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ORIGINAL RESEARCH ARTICLE

Therapeutic effect of cardiac rehabilitation combined cognitive behavioral therapy on kinesiophobia in AMI patients

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ABSTRACT

Objective: To study therapeutic effect of cardiac rehabilitation (CR) combined cognitive behavioral therapy (CBT) on kinesiophobia in patients with acute myocardial infarction (AMI). **Methods:** A total of 96 AMI patients with kinesiophobia treated in our hospital were divided into CR group (n = 47, were in hospital from September 2020 to January 2021 and received routine CR treatment) and combined intervention group (n = 49, were in hospital from February 2021 to June 2021 and recerved CBT based on CR group), both groups were intervened for three months. General clinical data, scores of Tampa scale for kinesiophobia heart (TSK-SV Heart), anxiety and depression scale and Barthel index (BI) before and after intervention were observed and compared between two groups. **Results:** During intervention, there was one case dropped out in CR group, and one case dropped out and two cases lost during follow-up in combined intervention group. Compared with CR group, three months after intervention, there were significant reductions in scores of TSK-SV Heart [(36.26±3.16) scores vs. (31.67±3.53) scores], anxiety scale [(7.39±2.05) scores vs. (5.78 ± 1.47) scores] and depression scale [(6.28 ± 2.10) scores vs. (4.65 ± 2.50) scores] and significant rise in BI score [(94.46 ± 4.11) scores vs. (96.41 ± 3.60) scores] in combined intervention group (P < 0.05 or <0.01). **Conclusion:** CR combined CBT can significantly improve daily self-care living capacity, reduce level of kinesiophobia and relieve anxiety and depression in AMI patients with kinesiophobia.

Keywords: myocardial infarction; rehabilitation; cognitive therapy

1. Introduction

Acute myocardial infarction (AMI) is a serious type of coronary heart disease, which has brought serious burden to health care and economy in China and even the world[1,2]. With the development of reperfusion therapy, the clinical outcome and survival rate of AMI patients have been greatly improved[3], but the process of postoperative atherosclerosis still exists, and some patients are still troubled by chest pain, chest tightness, decreased exercise ability, anxiety and depression[4]. Physical activity (PA) and exercise are the core components of cardiac rehabilitation (CR) after AMI[5]. However, a large number of clinical investigations show that the PA level of AMI patients is far lower than the recommended level in the guidelines[6,7]. The reason is that patients are afraid of dizziness, chest pain, chest tightness after experiencing acute cardiovascular events, and fear of excessive, irrational, debilitating fear of exercise caused by stent falling off after surgery.

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Researchers call this phenomenon phobia[8]. It has been found that the incidence of phobia in patients with acute coronary syndrome is as high as 86%, which is significantly higher than that in patients with stable coronary heart disease[9,10]. There are few studies on phobia in patients with heart disease in China, and existing studies show that early CR and health education can help reduce the incidence of phobia[11,12]. Therefore, this study aims to explore the effect of CR combined with cognitive behavioral therapy (CBT) on phobia in patients with AMI.

2. Data and methods

2.1. Research object

The patients in the Department of Cardiology of a Grade III Grade A hospital in Shanxi from September 2020 to June 2021 were selected by convenient sampling method as the research objects. Inclusion criteria: a) In line with the diagnostic criteria of the fourth edition of the General Definition of Myocardial Infarction[13], the first AMI; b) patients with stable condition after percutaneous coronary intervention (PCI) after admission; c) patients with heart disease were rated as phobia by the Exercise Fear Scale (TSK-SVHeart) (TSK-SVHeart score > 37); d) Killip grade ≤ Grade III; e) age: 18–75; f) no mental illness, consciousness and cognitive impairment; g) volunteer to participate in this study. Exclusion criteria: a) There were serious complications, such as malignant arrhythmia and severe heart failure; b) any disease of nerves, muscles and bones that hinders movement; c) those with severe dysfunction of liver, kidney and other important organs; d) recently, he is participating in other researchers. Obtain the informed consent of the patient and the approval of the hospital ethics committee.

2.2. Research methods

The research method of quasi experiment was adopted. According to the time sequence, 47 patients admitted from September 2020 to June 2021 were taken as CR group, and 49 patients admitted from February 2021 to June 2021 were taken as joint intervention group.

CR group:

