The Effect of Acupressure on Preventing Constipation in Patients with Acute Myocardial Infarction under Primary Percutaneous Coronary Intervention

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Abstract

Background:
Cardiac patients are prone to experiencing constipation. The main purpose of the present study was to assess the effect of acupressure on preventing constipation in patients with acute myocardial infarction (AMI) under primary percutaneous coronary intervention.

Methods:
The present randomized clinical trial was conducted on 90 patients with AMI (30 patients in each group) who were randomly allocated based on inclusion criteria. The intervention was carried out among the patients with AMI on the acupressure points SJ6, LI4, ST25, and SP6 two times a day (10 am and 6 pm) for three sequential days.

Results:
On the first and second days of the study, all of the patients had no defecation, and the first defecation occurred on the third day of the study. In the intervention, sham, and control groups, 93.3%, 46.7%, and 50.0% had normal defecation on the third day of the study, respectively. The results of the Chi-square test revealed significant differences among the three groups ($P<0.001$).

Conclusion:
The results of the present study showed that patients with AMI in the intervention group had significant improvement in terms of stool consistency based on the Bristol stool scale. So, acupressure can be used as a nursing intervention in critical care units.

Keywords:
Acupressure, Cardiac patient, Constipation, Complementary medicine, Ischemic disease

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Introduction

Constipation can be defined as abnormal and painful defecation and also, less than three-times defecation during the week, and generally as a lack of self-reported satisfactory defecation.[1] The prevalence of constipation is different according to the patient's condition. In a systematic review, the incidences of constipation in patients with stroke in the acute and

rehabilitation phases were 45% and 48%, respectively.[2] In another study that was conducted in an intensive care unit (ICU), 45.1% and 31.8% of the patients had no defecation 3 and 6 days after admission, respectively.[3] In cardiac patients, constipation can lead to increased intracranial pressure and stimulate the vagus nerve and bradycardia.[4] Cardiac patients are prone to experiencing constipation.[5] This may be increased in patients admitted to cardiac care units (CCUs) due to immobilization, administration of narcotics, diuretics, and also calcium channel blockers.[6-8] Also, people who have low intestinal movement and use laxatives may experience more cardiac disease.[9] Lactulose and magnesium hydroxide are commonly used in critical care units. Lactulose induces hypokalemia, and magnesium hydroxide increases the level of magnesium. Both can change the heart rhythm and cardiac hemodynamics.[10]

Nursing care has a holistic approach, and complementary therapies can respond to this aspect of care.[11] Acupressure is a non-invasive application of pressure on special areas of the body that are named energy meridians, and people can do it themselves.[12] Acupressure can balance the energy, so it has beneficial effects according to the acupressure point.[13] Several studies were conducted that revealed the beneficial effect of acupressure on the constipation of patients. A systematic review conducted on patients with leukemia revealed that acupressure had positive effects on constipation.[14] Another study showed sweet potato, footbath, and acupressure had a positive effect in preventing constipation in patients with acute coronary syndrome.[15] A study revealed the positive and significant effect of acupressure on chronic constipation in patients undergoing hemodialysis.[16]

Regarding the prevalence of constipation in cardiac patients, poor prognosis and the negative effect of constipation on these patients, and also the differences between acute myocardial infarction (AMI) and other patients in terms of medication and immobilization, assessing the effect of acupressure on preventing constipation of AMI has high priority. The literature review showed that most of the studies assessed the effect of acupressure on chronic constipation and had not prevented the approach. So, the main purpose of the present study was to assess the effect of acupressure on preventing constipation in patients with AMI under primary percutaneous coronary intervention.

Material and Methods

Sample and sampling method

The present randomized clinical trial was conducted in a heart center affiliated with Mazandaran University of Medical Sciences, Sari, Iran.

