

Original Article

Clinical efficacy of early cardiac rehabilitation nursing for patients with acute myocardial infarction after interventional therapy

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Abstract: Objective: Our aim was to explore the clinical efficacy of early cardiac rehabilitation nursing in patients with acute myocardial infarction (AMI) after interventional therapy. Methods: We selected and divided 120 patients with AMI after interventional therapy into the rehabilitation nursing group (n=60) given early cardiac rehabilitation care and the conventional nursing group (n=60) given routine care, using a random number table. The cardiac function classification, left ventricular ejection fraction, left ventricular end-diastolic dimension, self-rating depression scale and self-rating anxiety scale scores, Barthel index, complication rates and nursing satisfaction were compared between the two groups. Results: The cardiac function, psychological indexes (self-rating depression scale and self-rating anxiety scale scores), Barthel index, complication rates, and nursing satisfaction were all markedly better in the rehabilitation nursing group than in the conventional nursing group (all $P < 0.001$). Conclusion: Early cardiac rehabilitation nursing for patients with AMI after interventional therapy can effectively improve the cardiac function, ameliorate negative psychological status, improve quality of life and patient compliance, and reduce complication rates.

Keywords: Early cardiac rehabilitation nursing, acute myocardial infarction, interventional therapy, clinical effect

Introduction

Acute myocardial infarction (AMI) is common in the cardiovascular system, mostly induced by myocardial cell necrosis resulting from acute and persistent hypoxia and ischemia [1-3]. Its prevalence continues to increase and the mortality rate remains high. According to statistical data, the mortality rates of AMI in rural and urban areas in China are as high as 74.72/100,000 and 58.69/100,000, respectively [4-6]. Due to its minimal invasion and rapid recovery, percutaneous coronary intervention (PCI) has been widely used in clinical practice, effectively ameliorating the postoperative quality of life and prognosis [7-10]. In addition, early cardiac rehabilitation nursing can enhance cardiac function, quality of life, and postoperative recovery of patients with AMI through a variety of rehabilitation interventions [11-14]. It is reported that early rehabilitation nursing markedly alleviates symptoms,

relieves anxiety, and reduces complication rates in middle-aged and elderly patients with AMI [15].

However, more attention is generally given to the rescue and treatment of AMI, rather than cardiac rehabilitation nursing care after the onset of disease and cardiac surgery. Therefore, we further investigated the clinical effects of cardiac rehabilitation nursing in patients with AMI after interventional therapy.

Materials and methods

Research subjects

A total of 120 patients with AMI who received PCI in The Third Affiliated Hospital of Southern Medical University from December 2017 to December 2018 were enrolled and divided into the rehabilitation nursing group (n=60) and the conventional nursing group (n=60) using a

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random number table. The conventional nursing group had 35 males and 25 females with an average age of (59.36±3.27) years, while the rehabilitation nursing group had 31 males and 29 females with an average age of (60.28±2.82) years. All patients voluntarily signed the written informed consent, and ethical approval for this study was given by the Ethics Committee of The Third Affiliated Hospital of Southern Medical University.

Inclusion and exclusion criteria

Patients were included if they were diagnosed with AMI according to the criteria issued by Chinese Society of Cardiology [16]; received PCI through the radial or femoral artery approach; didn't who respond well to medications with chest pain of more than 0.5 h and received PCI within 12 hours of symptom onset; those without severe complications and good communicative ability, Killip classification and physical activity assessment.

Additionally, patients aged over 80 years with high-risk conditions (e.g., malignant arrhythmia, cardiogenic shock), vital organ dysfunction, severe mental illness, malignant tumors, or severe anemia were excluded. Those lost to follow-up with incomplete clinical data were also excluded.

Nursing methods

The conventional nursing group received routine cardiac care after PCI, i.e., giving basic clinical care and monitoring the patients' condition; performing routine drug therapy according to medical orders and gradually increasing physical activity after 3 days of bed rest. In addition to the conventional nursing care, the rehabilitation nursing group was also given cardiac rehabilitation care, i.e., medication guidance, health guidance, exercise guidance, dietary nursing and regular follow-up.

In terms of medication guidance, the patients were given personalized medication according to the doctor's advice, monitored for medication use and adverse events, and helped to understand the medication plan so as to enhance medication compliance.

In terms of health guidance, the occurrence and development of diseases as well as the

treatment processes were introduced to the patients to improve their awareness about AMI, helped to relieve negative emotions and enhance patient compliance with the treatment and nursing care.