CR group received routine care and CR therapy (including rest and diet guidance, medication guidance, pain care and CR therapy). Among them, CR treatment includes: a) The patient is absolutely in bed 24 h after surgery, and medical staff help the patient turn over and massage the core muscle group, and guide the patient to defecate in bed; b) on the second day after operation, the cardiologist evaluated the patient's vital signs and cardiac function. If there were no abnormalities, the cardiologist instructed the patient to perform abdominal breathing training, loose fists, clenched fists and ankle pump function training. Assist patients to eat and defecate independently; c) at the third day after operation, assist the patient to sit up, guide the patient to draw circles, bend elbows and extend arms, from simple to complex, 15~30 min/time, 2~3 times/day. Assist patients to wash and gargle independently; d) on the 4th day after operation, assist the patient to get out of bed and stand. Before standing, warm up and walk slowly for 30 m in the ward after 10~15 times of standing. 15~30 min/time, 2~3 times/d; e) on the 5th to 6th day after operation, the patient can walk in the room independently for 150 m, 15–30 min/time, 2–3 times/day. Use the centralized teaching method to publicize the knowledge related to coronary heart disease and guide patients to do aerobic exercise (Baduanjin, elastic band exercises); f) 7 days after operation, the patient can walk 150~200 m, 2–3 times a day, and go up and down two floors. Ask family members to take care of them; g) within one month after discharge, ask the patient to do light housework and desk work, with aerobic exercise for 30 min every day, at least three times a week; Two to three months after discharge, aerobic exercise for 30 min and flexible exercise for 10 min every day, at least three times a week. Tell the patient to warm up before each exercise.

Combined intervention group:

Combined intervention group adds CBT on the basis of routine nursing care: CBT refers to a psychotherapy method that can change individual behavior (exercise) level by changing the way of thinking and behavior[14]. It is composed of cognitive therapy and behavioral therapy, which are carried out simultaneously. Among them, cognitive therapy has four stages: evaluation, understanding, general practice and consolidation: a) evaluation stage: On the first day after the operation, introduce the ward environment to the patient, select the appropriate communication mode according to the patient's education level, and establish a good nurse patient relationship. Issue the scale and ask the patients and their families questions to investigate their views on physical activity. Identify the patients' automatic thinking through the questionnaire results and interview content; b) comprehension stage: this stage is to help patients find out the causes of phobia. Through interview, inquiry, self-examination and other methods, help patients find out the unreasonable places in their thinking, analyze the causes of phobia, and synchronize with the first stage; c) general repair stage: Find a large amount of clinical evidence, refute the wrong views of patients, correct the automatic thinking of "thinking of sports will cause fear" of phobia patients, so that patients can fully realize the positive role of exercise therapy and the harmfulness of phobia. Divert their attention, guide the patient to prioritize the problems in life, distract them from paying too much attention to the fear signals around them, and reduce their fear emotion. This stage is from the second day after operation to the day before discharge; d) consolidation stage: it is helpful for patients to further get rid of the wrong cognition of the disease and enhance the treatment effect. Timely correct and guide the patients' problems that still exist, and this stage will be carried out on the day of discharge, one month and three months after discharge. Behavior therapy: The purpose is to reduce the tension, anxiety and fear of patients, relax their body and mind, and increase the compliance of patients with CR. a) Imagination aversion therapy: This therapy is a way to correct the patient's bad behavior through aversion to stimuli, so as to ensure the patient's compliance in rehabilitation. Instruct patients to close their eyes and imagine that if they do not exercise because of fear, it is not conducive to the recovery of the heart and may increase the risk of myocardial infarction again, thus increasing the risk of re hospitalization and increasing the economic burden; b) progressive muscle relaxation therapy: This therapy allows patients to experience different states of muscles during contraction and relaxation. The difference in muscle perception is in the response of amplified signals to pressure, which enhances patients' resistance to tension signals and plays a role in relaxation. In a comfortable environment, guide the patient to regularly contract and tense the muscles of both upper limbs, hands, shoulders and neck, face, chest and abdomen, and finally to both thighs, calves and feet. The muscles of each group were exercised for 3 times, 10~15 s for tension, 15~20 s for relaxation, 25~30 min for exercise, and twice a day during hospitalization. After discharge, through WeChat, ask the family members to supervise the patient to complete the behavior intervention after discharge, once every 3 days, 15 min each time.

2.3. Evaluation index

Patient general information questionnaire:

The research team consulted relevant literature, combined with the influencing factors of phobia and semi-structured interview results, and designed it by itself after consulting experts.

TSK-SV Heart Scale:

This scale was specially developed by Dr. Bäck[15] in 2012 for the evaluation of phobia in patients with heart disease. It was later Sinicized by Lei[16] and used in the investigation of patients with coronary heart disease α The coefficient is 0.859. There are 17 items in total, using the Likert 4-level scoring method, with 1 very disagreed, 2 disagreed, 3 agreed, and 4 very agreed. The reverse scoring items are 4, 8, 12, and 16. The total score >37 indicates that the patient has phobia, and the higher the score, the higher the level of phobia.

Hospital Anxiety and Depression Scale (HADS):

HADS consists of two subscales, anxiety and depression, with seven entries each. The depression score is the sum of the double item scores, and the anxiety score is the sum of the single item scores. The scores of the anxiety and depression subscale were: 0~7 points for no symptoms of anxiety and depression; 8–10 points: suspicious; 11~21 points for positive existence; In this study, those who scored ≥8 were positive.

Barthel index (BI) rating scale:

BI is a commonly used evaluation index for patients' activities of daily living, with a total of 10 items, and a full score of 100 means no dependence. 61~99 belonged to slight dependence; 41–60 points are divided into those who need great help to complete daily life activities, and they are moderately dependent; If the score is ≤40, all of them need to be cared by others, which means they are heavily dependent.