The inclusion criteria consisted of (1) patients with AMI whose heart attacks did not last for more than 12 hours and were confirmed by a cardio-intervention specialist, (2) did not have chronic constipation based on Rome IV scale, (3) age≥18 years, (4) no known psychological, thyroid, gastrointestinal, neuromuscular, and renal disorder based on patients' history and physical examination by physician, (5) no addiction to any addictive substances, (6) absence of wounds, organ defects, allergies and fractures in the areas of acupressure, (7) not participating in other interventional studies simultaneously, (8) ability to communicate verbally, and (9) providing written informed consent to participate. The exclusion criteria were: (1) patients who needed laxatives other than routine medications such as magnesium hydroxide, (2) willingness to leave the study, (3) discharge or transfer the patient to another ward or center in order to continue treatment, and (4) diarrhea, nausea, vomiting, and other gastrointestinal disorders, malaise, and death of the patient during the study. The sample size was calculated as 28 patients for each group according to the mean and standard deviation of defecation frequency after intervention (intervention group:13.73±3.63 vs. control group:10.06±3.77) reported in the study[16] and a 95% confidence coefficient. Ultimately, 30 patients were considered for each three groups due to the possibility of sample attrition of 10% during the study using sampling formula (Eq. 1). Also, a randomized block design was considered (15 blocks, six patients in each group) (Figure 1).

$$n = \frac{[Z_{1-\alpha/2} + Z_{1-\beta}]^2 [S_1^2 + S_2^2]}{(X_1 - X_2)^2} \qquad \text{Eq. (1)}$$

Measurement instruments

The data collection tools included a sociodemographic questionnaire, Rome IV scale, Bristol stool scale, and patient control checklist.

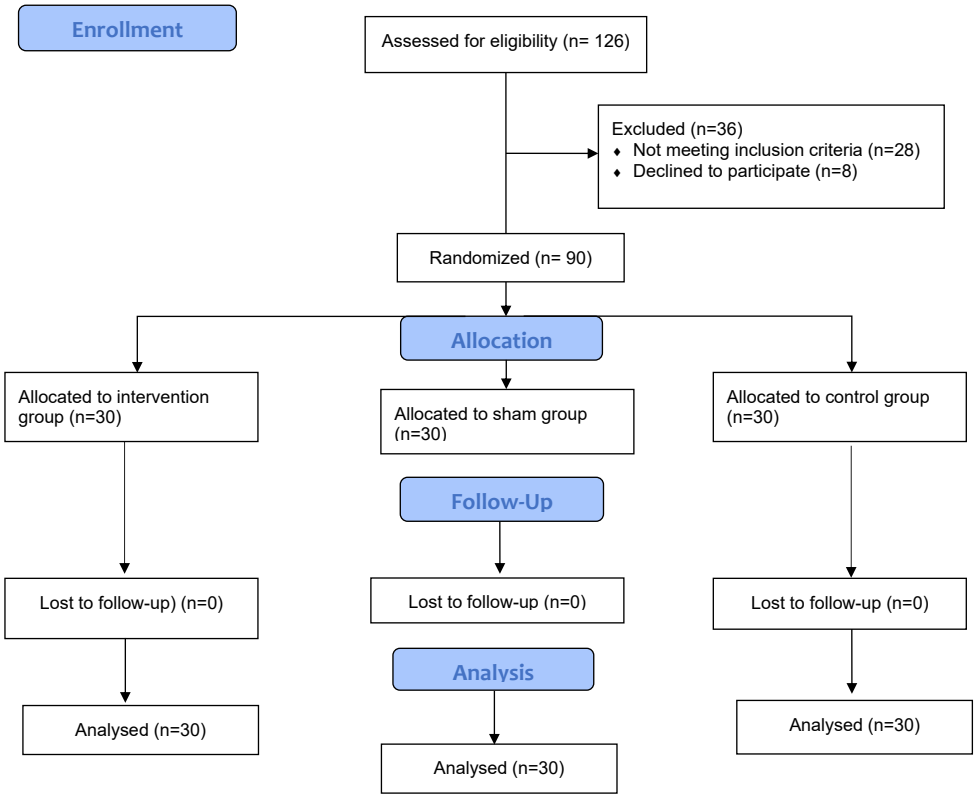

Figure 1. CONSORT flow diagram of the study

A sociodemographic questionnaire was completed before the intervention to collect data, including age, sex, smoking, activity, diet, defecation pattern, and history of physical and psychological disorders.

