

Effect of Foot Reflexology Massage and Foot Bath on the Sleep Quality of Patients with Acute Coronary Syndrome: A Comparative Study

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Received 2016 October 01; Accepted 2016 November 15.

Abstract

Objectives: Cardiovascular diseases, especially coronary artery diseases, result in sleep disturbance. Myocardial muscle oxygen demand rises in sleep disturbance. Also, the possibility of cardiovascular risks such as re-infarction and dysrhythmias increases. As a result, removing sleep disorders is very important. The current study aimed at assessing the effect of foot reflexology massage and foot bath methods on sleep quality of the patients with acute coronary syndrome (ACS) through a comparative study.

Methods: The current semi-experimental study was conducted on 3 groups of patients with ACS admitted to coronary care units (CCUs) of Baqiyatallah (AJ) hospital of Tehran, Iran. Samples of the study included 35 patients for each group (105 patients in all the groups) selected among the available hospitals and divided into 3 groups (foot reflexology massage, foot bath, and control) through random allocation. According to the related program, patients of the intervention groups were under intervention for 2 nights from the 2nd night of hospitalization and sleep quality was assessed through Verran and Snyder-Halpern (VSH) subjective sleep quality questionnaire before and after the intervention. Then, data analysis was done through SPSS version 21 by descriptive and inferential statistics.

Results: There was no significant statistical difference among the 3 groups regarding sleep disturbance and supplementary sleep after interventions ($P > 0.05$), but there was a significant statistical difference between the groups and at different time regarding the effectiveness after intervention ($P < 0.05$). The obtained results indicated that each of the interventions alone can result in improvement of sleep quality, but there was no significant statistical difference among them.

Conclusions: Foot massage and foot bath positive effect on the sleep quality of patients with ACS can be used as a complementary action.

Keywords: Acute Coronary Syndrome, Foot Bath, Foot Reflexology Massage, Sleep Quality

1. Background

Acute coronary syndrome (ACS) is one of the most common cardiovascular diagnoses worldwide, which requires hospitalization. ACS includes myocardial infarction with ST-segment elevation, myocardial infarction without ST-segment elevation, and unstable angina (1). Unstable coronary artery plaque is the most common cause of ACSs and it can appear as the myocardial infarction with ST-segment elevation, myocardial infarction without ST-segment elevation, and unstable angina; it can also appear as sudden heart attack due to ischemia caused by tachyarrhythmias (2).

ACS includes all the cardiac events due to decreased coronary artery blood flow following atherosclerosis and acute occlusion of arteries due to thrombosis and embolism (3, 4). Acute artery disease is the most common cause of death in the developed countries, which is based on coronary artery disease and its acute complications (4, 5). According to the world health organization (WHO) in 2002, 22% of deaths in the world and 37% of deaths in

Iran were due to cardiovascular diseases; this amount increased to 41.3% in 2005 and unfortunately, it is predicted that this amount increases to 44.8% in 2030 (6).

Many patients with the experience of hospitalization in CCU had decreased sleep quality, considering the psychological and environmental factors. About 56% of the patients are deprived of sleeping at the end of the first day of hospitalization (7, 8). According to the studies, patients with ACS have low sleep quality in the first 3 days of admission. Comfortable sleep is difficult for the patients hospitalized in CCUs and it is because of monitoring, units lights, noise due to taking care of other patients, mechanical ventilation, nurses' frequent walking, using sedatives and inotrope, disease severity and patients' waking early in the morning; although patients need more sleep in such units. It is clear that hospitalization can significantly disrupt sleep pattern. Sleep is one of the basic human needs and it is necessary to conserve energy, appearance, and physical well-being. Sleep plays an important role in cardiovascular performance and results in decreasing causes

of intensifying anxiety, irritability, anger, increased heart rate, and myocardial oxygen demand in a dangerous and repeated cycle. The most common method to treat or deal with sleep problems is using drugs. Considering the studies, there is no significant difference in the sleep quality of the patients using the drugs and the ones not using them (9).

Considering the results of previous studies, it is observed that there are several indicators of sleep disturbances in patients with acute myocardial infarction such as short duration of night sleep, trouble in falling asleep, several and long waking up during the night, which is observed in such patients more than normal people and influences physical and psychological health and improvement of such patients (10).