In terms of exercise guidance, the patients were instructed to perform an exercise training program in accordance with different interventional approaches (trans-radial PCI or trans-femoral PCI).

Nursing for trans-radial PCI patients: The patients were instructed to conduct simple movement of limbs and joints, and deep breathing exercise during bed rest within 6 h after surgery; they were encouraged to sit up, brush their teeth, eat and defecate spontaneously at 6-12 h after surgery; were motivated to stand up and walk at the their bedside at 12-24 h after surgery. At 1 day after surgery, the patients attempted to sit in a bedside chair three times a day (less than 30 min each time). At 2-3 days after surgery, they walked slowly in the ward area for about 40 meters three times a day (10 min each time). At 4 days after surgery, the patients were helped to walk to the bathroom, encouraged to increase the walking distance to 100 meters, and taught to measure the pulse. At 5 days after surgery, the patients were assisted to walk slowly for about 300 meters and gradually conduct exercise of going up and down stairs; relevant nurses introduced rehabilitation knowledge on drug use, diet, exercise, etc., and had better communication with the patients to help eliminate their adverse emotions. At 6-7 days after surgery, the previous relevant activities were repeated, and the volume of physical activity was appropriately increased according to their own physical conditions.

Nursing for trans-femoral PCI patients: The patients were instructed to conduct passive movement and ankle pump movement during bed rest within 6 h after surgery. At 24 h after surgery, the nursing staff assisted the patients to sit at the bedside and provided guidance in a deep breathing exercise. At 1-2 days after surgery, the nurses helped the patients in a sitting (or semi-sitting) position to perform contralateral limb movement, encouraged them to stand at the bedside for about 5 min twice a day. At 3-7 days after surgery, the program was the same as that for trans-radial PCI patients.

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Table 1. General data

	Conventional nursing group (n=60)	Rehabilitation nursing group (n=60)	t/ χ^2	P
Gender, male (n, %)	35 (58.33%)	31 (51.67%)	0.539	0.463
Age (year)	59.36±3.27	60.28±2.82	1.650	0.102
BMI (kg/m ²)	24.82±2.47	24.65±2.90	0.346	0.730
Killip classification			0.835	0.361
1-2	29	34		
3-4	31	26		
Physical activity ability			0.302	0.583
0-2	34	31		
3-4	26	29		
Medical history				
Smoking (n, %)	49 (81.67%)	46 (76.67%)	0.455	0.500
Hypertension (n, %)	19 (31.67%)	23 (38.33%)	0.586	0.444
Hyperlipemia (n, %)	38 (63.33%)	35 (58.33%)	0.315	0.575
Diabetes mellitus (n, %)	15 (25.00%)	17 (28.33%)	0.170	0.680

Note: BMI, body mass index.

In terms of dietary nursing, the nursing staff formulated diversified and balanced nutritional recipes that provided a diet that was low in sugar and salt, and high in vitamins, dietary fiber and high-quality protein. Moreover, the nurses encouraged the patients to quit smoking and drinking as soon as possible.

In terms of regular follow-up, regular telephone follow-up was given once every two months for one year, to answer the questions raised by the patients.

Main outcome measures

The cardiac function indexes, self-rating depression scale (SDS) and self-rating anxiety scale (SAS) scores, Barthel index, and complication rates of AMI were recorded and compared before and after the intervention. Nursing satisfaction was assessed at discharge.

Cardiac function was classified as: no limitation of physical activity (Class I), slight limitation of physical activity (Class II), marked limitation of physical activity (Class III), and inability to carry out any physical activity (Class IV). Echocardiography was applied to determine left ventricular ejection fraction (LVEF) and left ventricular end-diastolic dimension (LVEDD) in strict accordance with the relevant standards. Besides, the SDS and SAS scores were used to evaluate the psychological status of the patients during nursing care [17, 18]. The Barthel

index was adopted to assess quality of life and daily living ability [19]. As for complications evaluated, myocardial reinfarction, angina pectoris, heart failure and severe arrhythmia were mainly included. Patient satisfaction with care was categorized into three levels: satisfied, basically satisfied and dissatisfied. Satisfaction rate = (satisfied cases + basically satisfied cases)/total number of cases * 100%.