The Rome system was established in 1991 as a standardized criterion for the diagnosis of gastrointestinal disorders. In 2006, the Rome III criterion was introduced for diagnosing constipation. In 2016, a new version of the scale was introduced under the name Rome IV and straining to evacuate lumpy or hard stools, a sensation of incomplete evacuation, a sensation of anorectal obstruction/blockage, and manual maneuvers to facilitate defecations (for each criterion>25% of defecations). The patient should have the symptoms in the last 3 months, starting at least 6 months earlier, and have at least two of the above criteria.[17,18] The Rome IV scale was completed before the intervention to exclude patients with chronic constipation. According to the Iranian studies that conducted on patients with functional gastrointestinal disorders[19] and healthy people,[20] the Rome scale had good validity. The reliability of the Rome scale was examined in the healthy Iranian population to find the prevalence of gastrointestinal symptoms. The test-retest results showed the Cronbach alpha coefficient values were above 0.7 for all major symptoms.[20]

The Bristol stool scale was used to evaluate the stool consistency and the effectiveness of the intervention, and it was completed on all days of intervention. This scale evaluates the seven types of stool, including type 1: separate hard lumps, like nuts (difficult to pass and can be black), which indicates severe constipation, type 2: sausage-shaped, but lumpy indicates mild constipation, type 3: like a sausage but with cracks on its surface (can be black) indicates normal defecation, type 4: like a sausage or snake, smooth and soft (average stool) indicates normal defecation, type 5: soft blobs with clear cut edges indicates lacking diet fiber, type 6: fluffy pieces with ragged edges, a mushy stool indicates mild diarrhea, and type 7: watery, no solid pieces, entirely liquid indicates severe diarrhea.[21] A study was done on healthy adults, and the correlation between stool water content and the Bristol stool scale was determined using Spearman's correlation coefficient (Spearman's

rho=0.701, $P<0.001$).[22] Another study was conducted on patients with cerebrovascular accidents in Iran, and the reliability was done according to the observation of the three researchers on 10 patients. The Intra-class correlation coefficient of the Bristol stool scale was 0.9.[23]

The patient follow-up checklist assessed data, including mobility status, vital signs, and fluid intake measurements. This checklist was filled out in three groups (intervention, sham, and control) on all days of the study to assess the patients' health status.

Procedure

Prior to implementing the intervention, one of the researchers was trained to learn acupressure massage under the supervision of a specialist in this field. The intervention was carried out among the patients with AMI two times a day (10 am and 6 pm) for three sequential days. In the intervention group, the intervention was conducted on the acupressure points SJ6, LI4, ST25, and SP6 in both parts of the body symmetrically, so that 1-minute vertical pressure with the thumb, then 5 seconds stop to rest and after that 1-minute rotational massage was applied.[24,25] Each session lasted for approximately 9 minutes. The locations of acupressure are as follows: SJ6: On the dorsal aspect of the forearm, on the line connecting SJ4 and the tip of the elbow, 3 cun above the transverse crease of the wrist between the ulna and radius. LI4: the highest spot of the muscle when the thumb and index fingers are brought close together. ST25: In the middle of the abdomen, 2 cun lateral to the umbilicus. SP6: the inside of the leg, just above the ankle. In the sham group, the intervention was carried out at 1.5 cm distance from the major above-mentioned acupressure points. The control group received routine care at the hospital. For all the three groups, routine care for constipation including diet educational training and administration of magnesium hydroxide 10 cc three times a day, was applied.[26]

Data analysis

Statistical analyses were performed using the SPSS software, version 24. Also, descriptive statistics including frequency, percentage, mean and standard deviation were used to describe the data. The chi-square and Fisher exact tests were used to compare the three groups in terms of sex, smoking, physical disease, history of psychotic medication, physical activity, diet, and pattern and frequency of defecation. The ANOVA test was used to compare the three groups in terms of age. The Cochran test was used to assess the trend of defecation changes in each group. $P<0.05$ was considered statistically significant.

