there were significant decreases in blood pressure after reflexotherapy.²³

Massage therapy may also promote parasympathetic activation,²⁸ which causes reductions in heart rate, blood pressure, and breathing, increase the release of hormones (e.g., endorphins), and decrease in stress level.^{18,29} In this line, it seems that the effects of both reflexotherapy

and massage therapy on reducing the level of stress is strongly associated with its effect as parasympathetic stimulator. Also, the physical effects of these interventions can mediate their beneficial effects on mental relaxation leading to reduction in stress.

Conclusion

In conclusion, our study demonstrates that scheduling reflexotherapy before coronary angiography can help to stabilize vital sign as well as reduce the level of stress within this procedure, and may lead to better outcome and lower rate of complications. However, the effect of massage therapy is limited to reducing the level of stress.

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Conflict of Interests

Authors have no conflict of interests.

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