Statistical analysis

Data analyses were performed with the SPSS 20.0 software. The measurement data were expressed as mean \pm standard deviation ($\bar{x} \pm SD$). Independent samples t-test was used for the comparison between the two groups and paired samples t-test was applied for the comparison before and after intervention within the same group. Chi-square test (χ^2 test) was adopted for the enumeration data expressed as the case/percentage (n/%). $P < 0.05$ was considered a statistically significant difference.

Results

General data

There was no significance difference in the average age, gender, body mass index, Killip classification, physical activity ability and medical history between the two groups, suggesting that both groups were comparable. See **Table 1**.

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Table 2. Comparison of cardiac function indexes

Group	Cardiac function classification		LVEF (%)		LVEDD (mm)	
	Before nursing	After nursing	Before nursing	After nursing	Before nursing	After nursing
Conventional nursing group (n=60)	3.28±0.21	2.36±0.14***	52.16±1.72	59.35±1.62***	55.92±1.78	52.12±1.36***
Rehabilitation nursing group (n=60)	3.25±0.18	1.24±0.11***	52.68±2.13	64.87±1.52***	56.28±1.92	46.28±1.25***
t	0.840	48.726	1.471	19.248	1.065	24.489
P	0.403	<0.001	0.144	<0.001	0.289	<0.001

Note: Compared with pre-intervention, ***P<0.001. LVEF, left ventricular ejection fraction; LVEDD, left ventricular end-diastolic diameter.

Table 3. Comparison of SAS and SDS scores

Group	Cases	SAS score		SDS score	
		Before nursing	After nursing	Before nursing	After nursing
Conventional nursing group (n=60)	60	67.33±6.42	48.46±5.53***	68.94±6.26	45.88±2.54***
Rehabilitation nursing group (n=60)	60	66.15±5.96	31.73±4.72***	67.23±5.89	33.91±3.98***
t		1.043	17.824	1.541	19.638
P		0.299	<0.001	0.126	<0.001

Note: Compared with pre-intervention, ***P<0.001. SAS, self-rating anxiety scale; SDS, self-rating depression scale.

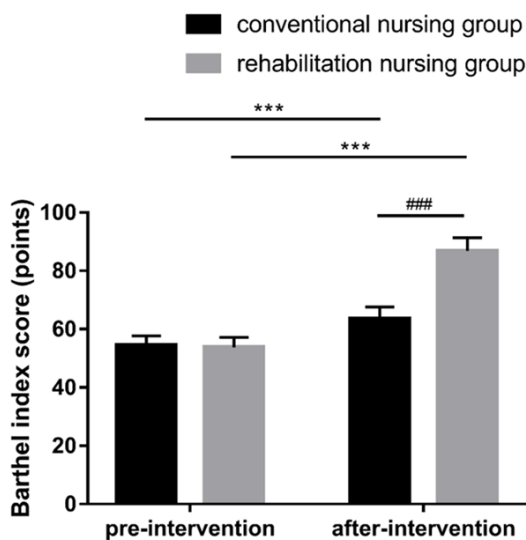


Figure 1. Comparison of Barthel index. Compared with pre-intervention, ***P<0.001; Compared with the conventional nursing group, ###P<0.001.

Comparison of cardiac function indexes

After the intervention, the LVEDD and classification scores in both groups were significantly decreased, while the LVEF was markedly increased (all P<0.001). Moreover, all the cardiac function indexes in the rehabilitation nursing group were better than those in the conventional nursing group (all P<0.001). See **Table 2**.

Comparison of SAS and SDS scores

Before the intervention, no significant differences were found in the SAS and SDS scores

between the two groups (both P>0.05). After the intervention, the SAS and SDS scores in both groups reduced, while the rehabilitation nursing group showed a significantly greater decrease in the scores than the conventional nursing group (both P<0.001). See **Table 3**.

Comparison of Barthel index

Before the intervention, no significant difference was identified in the Barthel index scores (P>0.05). After the intervention, the Barthel index scores in both groups significantly improved, while the rehabilitation nursing group showed a significantly greater increase in the scores than the conventional nursing group (P<0.001). See **Figure 1**.

Comparison of complication rates

After the intervention, in the rehabilitation group there were no cases of myocardial reinfarction, 13 cases of angina pectoris, 7 cases of heart failure and 5 cases of severe arrhythmia; as compared to 4 cases of myocardial reinfarction, 15 cases of angina pectoris, 21 cases of heart failure, and 13 cases of severe arrhythmia in the conventional group. The incidence rates of heart failure and severe arrhythmia in the rehabilitation nursing group were lower than those in the conventional nursing group (P<0.01 and P<0.05, respectively). The total complication rate in the rehabilitation nursing group was also significantly lower than that in the conventional nursing group (P<0.001). See **Table 4**.