Results

The mean age of the participants in the intervention, sham, and control groups were 49.90 (10.26), 51.47 (10.19), and 52.53 (10.84) years, respectively. Most of the participants in the three groups were male (intervention: 24.4%, sham: 17.8%, control: 21.1%) with no history of smoking (intervention: 27.8%, sham: 30.0%, control: 30.0%). Most of the patients with AMI had a history of known physical disease (intervention: 26.7%, sham: 28.9%, control: 26.7%), used cardiac diet (intervention: 28.9%, sham: 23.3%, control: 30.0%) and ability to move alone (intervention: 31.1%, sham: 32.2%, control: 32.2%). Also, most of them had defecation once a day before hospitalization (intervention: 21.1%, sham: 20.0%, control: 18.9%). Statistical tests revealed no significant difference in terms of sociodemographic and medical characteristics among the three groups ($P>0.05$, Table 1).

According to Table 2, none of the participants had defecation during one and two days of the study. But, 96.7%, 96.7%, and 73.3% reported the first defecation on the third day of the study in intervention, sham, and control groups, respectively.

Stool consistency of patients with AMI patients is shown in Table 3. On the third day of the study, the incidence of constipation was 3.3%, 36.7%, and 23.3% in the intervention, sham, and control groups, respectively. Also, 93.3% in intervention, 46.7% in sham, and 50.0% in the control group had normal defecation based on Bristol stool scale. The statistical test revealed a significant difference in terms of stool consistency on the third day of the study ($P<0.001$).

Discussion

The main purpose of the present study was to determine the effect of acupressure on preventing constipation in patients with AMI under primary percutaneous

Table 1. Comparison of the sociodemographic and medical characteristics of patients with AMI among three groups

Variables		Groups			*P* value
		Intervention	Sham	Control	
Gender, No. (%)	Male	22 (24.4)	16 (17.8)	19 (21.1)	0.275*
	Female	8 (8.9)	14 (15.6)	11 (12.2)	
Smoking, No. (%)	Yes	5 (5.6)	3 (3.3)	3 (3.3)	0.661*
	No	25 (27.8)	27 (30.0)	27 (30.0)	
Physical disease, No. (%)	Yes	24 (26.7)	26 (28.9)	24 (26.7)	0.738*
	No	6 (6.7)	4 (4.4)	6 (6.7)	
History of psychotic medication, No. (%)	Yes	3 (3.3)	3 (3.3)	2 (2.2)	0.872*
	No	27 (30.0)	27 (30.0)	28 (31.1)	
Physical activity, No. (%)	Alone	28 (31.1)	29 (32.2)	29 (32.2)	0.770*
	With cane	2 (2.2)	1 (1.1)	1 (1.1)	
Diet, No. (%)	Cardiac	26 (28.9)	21 (23.3)	27 (30.0)	0.095*
	Cardiac-diabetic	4 (4.4)	9 (10.0)	3 (3.3)	
Pattern of defecation before hospitalization, No. (%)	Once a day	19 (21.1)	18 (20.0)	17 (18.9)	0.579
	Twice a day	7 (7.8)	8 (8.9)	11 (12.2)	
	Three times a day	2 (2.2)	0 (0.0)	1 (1.1)	
	Every other day	1 (1.1)	3 (3.3)	0 (0.0)	
	Three times a week	1 (1.1)	1 (1.1)	1 (1.1)	
Age (years), Mean (SD)		49.90 (10.26)	51.47(10.19)	52.53(10.84)	0.619**

* Chi-square, **ANOVA.

