

Effect of early rehabilitation nursing care after emergency PCI on hemodynamics and serum inflammatory factors in patients with acute myocardial infarction (AMI).

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Abstract

Objective: To analyse the effect of early rehabilitation nursing after emergency PCI on hemodynamics, quality of life, serum inflammatory factors, lipoprotein related phospholipase A2 (Lp-PLA2), IL-6 and TNF- α in patients with AMI.

Methods: 120 cases of AMI patients treated with PCI were enrolled and divided into control group and study group according to the visiting sequence, and with 60 cases in each group. Patients in the control group received routine nursing care, while patients received early rehabilitation nursing in the study group. Postoperative hemodynamics, quality of life, levels of serum inflammatory factors, lipoprotein associated phospholipase A2 (Lp-PLA2), IL-6 and TNF- α were compared between the two groups.

Results: Before the intervention, there were no significant differences between the two groups in cardiac output, systolic blood pressure, diastolic blood pressure, pulse pressure and heart rate ($p>0.05$). After the intervention, cardiac output of patients in the two groups significantly increased ($p<0.05$) and the average pulse pressure significantly decreased ($p<0.05$). What's more, the improvement degree in the study group was significantly greater than the control group ($P<0.05$). There were no significant changes on systolic blood pressure, diastolic blood pressure and heart rate after the intervention in each group ($p>0.05$). Before the intervention, there was no significant difference on the quality of life and pain scores between the two groups ($P>0.05$). After the intervention, quality of life scores increased significantly and pain scores decreased significantly in the two groups ($P<0.05$), the study group changed more obviously ($P<0.05$). Before the intervention, there was no significant difference in serum levels of Lp-PLA2, IL-6 and TNF- α between the two groups ($p>0.05$). After the intervention, the levels of serum Lp-PLA2, IL-6 and TNF- α were significantly lower than the control group ($p<0.05$).

Conclusion: Early rehabilitation nursing care after emergency PCI in patients with AMI can improve hemodynamics and the quality of life. It can also reduce serum Lp-PLA2, IL-6 and TNF- levels and has certain clinical application value.

Keywords: Early rehabilitation nursing, Hemodynamics, Quality of life, Acute myocardial infarction, Percutaneous coronary intervention, Lp-PLA2.

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Introduction

Acute Myocardial Infarction (AMI) is the most common acute cardiovascular disease, which is mainly caused by lots of myocardial necrosis followed by acute and persistent ischemia and hypoxia of coronary artery. AMI is often accompanied by inflammation reactions, increased myocardial enzyme activities and dynamic changes in ECG. It can be complicated by arrhythmias, shocks or heart failure and often endanger life [1]. Related studies have shown that [2] AMI can lead to hyperplasia of myocardial scars and ventricular remodeling, and can develop to ischemic cardiomyopathy and cardiac failure gradually, which are the main causes of disability and death. The main cause of AMI is acute coronary occlusion, and it can greatly increase the number of viable myocardium if the

infarct related artery can recover quickly and completely. Early recanalization can effectively improve ventricular remodeling and the survival rates of patients with AMI. Previous studies have shown that [3] reperfusion therapy can significantly improve cardiac function and prognosis of patients with AMI. Percutaneous Coronary Intervention (PCI) operation, one of the effective means of reperfusion therapy, can directly unblock the infarct related artery and recover myocardial blood supply. Therefore, it can effectively restrict and reduce the infarct size, protect left ventricular function and improve ventricular remodeling and the near prognosis of patients. However, the traditional method of emergency PCI need puncture at femoral artery and can cause pain, infection, subcutaneous hematoma and other complications. Due to the certain operation risks of PCI, it can cause some psychological

burden to patients and thereby affect the curative effects [4]. Previous studies have also shown that [5] PCI can give patients comprehensive rehabilitation therapy, which can improve the exercise ability of patients and reduce the recurrence of cardiac ischemic events, and have attracted more and more concerns. Relevant data show that [6] early postoperative rehabilitation nursing after PCI can reduce cardiovascular recurrence, promote physical recovery and prevent thrombosis. However, there are few reports on the effects of early rehabilitation nursing intervention after emergency PCI on hemodynamics and serum inflammatory factors in patients with AMI. Here we focused on the effect of early rehabilitation nursing after emergency PCI on hemodynamics, quality of life, serum inflammatory factors, Lipoprotein Related Phospholipase A2 (Lp-PLA2), IL-6 and TNF- α in patients with AMI and results are reported as follows.