In the study by Moradi et al. on 200 patients with heart failure who filled out the questionnaire related to sleep quality, only 21% had good sleep quality (11). In the study by Nieseh et al., on patients with ACS, 63.35% of the samples of the study had inappropriate sleep quality (12). Schiza et al., reported that patients had low sleep quality in the first 3 days of admission after ACS occurrence (7). In the study by Chen et al., the prevalence of sleep disturbances was 74% in patients with heart failure (13).

The body rests during sleep, gains its lost energy, and prepares for physical and intellectual activity again. Physical and mental health problems intervene in the people's sleep and cardiovascular diseases are one of them (12, 14).

Insomnia increases heart contraction speed, stimulates heart power, and finally increases heart muscle oxygen demand. As cardiovascular diseases, especially coronary artery diseases, cause sleep disturbance, and considering that sleep disturbance increases myocardial muscle oxygen demand and the possibility of cardiac risks such as re-infarction and dysrhythmia, it can be concluded that removing sleep disturbance is really important (15).

One of the most popular methods of complementary medicine is massage therapy and it is in the 3rd rank among the complementary medicine in terms of the prevalence of use by patients. Massage therapy is a systematic and scientific manipulation of soft tissues and body muscles to help maintenance, performance, healing, and achieving health outcomes including relaxation resistant, mental relaxation, creating comfort, and healing; its elements are easy, safe, non-aggressive, and relatively cheap (16, 17). Massage is one of the most professional nursing actions (18), which results in mutual transfer of energy between patient and therapist, and it is used as the general manipulation of the soft tissues of the body to return the metabolic balance of the tissue (19).

One of the theories regarding foot reflexology massage is that since psychological pressures and tensions are the

cause of 75% of the human health problems, and there are more than 7000 nerves in each foot, feet massage and stimulating their nerves reduce tension and create relaxation, and as a result the body balance happens. According to the Chinese beliefs, massage improves life energy through releasing serotonin and melatonin neural interface; therefore, it results in feeling less fatigue and improvement of depression and sleep (14). It is several hundred years that reflexology massage is used as a useful method in countries such as China, Egypt, and India (20). According to the studies, massage therapy is an ancient therapy, which results in major improvement in anxiety and muscle tension pain; it should be noticed that massage therapy by an experienced therapist is a safe and sound method (21).

In a study by San et al., on 58 patients underwent cardiac surgery, pain, anxiety, and tension significantly decreased in the ones who received massage (21). The study by Hoseinabadi et al., showed that acupuncture improves sleeping in the elderly; they suggested acupuncture as a non-pharmaceutical method to the elderly people with sleep disorder (22).

Foot bath is one of the methods to promote sleep improvement in hospitalized patients in Japan (23). Mechanism of foot bath is not clear yet, but soaking foot in warm water stimulates sense of touch and reduces sympathetic activity; the cause of this reduction is not clear yet, but reduced sympathetic nerve activity is the main mechanism of increased comfort and reduced pain in patients (17). Foot warm bath may increase peripheral blood flow and also peripheral temperature due to heat loss without increasing core body temperature, and improves falling asleep and sleep quality (24). It seems that soaking feet in warm water is more effective than taking a bath in terms of facilitating falling asleep and increasing sleep quality; it is recommended to people with disabilities, elderly, and also patients with cardiovascular disease (25).

In a study by Namba et al., on patients admitted to ICU, better sleep after foot bath was reported by the patients (23).

According to the Roy adaptation model, human beings are considered as bio-psychological systems adapted with their environment changes; according to this model, nurses' role is promoting patient's adaptation and regulating stimulants, which influence adaptation (26, 27).

Considering the problem of sleep disturbance in patients hospitalized in CCUs, and also the negative effect of insomnia on the cardiovascular system performance, physical-mental health level, and recovery of the patients with coronary artery diseases, and considering that the previous studies reported positive effects of each of the foot massage and foot bath methods on improving sleep, the current study aimed at identifying the effects of the 2

methods on modifying sleep in patients with ACS admitted to CCUs, under the specific physical and cultural conditions of Iran.