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Table 4. Comparison of complication rates (n, %)

Group	Myocardial reinfarction	Angina pectoris	Heart failure	Severe arrhythmia	Total complication rate	χ^2	P
Conventional nursing group (n=60)	4 (6.67)	15 (25.00)	21 (35.00)	13 (21.67)	53 (88.33)	28.718	<0.001
Rehabilitation nursing group (n=60)	0 (0.00)	13 (21.67)	7 (11.67)	5 (8.33)	25 (41.67)		
χ^2	2.328	0.186	9.130	4.183			
P	0.127	0.666	0.003	0.041			

Table 5. Comparison of nursing satisfaction

Group	Satisfied	Basically satisfied	Dissatisfied	Satisfaction rate (%)	χ^2	P
Rehabilitation nursing group (n=60)	42 (70.00)	18 (30.00)	0 (0.00)	60 (100.00)	13.333	<0.001
Conventional nursing group (n=60)	26 (43.33)	22 (36.67)	12 (20.00)	48 (80.00)		
χ^2	8.688	0.600	13.333			
P	0.003	0.439	<0.001			

Comparison of nursing satisfaction

The dissatisfaction rate was lower and the total satisfaction rate was higher in the rehabilitation nursing group than in the conventional nursing group (both $P < 0.001$). See **Table 5**.

Discussion

AMI is a common cardio-cerebrovascular disease generally combined with decreased cardiopulmonary function and exercise tolerance. In severe cases, patients may even lose basic self-care ability [20]. Currently, patients with AMI are mainly treated with PCI [21]. Early cardiac rehabilitation nursing care can help patients reduce the workload of the heart, restore myocardial function and maximize the recovery of physical activity through effective rehabilitation training on overall health care and cardiac function.

Furthermore, early cardiac rehabilitation nursing care after PCI promotes cardiac collateral formation, increases myocardial perfusion, facilitates vessel recanalization, and thus achieves cardiac function recovery [22, 23]. It was identified that patients with AMI after PCI undergoing cardiac rehabilitation intervention showed a significantly larger increase in LVEF and decrease in wall motion score index than patients receiving routine cardiac intervention, indicating that early cardiac rehabilitation ameliorates cardiac function [24]. Our study demonstrated that the cardiac function classification scores, LVEDD and LVEF in the rehabilitati-

on nursing group were better than those in the conventional nursing group. The findings strongly indicate that early cardiac rehabilitation nursing care helps AMI patients improve exercise capacity, cardiovascular reserve capacity, and cardiac function after PCI for better postoperative recovery. Besides, the nursing intervention can accelerate blood flow and promote the cardiac collateral formation, and improved LVEF can increase coronary blood flow to prevent or delay the occurrence of myocardial ischemia.

Some studies have unveiled that cardiac rehabilitation nursing care is effective for patients with AMI after PCI in promoting psychological well-being and postoperative recovery, and reducing complication rates [25, 26]. In our study, the SAS and SDS scores, Barthel index, and complication rates of AMI in the rehabilitation nursing group were better than those in the conventional nursing group, which were consistent with the results reported by Dai et al. [25]. The findings suggest that cardiac rehabilitation nursing care can effectively improve psychological status, which plays a role in relieving depression and anxiety, assisting patients to maintain a positive mood during treatment so as to avoid the adverse effects caused by psychological factors and enhance patient confidence in early recovery. Meanwhile, early cardiac rehabilitation nursing care can effectively strengthen the ability in activities of daily living and reduce complication rates. In addition, the rehabilitation nursing group was more satisfied with care than the conventional nursing group,

suggesting cardiac rehabilitation nursing care helps establish a good doctor-patient relationship, reduce doctor-patient disputes, and increase patient trust for medical staff and compliance with treatment.

With the small sample size in this study, we are aware that more research with a larger sample is needed to confirm the effect of early cardiac rehabilitation nursing intervention. Moreover, our single-center study may weaken the universal applicability of nursing intervention, thus multi-center studies should also be taken into consideration to obtain a more precise conclusion in the future.

In summary, early cardiac rehabilitation nursing care for patients with AMI after PCI can effectively ameliorate cardiac function, relieve psychological problems and decrease complication rates, which is worth being popularized clinically.

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Disclosure of conflict of interest

None.

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