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Comparing the Effect of Foot Reflexology Massage, Foot Bath and Their Combination on Quality of Sleep in Patients with Acute Coronary Syndrome

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ABSTRACT

Introduction: Many patients in coronary care unit (CCU) suffer from decreased sleep quality caused by environmental and mental factors. This study compared the efficacy of foot reflexology massage, foot bath, and a combination of them on the quality of sleep of patients with acute coronary syndrome (ACS).

Methods: This quasi-experimental study was implemented on ACS patients in Iran. Random sampling was used to divide the patients into four groups of 35 subjects. The groups were foot reflexology massage, foot bath, a combination of the two and the control group. Sleep quality was measured using the Veran Snyder-Halpern questionnaire. Data were analyzed by SPSS version 13.

Results: The mean age of the four groups was 61.22 (11.67) years. The mean sleep disturbance in intervention groups (foot reflexology massage and foot bath groups) during the second and third nights was significantly less than before intervention. The results also showed a greater reduction in sleep disturbance in the combined group than in the other groups when compared to the control group.

Conclusion: It can be concluded that the intervention of foot bath and massage are effective in reducing sleep disorders and there was a synergistic effect when used in combination. This complementary care method can be recommended to be implemented by CCU nurses.

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Introduction

Acute coronary syndrome (ACS) is the most common type of heart disease globally that requires hospitalization.[1] Unstable coronary artery plaque is the major cause of ACS. This syndrome can be presented as sudden cardiac arrest due to ischemia and tachyarrhythmia.[1,2]

ACS refers to all cardiac events caused by decreased blood flow to the coronary artery caused by atherosclerosis and acute arterial occlusion from thrombosis and embolism.[3,4]

Coronary artery disease and its complications are the most common cause of death in developed countries.[3,5] The world health organization (WHO) reported in 2002 that 22% of deaths globally and 37% of deaths in Iran were caused by cardiovascular disease.

This percentage in Iran reached 41.3% in 2005 and it is predicted to reach 44.8% by 2030.[6] Many patients in CCU complain of decreased sleep quality caused by environmental and mental factors. Studies have shown that sleep quality of hospitalized ACS patients decreases in the first three days in intensive care units because of monitors' alarms, lights, sounds of instruments and ventilators, ongoing care to other patients, the effects of sedatives and inotrope drugs, severity of disease and the wakening of patients in the early morning when they still

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require sleep.[7] Sleep is a basic human need that is required to maintain energy and physical health. It plays an important role in cardiovascular function and its disturbance causes anxiety disorders, restlessness, nervousness, increased heart rate, and increased myocardial oxygen demand that forms a dangerous cycle. The most common treatment for lack of sleep is the use of medication, but literature review shows that there is no significant difference in sleep quality between those who used medication and those who do not.[8]

Studies have shown that sleep disorders observed in patients with acute myocardial infarction include short sleep duration, difficulty in falling asleep, and multiple and lengthy waking during the night. These symptoms are more common than general population and affect the physical and mental health and recovery of patients.[9] The body relaxes during sleep, regains its lost energy, and prepares for physical and intellectual activity. Physical and psychological illness interfere with sleep and cardiovascular disease frequently produces sleep disorders in patients.[10,11] Moreover, insomnia may result in increased heart rate, stimulates heart contractions and increases the heart muscle's demand for oxygen. Given that cardiovascular disease, especially coronary artery disease, causes sleep disturbances that increase myocardial muscle oxygen demand, and increases the risks of myocardial infarction (MI) and the incidence of dysrhythmia. Therefore some strategies should be implemented for resolving for sleep disorders.[12]

Massage therapy is a popular method of alternative medicine. It is the systematic and scientific manipulation of the soft tissues and muscles of the body to promote their maintenance, performance and healing, and improve desirable therapeutic outcomes such as mental and psychological relaxation to increase comfort and healing.[13] Massage therapy is the most commonly-used form of complementary medicine and is an easy, safe, non-invasive, and relatively inexpensive method.[14,15] One theory about foot reflexology massage is that psychological stress is responsible for 75% of problems and health complications in humans. More than 7000 nerves exist in each foot; when manipulated by foot massage, these are stimulated to reduce the stress and relax the body, resulting in body equilibrium. In Chinese medicine, massage is carried out to improve life energy through the release of serotonin and melatonin neurotransmitter mediators, which decreases fatigue, resolves depression and improves sleep.[11] Reflexology has been a useful method of nursing care for several hundred years in China, Egypt and India.[16] The review of literature indicates that massage therapy is an ancient treatment method that can bring about major improvement in pain, anxiety and muscle stress.[17]