Data and Methods

General data

A total of 120 cases of AMI patients who received PCI treatment in our hospital from August 2015 to February 2017 were enrolled and the inclusion criteria were: 1. Patients met the diagnostic criteria of AMI; 2. Patients received emergency PCI treatment; 3. ECG showed ST segment elevation. Exclusion criteria were 1). Patients with severe arrhythmia; 2). Patients with cardiogenic shock; 3). Patients with severe liver and kidney diseases; 4). Patients with previous history of myocardial infarction; 5). Patients with left main coronary artery disease; 6). Patients unable to cope with the research plan of rehabilitation training after operation; 7). Patients unable to tolerate sports training. Patients were divided into the control group and the study group according to the visiting sequence, with 60 cases in each group. Baseline characteristics in the control group were: 34 males, 26 females; ages ranged from 42 to 73 y, the mean age was (55.7 ± 2.2 y). Cardiac function grading: grade I, 28 cases, grade II, 20 cases, grade III, 12 cases; numbers of coronary artery lesions: 25 cases with single lesion, 20 cases of double vessel disease, 15 cases of triple vessel disease. Baseline characteristics in study group: 35 males, 25 females; ages ranged from 41 to 72 y, the mean age was (55.3 ± 1.8 y); Cardiac function grading: grade I, 27 cases, grade II, 21 cases, and grade III, 12 cases. Numbers of coronary artery lesions: 24 cases of single lesion, 19 cases of double vessel disease, 17 cases of triple vessel disease. There was no significant difference between the two groups in sex, age and cardiac function classification at baseline ($p > 0.05$).

Intervention methods

Patients in the control group received routine nursing care: 1. Vital signs nursing. Vital signs of patients were closely monitored, such as body temperature, pulse, respiration, blood pressure, heart rate and so on, and were recorded in detail. If an abnormality occurs, the patient will be treated immediately and the patients were instructed to drink appropriate amount of water and proper infusion. 2. Puncture point nursing: patients

received routine anticoagulant treatment with aspirin 100 mg/d and clopidogrel 75 mg/d and routine postoperative placement of indwelling catheter. Hemorrhage and hematoma were closely monitored.

In the study group, patients received early procedural rehabilitation nursing on the basis of the control group: stage I (first day after surgery). First of all, educate patients about the ward environment and postoperative precautions, and chat with patients to understand their psychological status and provide targeted psychological counselling to ease their tension and fears, and help them gradually adapt to the environment of the ward and further enhance the doctor-patient and nurse-patient relationships, increase patient confidence to overcome the disease and improve patients' compliance with treatment and nursing. Within the 6 h after the operation, patients were required absolute bed rest, and can be massaged at waist or legs if they feel uncomfortable during the 6 h. Alternate the bed flat or raised 15 to 30° to adjust to proper posture. Press the puncture point 6 h after to prevent the occurrence of bleeding or hematoma, and assist patients to master joint activities. Help patients turn over 12 h later. Within 12 to 24 h after the operation, the position requirements are loose and patients are not strictly required to maintain a healthy side extension, but the activity magnitude should not be too large to prevent secondary damage to the injured limb. Stage II (the second day after operation). Patients can be in semi supine or sitting position and guide them to turn over by themselves and respiratory muscle training. Patient can eat in bed, and mainly food rich in vitamin and cellulose food to keep bowels open. Stage III (the third day after operation). In this stage, patients can own simple life activities, such as brush teeth, wash, eat, dress. Let the patient sit on the bed and keep lower limbs droop naturally and last 5-15 min each time. Get out of bed and stand if patient body conditions allow and walk slowly. Training should be stopped immediately if patients feel dizzy, chest pain, shortness of breath, palpitation and other reactions during the process of sports training. Explain relevant knowledge and notes to the patients in the course of training to alleviate the patient's bad mood.

Indexes observed

Hemodynamics: Cardiac output, systolic pressure, diastolic pressure and mean pulse pressure and heart rate; quality of life score: It consists of 4 items, including physical function, social function, psychological function, material life condition, and score each item according to the actual situation of the patients and evaluate the quality of life with a total score, the higher the score, the higher the quality of life; 3. Postoperative pain: the visual analogue scale was used to evaluate this content, the highest was 10 points and the lowest was 0 points. Score this content according to the degree of pain and the higher the score, the more severe the pain. 4. Serum inflammatory factors: detect serum Lp-PLA2 before and after intervention respectively by Enzyme-Linked Immunosorbent Assay (ELISA) and kit was purchased from Tianjin Kang Volcker Biological Technology Co. Ltd. IL-6 and TNF- α levels were

Effect of early rehabilitation nursing care after emergency PCI on hemodynamics and serum inflammatory factors in patients with acute myocardial infarction (AMI)

determined using radioimmunoassay kit which was purchased from Beijing North biotechnology research institute.