Table 2. Comparison of the frequency of defecation of patients with AMI among the three groups during the study

Variable	Days of intervention		Groups			Inter-group comparison, *P* value*
			Intervention No. (%)	Sham No. (%)	Control No. (%)	
Defecation frequency	1st day	None	30 (100)	30 (100)	30 (100)	-
		One and more	0 (0.0)	0 (0.0)	0 (0.0)	
	2nd day	None	30 (100)	30 (100)	30 (100)	-
		One and more	0 (0.0)	0 (0.0)	0 (0.0)	
	3rd day	None	1 (3.3)	1 (3.3)	8 (26.7)	0.006
		One and more	29 (96.7)	29 (96.7)	22 (73.3)	
	4th day	None	0 (0.0)	0 (0.0)	0 (0.0)	-
		One and more	30 (100)	30 (100)	30 (100)	
	Intra-group comparison *P* value**		<0.001	<0.001	<0.001	-

*Fisher exact test ** Cochran test

coronary intervention. The results showed no patients had defecation one and two days after intervention, but significant differences were seen 3 days after acupressure. Also, stool consistency based on the Bristol stool scale showed a significant difference among the three groups after three and four days after the intervention. So, the normal defecation frequencies among intervention, sham, and control groups were 96.7%, 46.7%, and 63.3%, respectively, on the 4th day of the study. The results of the sham group, in comparison with the intervention and control groups, showed not only pressure had no effect on constipation but also pressure on meridian channel energy could improve the intestinal function of patients with AMI.

Similar to the present study, in a study that was conducted on patients with total knee arthroplasty,

Table 3. Comparison of the frequency of stool consistency based on Bristol stool scale one day after the intervention among three groups

Variable	Days of intervention		Groups			Inter-group comparison *P* value *
			Intervention	Sham	Control	
Stool consistency	1st day	No defecation	30 (100)	30 (100)	30 (100)	-
		Constipation	0 (0.0)	0 (0.0)	0 (0.0)	
		Normal defecation	0 (0.0)	0 (0.0)	0 (0.0)	
		Low diet fiber	0 (0.0)	0 (0.0)	0 (0.0)	
	2nd day	No defecation	30 (100)	30 (100)	30 (100)	-
		Constipation	0 (0.0)	0 (0.0)	0 (0.0)	
		Normal defecation	0 (0.0)	0 (0.0)	0 (0.0)	
		Low diet fiber	0 (0.0)	0 (0.0)	0 (0.0)	
	3rd day	No defecation	1 (3.3)	1 (3.3)	8 (26.7)	<0.001
		Constipation	1 (3.3)	11 (36.7)	7 (23.3)	
		Normal defecation	28 (93.3)	14 (46.7)	15 (50.0)	
		Low diet fiber	0 (0.0)	4 (13.3)	0 (0.0)	
	4th day	No defecation	0 (0.0)	0 (0.0)	0 (0.0)	<0.001
		Constipation	1 (3.3)	12 (40.0)	10 (3.3)	
		Normal defecation	29 (96.7)	14 (46.7)	19 (63.3)	
		Low diet fiber	0 (0.0)	4 (13.3)	1 (3.3)	
	Intra-group comparison *P* value **		<0.001	<0.001	<0.001	-

*Fisher exact test, ** Cochran test.

ST25 acupressure point was used. The intervention was performed from one day after the operation for 5 days once a day. The results showed stool consistency had improved after acupressure and abdominal massage, but unlike in our study, the patients in the intervention group defecated earlier than the others.[27] Similar to our study, another study revealed significant improvement in constipation symptoms among advanced cancer after three sequences of day intervention. The last study, similar to ours, used ST25 acupressure point, but unlike our study, the researchers used multiple laxatives such as sennoside, magnesium oxide, primperan, lactulose, bisacodyl, Dulcolax suppositories, and glycerin enema.[28] Another study was conducted on hemodialysis patients with constipation for 4 weeks on LI4, ST36, LIV3, SP15, and CV6. The results showed a significant difference between the two groups in terms of defecation frequency after one week. So the intervention group reported more defecation frequency than the control group. These delays in defecation might be due to the recent study that assessed hemodialysis patients with known constipation, but our study excluded the patients with chronic constipation. On the other hand, the present study was conducted to prevent constipation in patients with AMI.[16]