Foot baths have been shown to improve the sleep of patients admitted to Japanese hospitals.[18] Oshvandi concluded that the sleep quality of cardiac patients improved after foot massage.[6] Namba reported that foot baths improved the quality of sleep in ICU hospitalized patients.[18] The mechanism behind the effect of foot baths heve not been fully understood, but soaking feet in warm water stimulates tactile sensations and reduces sympathetic nerve activity.[15] Moreover, warm foot baths may increase peripheral blood flow and peripheral temperature due to heat loss without increasing the central body temperature, hastening the onset of sleep and improving the quality of sleep.[19] Soaking feet in warm water appears to be more effective than bathing the entire body to facilitate the onset of sleep and increase sleep quality. It is frequently recommended for the disabled, retired persons and patients with cardiovascular disease.[13]

Sleep disturbances are more common in patients hospitalized in CCU which have the negative impact on the cardiovascular system and on physical-mental health. Because studies have reported positive effects for foot massage and foot baths on sleep, these techniques were tested both separately and in combination in the current study as a possible new and

improved form of intervention. Few studies have examined the effect of foot baths on sleep quality in cardiac care patients. The current study assessed the efficacy of the two methods and also their combined effect on ACS patients admitted to Baqiyatallah Hospital in Iran.

Materials and methods

This quasi-experimental study was conducted on four groups of male patients. A total of 140 subjects were selected from ACS patients admitted to the men's ward in the CCU of Baqiyatallah Hospital (Tehran) using the convenience sampling method. The inclusion criteria were a confirmed diagnosis of ACS and the patient being alert and able to provide informed consent. Exclusion criteria were the presence of a skin disease, eczema or any wound on the area treated by massage and foot baths, diabetes or neuropathy, use of sedatives or general anesthesia within the previous 12 hours, ejection fraction (EF) of less than 40% and addiction to stimulatory drugs, alcohol, narcotics or sedatives. The subjects were randomly assigned to four groups of 35 persons. Group A received foot reflexology massage, group B received foot bath, group C received a combination of the two methods, and group D was the control group without intervention. The interventions was began on the second night of hospitalization and continued for the third night for each group.

Before intervention, patient demographic data was collected by self-administered questionnaires and the quality of patient sleep was determined using the Veran Snyder-Halpern subjective sleep quality questionnaire.[20] This scale is a 15 items scale for assessing the quality of sleep in hospitalized patients. It measures participant understanding of sleep during the previous night. Each item is rated from 0 to 100. The scale includes sub-scales that assess sleep disturbance (interruption and delay in sleep; rated 0-500), efficacy (ease of falling asleep, vigor upon waking; rated 0-400), and additional sleep (daytime naps; rated 0-700). Higher scores for sleep disturbance and additional sleep indicate greater sleep disorder. Arab et al., assessed the validity of this scale in Iran with a score of CVI= 91.66 and its reliability by interclass correlation coefficients with Cronbach's alpha of 0.78.[21]

The interventions were applied by a nurse using the same method each time. The procedure for the intervention and control groups began on the second night of hospitalization before bedtime. Sleep quality was measured at 8 AM the following morning. This was repeated on the third night and mean patient sleep over the course of the second and third days was compared before and after intervention.

- Group A (foot reflexology massage): Rotational massage of the solar plexus point was performed on both feet (Between the upper third and lower two-thirds bottom of foot) for 10 minutes.
- Group B (foot bath): The patient is seated in semi-sitting position to immerse the feet in 40°C water up to 10 cm above the ankle without washing or massage for 10 minutes.
- Group C (combination): First, foot reflexology massage was performed and then the foot bath was performed as described above.
- Group D: No intervention: The study was approved by Ethical Committee of Baqiyatallah University of Medical Sciences. Moreover, the confidentiality of patient information was observed throughout the study and patient participation in the study was voluntary.

In this study, descriptive and inferential analyses using frequencies, mean (SD), chi-square, and ANOVA test were used.

Results

The frequency distribution of acute coronary syndrome showed that STEMI (ST Elevation Myocardial Infarction) had the highest frequency; however, the results showed no significant difference between the four groups ($P > 0.05$), making them homogeneous (Table 1). The mean age of the four groups was 61.22 (11.67) years and the mean age of the

combined group was highest, although there was no significant difference between groups (P>0.05), making them homogeneous (Table 2).