2. Methods

The current semi-experimental study was conducted on 3 groups of patients. Samples of the study were selected among patients with ACS hospitalized in CCU of Baqiyatalah (A) Hospital through convenience sampling method; 105 patients were selected according to the inclusion criteria, which were voluntary consent, lack of skin disease, eczema, and any wound in the massage area and foot bath, not receiving hypnotic drugs and intravenous narcotics, and also general anesthesia 12 hours prior to the study, the patients' alertness and awareness of the time and place, ejection fraction (EF) above 40%, lack of underlying diseases influencing sleep, lack of severe neuropathy, and not accustomed to using drugs and alcohol. Samples were randomly selected and divided into 3 groups of 35: Group A (foot reflexology massage), group B (foot bath), and group C (control group, without intervention). The researcher attended the study environment by the approval of medical ethics committee. Researchers' intervention program was started from the 2nd night of admission. Sampling for every group was done during 2 nights after explaining the aims and the method of the study, and obtaining informed consent.

Patients' demographic data were collected by a researcher-made questionnaire before intervention; also, patients' sleep status was determined by Verran and Snyder-Halpern (VSH) subjective sleep quality questionnaire.

It is a 15-item visual scale used to evaluate hospitalized patients' sleep quality. This scale measures participants' understanding of the last night sleep. Every item includes 0 - 100 score and the participants mark their understanding of the last night sleep. This scale includes main sleep scales, disturbance (interruption or delay in sleeping), effectiveness (the amount of good sleep, person's happiness after sleep), and supplementary sleep (snooze and sleep during a day); total scores of this scale are 0 - 700, 0 - 500, 0 - 400. Disturbance included measuring the interruptions in sleep and delay in falling asleep, efficacy included quality (sleep depth and sleep comfort), and supplementary sleep included snooze and going back to sleep after awakening in the morning. In terms of disturbance and supplementary sleep, higher scores indicated more sleep disturbance.

In Iran, Arab et al., calculated the validity of the tool (CVI = 91.66) and its reliability based on internal correlation coefficient and by Chronbach's alpha $\alpha = 0.78$ (26).

Researcher's intervention on the groups of the study was performed from the 2nd night of patient's admission before sleep, as follows:

Group A: Foot reflexology massage and solar plexus rotating massage (Quan Yang district) were done on the patient's both feet (in the middle of the foot, between 1.3 of the upper and 2.3 of the lower metatarsus) for 10 minutes.

Group B: In the foot bath group, patients were in the semi-upright position and immersed their feet up to 10 cm above the ankle in the 40°C water for 10 minutes without any foot washing and massage.

Group D: With no intervention. Patients' sleep quality was measured the next day at 8:00 AM; it was repeated for 2 nights, the sleep average of the last 2 days of the patient as the amount of sleep after intervention was compared on the last day with those of before intervention. Considering the type of study and variables, SPSS 21 software, descriptive statistical tests (average and standard deviation), and inferential statistical tests (Chi-square, ANOVA, Tukey post hoc test, and RM-ANOVA) were used.

3. Results

Initially, quantitative variables were assessed according to groups of the study in terms of normal distribution through Kolmogorov-Smirnoff (KS) test. All the variables had normal distribution; therefore, data analysis was done by parametric tests. The study assessed 105 people and the frequent distribution of the groups of the study in terms of ACS is indicated in [Table 1](#). As it can be observed, ST-elevated myocardial infarction (ST-elevated MI) had the highest frequency compared with the other 2 groups. Also, the results indicated that there was no significant difference between the groups ($P > 0.05$); in other words, the groups were homogeneous. The frequency distribution of the study groups according to the mean age is indicated in [Table 2](#). The statistical test showed that the groups were not significantly different in terms of mean age ($P > 0.05$). In other words, the 3 groups were homogeneous.

[Table 3](#) indicates that the average of sleep disturbance of the 3 groups was not significantly different before intervention ($P > 0.05$). In other words, the groups were homogeneous before intervention in terms of sleep disorder. Also, the average of sleep disturbance in the 2 groups of intervention was less and less respectively during the 2nd and the 3rd nights and the difference was significant according to ANOVA test ($P < 0.05$). The decreasing sleep disorder during the 2nd and the 3rd nights of hospitalization was little in the control group, but there was no significant difference between this group and the other 2 groups in terms of decreased sleep disturbance ($P < 0.05$). Tukey post hoc test also showed that the difference between foot