Statistical analysis

SPSS 21 statistical software was adopted for data processing. Measurement data are consistent with the normal distribution and homogeneity of variance. The comparisons on measurement data between groups were conducted using t-test and comparisons on enumeration data were conducted using chi square test. $p < 0.05$ means difference was statistically significant.

Results

Comparisons on hemodynamics before and after intervention in the two groups

Before the intervention, there was no significant difference between the two groups on cardiac output, systolic blood pressure, diastolic blood pressure, pulse pressure and heart rate ($p > 0.05$). After the intervention, cardiac output significantly increased ($p < 0.05$) and the average pulse pressure significantly decreased ($p < 0.05$) in the two groups. The improvement

degree of the study group was significantly greater than the control group ($p < 0.05$). There was no significant difference on systolic blood pressure, diastolic blood pressure and heart rate before and after the intervention in the two groups ($p > 0.05$, Table 1).

Comparisons on the quality of life score and pain score before and after intervention in the two groups

Before the intervention, there was no significant difference on quality of life scores and pain scores between the two groups ($p > 0.05$). After the intervention, quality of life scores increased and pain scores decreased significantly in each group ($p < 0.05$) and the improvement degree in the study group was greater than the control group ($p < 0.05$, Table 2).

Comparison on serum inflammatory factors before and after intervention between the two groups

Before the intervention, there was no significant difference on serum Lp-PLA2, IL-6 and TNF- α levels between the two groups ($p > 0.05$). After the intervention, the levels of serum Lp-PLA2, IL-6 and TNF- α in the study group were significantly lower than the control group ($p < 0.05$, Table 3).

Table 1. Comparisons on hemodynamics before and after intervention in the two groups.

Group	N	Cardiac output (L/min)		Systolic blood pressure (mmHg)		Diastolic blood pressure (mmHg)		Pulse pressure (mmHg)		Heart rate (bpm)	
		Before	After	Before	After	Before	After	Before	After	Before	After
Control	60	4.8 ± 1.3	5.3 ± 1.1	129.4 ± 12.8	128.6 ± 7.8	81.4 ± 4.3	79.5 ± 3.7	96.7 ± 5.2	88.6 ±	75.2 ± 8.6	74.4 ± 7.2
Study	60	4.7 ± 1.8	6.8 ± 1.2	130.1 ± 11.5	129.1 ± 6.3	81.5 ± 4.1	82.3 ± 4.4	96.6 ± 4.8	81.2 ±	74.8 ± 7.5	76.3 ± 6.8
t		0.431	6.952	0.306	1.286	0.148	1.103	0.671	7.156	0.857	1.502
p		>0.05	<0.05	>0.05	>0.05	>0.05	>0.05	>0.05	<0.05	>0.05	>0.05

Table 2. Comparisons on the quality of life score and pain score before and after intervention in the two groups.

Group	N	Physical function		Social function		Psychological function		Material life condition		Pain score	
		Before	After	Before	After	Before	After	Before	After	Before	After
Control	60	24.5 ± 3.8	31.6 ± 4.3	22.8 ± 3.4	28.1 ± 4.3	21.4 ± 3.5	31.2 ± 2.2	18.3 ± 2.4	26.7 ± 2.7	6.3 ± 1.5	3.4 ± 0.7
Study	60	24.6 ± 3.6	39.8 ± 4.7	22.6 ± 3.2	36.9 ± 5.2	21.7 ± 3.2	39.1 ± 2.5	18.5 ± 2.6	33.3 ±	6.4 ± 1.6	1.7 ± 0.5
t		0.856	7.043	0.442	7.096	0.473	7.894	0.709	8.002	0.947	6.036
p		>0.05	<0.05	>0.05	>0.05	>0.05	>0.05	>0.05	<0.05	>0.05	>0.05

Table 3. Comparison on serum inflammatory factors between the two groups.