There was no significant difference in mean score of sleep disturbance of the four groups before intervention (P>0.05). Mean sleep disturbance during the second and third nights decreased significantly in the three intervention groups as analyzed by ANOVA (P<0.05). The results showed a more significant decrease in sleep disturbance in the combined group than in the other groups. The decrease in sleep disturbances in the control group was significantly less than other three groups during the second and third nights of hospitalization (P<0.05). The Tukey post-hoc test indicated that the difference in sleep disorder scores was only significant between the control and the combined groups (P=0.001) as shown in Table 3.

Table 1. Distribution of the samples according to ACS's type

ACS	Foot reflexology massage N (%)	Foot bath N (%)	Combination N (%)	Control N (%)	Statistical indicator
Unstable angina	12 (34.3)	12 (34.3)	13 (37.1)	11 (31.4)	X^2=0.346
ST elevate MI	13 (37.1)	14 (40)	13 (37.1)	14 (14)	df=6
Non ST elevate MI	10 (28.6)	9 (25.7)	9 (25.7)	10 (28.6)	P=0.999
Total	35 (100)	35 (100)	35 (100)	35 (100)	

Table 2. Comparison of mean age (SD) of groups

Groups	Mean (SD)†	ANOVA
Foot reflexology massage	61.4 (12.9)	df=3
Foot bath	59.6 (11.6)	F=0.418
Combination	62.6 (10.8)	P=0.740
Control	61.3 (11.4)	

†Mean (Standard Deviation)

Table 3. Comparison of the average score of sleep disturbance between four groups

	Pre-intervention		Second night		Third night		ANOVA§	
Groups	**Mean (SD)†**	**95%CI***	**Mean (SD)**	**95%CI**	**Mean (SD)**	**95%CI**	**Within group**	**Between group**
Foot reflexology massage	327 (138.8)	279.38-374.79	220.8(130.8)	175.89-265.81	159.1(102.5)	123.91-194.37	P=0.000	df=3 F=5.002 P=0.003
Foot bath	319 (125.2)	275.98-362.01	215(112.9)	176.21-253.78	164(120.7)	122.56-205.49	P=0.000	
Combination	326 (99.6)	291.92-360.36	167(98.6)	133.59-201.37	83.2(49.8)	66.07-100.32	P=0.000	
Control	310.2 (21.1)	276.15-353.30	286.2(130.3)	241.41-331.03	276.2(128)	231.95-320.50	P=0.017	
Test ANOVA	df=3 F=0.141 P=0.935		df=3 F=5.889 P=0.001		df=3 F=20.03 P=0.000			

†Mean (Standard Deviation), *Confidence interval, §Repeated measures

This study showed that the mean difference of sleep disturbance after intervention was significantly different between groups at different times (P<0.05). The Tukey test showed that this difference was between the control group with the other groups and that the difference between the control and combined group was greater than for the other groups. There was no difference between the foot massage and foot bath groups (Table 4).

Improvement was shown in supplementary daytime sleep in the three intervention groups, with a significant difference between combined group and the control group (P<0.05) (Table 5).

Discussion

According to the results, STEMI was the most common type of ACS. This type of ACS has dangerous complications and the results in Table 2 indicate that the study groups was at relatively high risk age (59-62 years). This makes it necessary for health sector managers to take this issue seriously. Potluri showed that 25294 out of 929465 adult patients had ACS (mean age of 67 years and 64.2% male); during

Table 4. Comparison of the effectiveness of intervention on average score of sleep disturbance between four groups

Groups	Pre-intervention		Second night		Third night		ANOVA§	
	Mean (SD)†	95%CI*	Mean (SD)	95%CI	Mean (SD)	95%CI	Within group	Between group
Foot reflexology massage	313.8(74.1)	288.33-339.26	366.8(66.7)	343.58-390	396.7(52.3)	378.72-414.69	P=0.000	df=3 F=6.96 P=0.00
Foot bath	316.7(56.7)	297.23-336.19	326.6(51)	345.09-380.15	399.6(47.7)	383.26-416.04	P=0.000	
Combination	318.4(59.4	297.86-338.7	385.5(55.6)	366.4-404.62	425(42.3)	410.58-439.64	P=0.000	
Control	320.9(56.2)	301.62-340.26	322.9(57.8)	303.10-342.84	327(62.3)	305.57-348.42	P=0.017	
Test ANOVA	df=3 F=0.141 P=0.970		df=3 F=7.101 P=0.000		df=3 F=23.15 P=0.00			