Table 1. Frequency Distribution of the Study Samples Based on ACS

Group	Foot Massage		Foot Bath		Control		Type of Test
	Number	Percent	Number	Percent	Number	Percent	
Unstable angina	12	34.3	12	34.3	11	31.4	= 0.175 χ^2 , df = 4, P = 0.996
ST-Elevated MI	13	37.1	14	40	14	40	
Non-ST-Elevated MI	10	28.6	9	25.7	10	28.6	
Total	35	100	35	100	35	100	

Table 2. Comparing the Groups of the Study Based on Age

Age	Mean (SD)	ANOVA Test
Group		
Foot massage	61.4 (12.9)	df = 2, F = 0.328, P = 0.721
Foot bath	59.6 (11.6)	
Control	61.7 (10.4)	

bath group and the control group ($P = 0.09$) was more than that of the massage and control group ($P = 0.11$) in the inter-group evaluations.

Table 4 shows no difference between the 3 groups in terms of sleep efficacy average before intervention ($P > 0.05$). Therefore, the groups were homogeneous in this regard. Meanwhile, there was a significant difference between the 3 groups in terms of sleep efficacy average after intervention ($P < 0.05$). Results of Tukey post hoc test showed that this difference was related to the difference of control group with all the groups; the difference between the control and foot bath groups was more than that of the other group, but the difference was insignificant. There was no difference between the massage and foot bath groups.

Table 5 shows no difference in the 3 groups before intervention in terms of supplementary sleep average ($P > 0.05$); therefore, the groups were homogeneous in this regard. Also, supplementary sleep average in the 2nd and 3rd nights of intervention in the massage and foot bath groups were improved, but the difference was insignificant in the control group and there was no significant difference between the groups. Tukey post hoc test showed that the difference between foot bath and control groups was more than that of foot massage and control groups, although the difference was insignificant.

4. Discussion

Findings of the study indicated that among the study groups in terms of ACS frequency, ST-elevated MI group had

the highest frequency, compared with the other 2 groups (Table 1). In other words, it can be said that this type of ACS was more common in the study population. Considering the importance of ACS and that of the study samples were relatively older and in more dangerous age group (59 to 62 years old), the health managers should consider the problem. This result was similar to that of the study by Taghipour et al., on comparing the clinical symptoms of heart attack in the middle-aged and elderly people that the number of patients with ACS with ST-elevated MI was 52.73% (28); it was not similar to the results of the study by Norouzzadeh and Heidari. In their study, there was no statistical significant difference between the frequency of myocardial infarction report with ST-segment elevation, myocardial infarction without ST-segment elevation, and unstable angina pectoris between the 2 age groups above and below 65 years (4).

In the current study, the effect of foot massage and bath on sleep quality of patients with ACS was assessed; results indicated in tables 3 to 5 showed that each of the methods alone improved sleep quality, but these 2 methods were not statistically significant and one was not preferred to another. These results were similar to those of the study by Aryamanesh et al., regarding the effect of foot massage on night sleep quality of patients undergoing hemodialysis; this study was conducted on 18 patients referring to hemodialysis ward of Shohada and ShahidRahimi hospitals of Khoramabad in 2014. The tools included Pittsburg questionnaire and sleep chart form; the sleep status of the samples of the study who had the sleep problem was assessed by these tools at nights before and after massage. Educational intervention in the current study included foot massage for 10 minutes during dialysis, 3 times per week for 4 consecutive weeks. The changes in Pittsburg score showed that foot massage influenced sleep quality in the experimental group and resulted in increased night sleep; totally, patients' status was improved every week compared to the previous week by repeating the intervention (29). The study by Asltooghi et al., was conducted on 100 retired postmenopausal females in Hamadan; cases were divided into 2 reflexology

Table 3. Comparing Sleep Score Average in the Groups of the Study^a

Sleep Score	Before Intervention	The 2nd Night of Hospitalization	The 3rd Night of Hospitalization	RM-ANOVA Test	
				Intergroup	Intergroup
Group					
Foot massage	327 (138.8)	220.8 (130.8)	159.1 (102.5)	P = 0.000	df = 2, F = 2.806, P = 0.065
Foot bath	319 (125.2)	215 (112.9)	164 (120.7)	P = 0.000	
Control	310.2 (125.3)	286.2 (130.4)	276.2 (128)	P = 0.017	

^aValue are expressed as mean (SD).