Group	N	Lp-PLA2 (mg/L)		IL-6 (ng/ml)		TNF- α (ng/ml)	
		Before	After	Before	After	Before	After
Control	60	235.6 ± 10.8	187.4 ± 6.5	35.4 ± 2.6	16.7 ± 1.5	31.2 ± 3.8	16.6 ± 1.2
Study	60	236.7 ± 9.5	166.3 ± 5.6	35.6 ± 2.3	10.9 ± 1.8	31.4 ± 3.5	10.5 ± 0.9

t	0.195	6.004	0.512	7.552	0.241	7.069
p	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

Discussion

Nowadays, emergency PCI operation has become the first choice for the treatment of patients with acute myocardial infarction, it can significantly reduce the complications and greatly improve the success rate, and it can also shorten the hospitalization period, save medical costs and improve patients' quality of life [7,8]. Careful observation and nursing and correct health guidance are very important for improving and ensuring the success rate of PCI. Previous studies have shown that [9,10] it means a lot if patients are given early system and overall nursing intervention after PCI, it will help the patients have a good attitude to the treatment and care work. In previous nursing mode [11], it was generally believed that patients need absolute bed rest within 1 w after PCIs to reduce the load on the heart and myocardial oxygen consumption, but with the deep study for treatment and the improvement of nursing mode, it is generally believed that patients can be given early rehabilitation exercise training and proper exercise can effectively alleviate the excessive activation of the sympathetic nervous system, so as to improve the curative effect of [11,12].

Patients in the study group were given early rehabilitation nursing intervention, and were compared with the routine nursing care. Cardiac output after the intervention group was significantly bigger than that before the intervention and control group. The average pulse pressure of the two groups significantly decreased after the intervention, and the study group decreased much more significantly. There was no significant difference on quality of life scores and pain scores before the intervention between the two groups. After the intervention, quality of life scores increased and pain scores decreased significantly, and the changes in the study group were more obvious. These results suggested that early rehabilitation nursing intervention can improve heart reserve capacity and cardiovascular work efficiency to a certain extent after PCI surgery, and can improve the quality of life and reduce postoperative pain, so as to be beneficial to the outcome and prognosis of the disease. The reason may be that early postoperative rehabilitation nursing intervention is beneficial to the expansion of peripheral blood vessels, blood pressure reduction and blood flow increase, so as to improve myocardial blood flow and function. Also, muscle contraction will also help increase the return to the heart in the process of sports training.

Inflammatory response plays a key role in the formation and progression of acute myocardial infarction [13,14]. Lp-PLA2 is a newly found specific marker of inflammation which is independent of traditional cardiovascular risk factors. The expression of Lp-PLA2 increased in the core area of vulnerable atherosclerotic plaques and peripheral macrophages in acute myocardial infarction patients and is a new marker of plaque

stability [15]. Lp-PLA2 hydrolysis oxidized low density lipoproteins to produce carbachol (lysoPCs) and oxidized free fatty acids. Lysophosphatidylcholine, as a pro-inflammatory mediator, can stimulate adhesion molecules and promote the formation of other cytokines, it can attract macrophage accumulation and further evolve into foam cell apoptosis, and then accumulate to form atherosclerotic plaques [16]. At the same time, it can promote the increased release of inflammatory cytokines, degrade smooth muscle cells of the fibrous cap and collagen matrix, and induce the apoptosis of vascular endothelial cells and smooth muscle cells. Thinning of fibrous cap of plaques promote the vulnerable plaque rupture, leading to thrombosis and acute cardiovascular events. TNF- α and IL-6 have extensive biological effects as pro-inflammatory cytokines [17], and increased significantly in AMI patients, predicting a high risk of death. IL-6 can activate neutrophils and increase the secretion of Matrix Metalloproteinases (MMPs) and TNF- α in the fibrous cap of coronary atherosclerotic plaques, resulting in increased plaque instability. The results of this study show that before the intervention, there was no significant difference between the two groups on serum Lp-PLA2, IL-6 and TNF- α levels ($p>0.05$). After the intervention, the levels of serum Lp-PLA2, IL-6 and TNF- α were significantly lower than the control group ($p<0.05$). It suggested that early rehabilitation nursing intervention for patients with AMI after emergency PCI can reduce the levels of serum Lp-PLA2, IL-6 and TNF- α , so as to achieve the purpose of relieving the patient's condition.

In summary, early rehabilitation nursing intervention after emergency PCI can improve the hemodynamics of patients, improve the quality of life and reduce serum levels of Lp-PLA2, IL-6 and TNF- α on patients with AMI, and it has certain clinical application value.

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Effect of early rehabilitation nursing care after emergency PCI on hemodynamics and serum inflammatory factors in patients with acute myocardial infarction (AMI)

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