A study used a combination of the intervention, including sweet potato, footbath, and acupressure, to prevent constipation in acute coronary syndrome patients. Two common acupressure points between this study and ours were SJ6 and ST25. The intervention was carried out one day after admission and ended on discharge day. The results showed that the incidence of constipation was significantly different between the two groups (intervention group: 27.27% vs. control group: 48.98).[15] Similar to the present study, there was no significant statistical difference between the two groups in terms of the first defecation, but unlike in our study, in the last study, the first defecation was different, ranging from one day to three days after intervention whereas all of the patients with AMI experienced the first defecation on the third day after intervention. The recent study used combination therapy that could facilitate preventive objects of constipation. Also, the patients with AMI in our study underwent primary percutaneous coronary intervention

that could complicate conditions and mobility.

A study performed acupressure on the fecal impaction among hemodialysis patients.[29] Their intervention was carried out on SP15, LI4, LIV3, ST36, and CV6 every other day (three times a week) for four weeks. Stool consistency was significantly different in weeks three and four. This latency improvement might be due to the frequency of intervention and different acupressure points. But in our study, the intervention was carried out two times a day for three sequence days. In addition, the last study assessed chronic constipation, unlike our study. Also, hemodialysis patients experience chronic constipation due to fluid and electrolyte imbalances.

Unlike the present study, a randomized clinical trial was conducted on postoperative gastrointestinal function in patients with colorectal cancer using ST36 acupressure point three times a day for five days. The results showed patients undergoing acupressure had significantly earlier flatus passage, and also, the frequency of bowel sounds was significantly higher in comparison to the control group for the first two days after surgery. The outcome of the recent study was different but showed a positive effect of acupressure on intestinal function, which confirms the findings of our study.[30]

A study assessed the effect of acupressure on bowel elimination in patients with skeletal traction. Like the present study, ST25, LI4, and SJ6 were considered, and intervention was carried out two times a day for three sequential days. In the last study, the intervention was carried out on the first day of skeletal traction insertion. The results showed 61.7% of the intervention group and 38.3% of the control group experienced the first defecation within two and three days of the intervention, respectively. But in our study, the first defecation occurred among 96.7% of the intervention group and 73.3% of the control group.[25] This difference might be due to the fact that, in comparison to patients with AMI, skeletal traction could induce more limitations for using a bedpan.

The limitations of the study were that some patients might ignore the sensation of defecation due to the unpleasant sense of defecating in bed during times of complete bed rest, the flat positioning for defecation in hospital, and also fear of bleeding despite equipment such as angiography sheath and sandbag during defecation.

Conclusion

The results of the present study showed patients with AMI in the intervention group had no discrepancy in the frequency of defecation during the study, but they revealed significant improvement in terms of stool consistency based on the Bristol stool scale. So, acupressure can be used as a nursing intervention in critical care units. Similar to the present study, many randomized clinical trial studies that had a sham group showed acupressure had no positive effect in sham comparison with the intervention group and confirmed the effect of acupressure exactly. On the other hand, the meridian channel energy had a positive effect in this regard.[31] It is recommended that further studies add other acupressure points, such as ST 36,[16,29,30] and also add to the frequency of intervention, for example, three times a day instead of two times a day. The present study was the first study that was conducted on patients with AMI, so we designed the intervention two times a day to assess intestinal function. It seems that the frequency of acupressure can be increased to three times a day to achieve normal defecation earlier than in the present study.

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Conflict of Interest

The authors declare no conflict of interest related to this work.

Ethical Approval

The present study was approved by the Ethics Committee of Mazandaran University of Medical Sciences (IR.MAZUMS.REC.1398.1256). It was also registered in the Iranian Registry of Clinical Trials (IRCT20110906007494N31). All the procedure was explained to participants, and signed informed written consent was obtained.

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