Table 4. Comparing the Average Score of Sleep Efficacy in the Study Groups^a

Sleep Score	Before Intervention	The 2nd Night of Hospitalization	The 3rd Night of Hospitalization	RM-ANOVA Test	
				Intergroup	Intergroup
Group					
Foot massage	313.8 (74.1)	366.8 (67.7)	396.7 (52.3)	P = 0.000	df = 2, F = 5.590, P = 0.005
Foot bath	316.7 (56.7)	362.6 (51)	399.6 (47.7)	P = 0.000	
Control	320.9 (56.2)	322.9 (57.8)	327 (62.3)	P = 0.017	

^aValue are expressed as mean (SD).

Table 5. Comparing the Average Score of Supplementary Sleep in the Study Groups^a

Sleep Score	Before Intervention	The second Night of Hospitalization	The third Night of Hospitalization	RM-ANOVA Test	
				Intergroup	Intergroup
Group					
Foot massage	128.7 (77.2)	95 (78.4)	75 (80.1)	P = 0.000	df = 2, F = 1.791, P = 0.172
Foot bath	126.7 (70.6)	90 (67.7)	76 (78.5)	P = 0.000	
Control	129.2 (70.9)	125.6 (71.9)	123.4 (61.2)	P = 0.017	

^aValue are expressed as mean (SD).

massage and non-specialized massage; the intervention was done for 21 days with 15 minutes massage for every day, and finally sleep disturbance decreased in every intervention, but there was no statistical significant difference between reflexology massage and unspecialized massage (30), which was inconsistent with the current study results.

In the study by Bagheri et al., on 60 patients with ACS in Mazandaran heart center, reflexology points' massage, which was Quan Yang District in the foot, improved sleep quality of patients with ACS (9). In the study by Shvandi et al., on 60 patients with ischemic heart disease in the CCU of Ekbatan Hospital, patients were divided into 2 groups of 30 cases; routine medical treatment was applied in the

control group and in the intervention group foot massage was used in addition to medical treatment; there was a significant difference between the 2 groups after intervention, and foot massage improved sleep quality (6), which was consistent with the results of the current study. The study of Kashani et al., on the patients with breast cancer showed that massage therapy improved their sleep quality (31). Oliveira et al., evaluated the effect of massage on postmenopausal females with insomnia; this study showed that anxiety and depression decreased after intervention and also the sleep quality improved (32). The study by Williams et al. aimed at determining the effect of massage with essential oils on falling asleep, sleeping time, and sleep disorders in 12 children with autism; results showed

that massage did not improve sleep quality in the children with autism (33). It is possible that massage could be more effective in the case of being done at home and with long-term intervention; also, the sample size was small.

In the study by John et al., on 72 patients with cancer bone metastases, massage therapy did not cause any significant difference after the intervention (34), which was different from the current study results. As patients had experienced skeletal pain in this study, skeletal pain was interfering with massage therapy; it seems that increasing massage therapy sessions can have useful effects.

A study by Namba et al. on patients admitted to ICU showed better sleep after foot bath in the patients (23). The study of Young regarding the effect of foot bath on relieving fatigue and insomnia in patients with gynecological cancers (cervical cancer, ovarian cancer, and endometrial sarcoma), who were under chemotherapy, foot bath in 41°C to 42°C water relieved fatigue significantly and also improved sleep quality (35). A polysomnography study by Liauo et al. on 43 elderly showed that foot bath in 40°C water for 20 minutes does not influence sleep quality (36). Among the limitations of the current study, it can be pointed out that the study was conducted only in 1 medical education center in Tehran. In order to generalize findings to other areas, it is necessary to conduct more studies in other areas of the country. Another limitation of the study was the impossibility of controlling complications of the prescribed drugs by the physicians, which may have sedative effects and the impossibility of completely controlling the physical conditions of the ward, which may influence patients' sleep.

4.1. Conclusion

Foot bath and massage methods alone can improve sleep quality in patients with ACS; foot bath and foot massage were not preferred to one other. It is suggested to assess the effect of combined foot bath and massage methods in the further studies.

Acknowledgments

This article was part of a nursing thesis and was financially supported by the deputy of research and technology at Atherosclerosis Center of Baqiyatallah (AJ) Medical Sciences University. The authors appreciate research deputy of the nursing faculty of Baqiyatallah (AJ) Medical Sciences University, patients with ACS who participated in the study, and authorities of CCU of Baqiyatallah (AJ) hospital.

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