†Mean (Standard Deviation), *Confidence interval, § Repeated Measures

Table 5. Comparison of the average score of supplementation sleep in samples

Groups	Pre-intervention		Second night		Third night		ANOVA§	
	Mean(SD)†	95%CI*	Mean(SD)	95%CI	Mean(SD)	95%CI	Within group	Between group
Foot reflexology massage	128.7 (77.2)	102.17-155.25	95 (87.4)	68.03-121.96	75 (80.1)	47.47-102.52	P=0.000	df=3 F=4.153 P=0.008
Foot bath	126.7 (71.6)	102.48-151.05	90 (76.7)	67.19-113.72	76.8 (78.5)	49.90-103.86	P=0.000	
Combination	126.9 (68.1)	103.49-150.33	65.6 (45)	50.22- 81.14	23.5 (30.5)	13.05- 34.03	P=0.000	
Control	129.2 (70.9)	104.83-153.56	125.6 (71.9)	100.89-150.30	123.4 (67.2)	100.28-146.51	P=0.017	
Test ANOVA	df=3 F=0.141 P=0.999		df=3 F=4.716 P=0.004		df=3 F=12.91 P=0.000			

†Mean (Standard Deviation), *Confidence interval, §Repeated Measures

their study follow-up period, 38.2% of patients died of ACS.[1]

Norouzzade and Heidari reported no significant difference in the frequency of STEMI, NSTEMI, and unstable angina between groups for ages either above or below 65 years.[3]

The results indicates that there was no significant difference between the four groups for sleep disturbance, sleep efficiency, and additional sleep before intervention. After intervention, a significant difference was observed on the second and third nights of hospitalization between groups, indicating that the interventions had a positive effect on sleep quality in all areas. The analysis showed a significant difference between the combined and control groups. The repeated-measures ANOVA showed significant differences between groups for the effect of intervention over time. This effect was significant for all three areas of sleep quality between the combined and control groups. It can be concluded that the interventions of foot baths and massages were effective in decreasing sleep disorders. When these interventions were used in combination, the significant effect was doubled.

The results of current study have similar aspects and differences with results of previous studies. Oshvandi et al., studied the effect of foot massage on sleep quality and found a significant difference between mean scores for quality of life before and after foot massage in the experimental group (P= 0.002).[6] They also found that the sleep quality of cardiac patients improved with foot massage. They concluded that this method is an inexpensive method, without complications and is easy to administer. Moreover, they found an improvement in the quality of sleep in patients with cardiac ischemia. Bagheri-Nesami et al., studied the impact of foot massage on sleep quality in patients with ischemic heart disease admitted to the CCU and concluded that acupressure had a therapeutic effect on improving the quality of sleep in patients with ACS.[8]

Ariamanesh et al., reported that foot massage improved the quality of sleep and nocturnal sleep duration was prolonged by using this technique.[22] The assessments in

these studies were only for the effects of foot massage, while the present study examined foot massage and foot bath separately and in combination on ACS patients.

Namba et al.,[18] found that in the ICU, patients reported better sleep after foot bath.[17] Namba et al.,[18] conducted the study on ICU patients, while the current study was performed on patients with coronary heart disease, but the results of both study were similar. Cutshall et al., studied 58 patients after cardiac surgery and found that pain, anxiety, and stress decreased significantly in patients who received foot massage.[17]

Valizadeh et al., noted an improvement in the quality of sleep in both foot bath and reflexology intervention in the elderly patients, although there was no statistically significant difference between groups.[23] Seyyedrasooli et al., found that both foot bath and reflexology improved the quality of sleep in seniors, but the foot bath had a greater effect.[24] Nerbass et al., found that patients in the massage therapy group had a higher level of comfort than in the control group.[25] They noted a decrease in fatigue of patients during the recovery period after CABG surgery. Massage therapy was effective and promoted the quality of sleep.

The results of these studies showed that foot bath and foot massage has a good effect on the sleep of patients. The results of the present study is consistent with those results. Some studies reported that the foot bath was more effective for improving sleep than foot massage and some studies reported that the two methods had similar effects.

The major difference between this study and previous studies was that the current study combined the interventions of foot bath and massage for ACS patients and found that the combined group showed better results than a single method. It is also recommended that similar research should be carried out in women patients.

Conclusion

Combined foot reflexology massage and foot baths could be used as an inexpensive, simple, and effective nursing intervention with a synergistic effect for improving sleep disorder of patients with acute coronary syndrome. The results suggests that this complementary care method is effective for administration by CCU nurses. It is a simple method that can be completed in a short time, is inexpensive and useful for decreasing sleep disorders. This study was performed in males and patients with various ACS that is the limit. Recommended that a study be conducted with other conditions.

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Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

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