2.4. Data collection method

The data were distributed by the nursing staff. Before distribution, the investigators were trained. The unified terminology and evaluation criteria were used. The patients filled in the questionnaire and took it back on the spot. Two people checked to ensure the validity of the questionnaire and scale.

2.5. Statistical methods

After the data is collected and reviewed by two people, it is entered into Excel software and analyzed by SPSS25.0 software. The measurement data is expressed by mean ± standard deviation ($x \pm s$). The comparison is performed by *t*-test, the counting data is expressed by percentage, and the comparison is performed by χ^2 Inspection. $P < 0.05$ means the difference is statistically significant.

3. Results

3.1. Comparison of general data of two groups of patients

During the study period, one case fell out of CR group, one case withdrew from the joint intervention group due to the deterioration of the disease, and two cases lost the follow-up. Finally, 46 cases in CR group and 46 cases in the joint intervention group completed the cost study. There was no significant difference in general data between the two groups ($P > 0.05$), which was comparable, as shown in **Table 1**.

Table 1. Comparison of general data of two groups of patients.

	Joint intervention group (46 cases)	**CR group (46 cases)**	t/χ^2	***P***
Age	63.42 ± 7.44	62.53 ± 8.19	0.546	0.586
BMI (kg/m^2)	25.68 ± 2.39	25.69 ± 3.17	–0.017	0.986
Male *n* (%)	31(67.39)	28(60.87)	0.425	0.514
degree of education				0.897*
Primary school and illiterate (%)	18(9.13)	17(39.96)		
Junior high school (%)	19(41.30)	21(45.65)		
High school or technical secondary school (%)	7(15.22)	5(10.87)		
College degree and above (%)	2(4.35)	3(6.52)		
Medical payment method			2.070	0.355
Medical insurance for urban and rural residents (%)	30(65.22)	26(56.52)		
Employee medical insurance (%)	10(21.74)	16(34.78)		
Other *h* (%)	6(13.04)	4(8.70)		

Average monthly household income			3.832	0.280
<1000 yuan *n* (%)	7(15.22)	6(13.04)		
1001~3000 yuan *h* (%)	20(43.48)	24(52.17)		
3001~5000 yuan *h* (%)	10(21.74)	13(28.26)		
>5000 yuan *n* (%)	9(19.57)	3(6.52)		
working condition			4.483	0.106
In service (%)	11(23.91)	19(41.30)		
Retirement (%)	13(28.26)	14(30.43)		
Other *h* (%)	22(47.83)	13(28.26)		
Smoking			2.318	0.314
Never smoke (%)	18(39.13)	14(30.43)		
Have quit smoking (%)	7(15.22)	4(8.70)		
Currently smoking (%)	21(45.65)	28(60.87)		
Past history of chronic disease (disease type)				0.244*
0 *n* (%)	10(21.74)	15(32.16)		
1 *n* (%)	24(52.17)	26(56.52)		
2 *n* (%)	8(17.39)	4(8.70)		
≥3 *n* (%)	4(8.70)	1(2.17)		
Cardiac function grading				0.365*
Killip Grade I *n* (%)	36(78.26)	30(65.22)		
Killip II *n* (%)	7(15.22)	13(28.26)		
Killip III *n* (%)	3(6.52)	3(6.52)		

Note: BMI: body mass index, CR: cardiac rehabilitation. The following table is the same* Fisher exact probability method.

3.2. Comparison of TSK-SV Heart, HADS and BI scores between the two groups

There was no significant difference in TSK-SV Heart, HADS anxiety subscale, depression subscale and BI scores between the two groups ($P > 0.05$) (See **Table 2**). Compared with that after operation, three months after intervention, the scores of TSK-SV Heart, HADS anxiety subscale and depression subscale in the two groups were significantly lower, and BI scores were significantly higher ($P < 0.01$); Compared with the CR group, the scores of TSK-SV Heart, HADS anxiety subscale and depression subscale in the combined intervention group decreased more significantly, and the BI score increased more significantly ($P < 0.05$ or <0.01) 3 months after the intervention.

Table 2. Comparison of TSK-SV Heart, HADS and BI scores between the two groups ($\overline{x} \pm s, n = 46$).

Group	**TSK-SV Heart (min)**			**Anxiety Scale (score)**		
	Postoperative	**3 months after intervention**	***L/P***	**Postoperative**	**3 months after intervention**	***L/P***
Joint intervention group	4367 ± 3.03	3167 ± 3.53**$^{\Delta\Delta}$	20.207/0.001	876 ± 2.24	5.78 ± 1.47**$^{\Delta\Delta}$	8.420/0.001
CR group	4439 ± 3.12	36.26 ± 316**	18607/0001	904 ± 3.35	7.39 ± 2.05**	2907/0006
L	−1120	−656		−0.475	−4322	
P	0266	0001		0636	0001	
Group	**Depression Scale (points)**			**BI (min)**		
	Postoperative	**3 months after**	***L/P***	**Postoperative**	**3 months after**	***L/P***

		intervention			intervention	
Joint intervention group	7.67 ± 2.62	465 ± 2.50**$^{\Delta\Delta}$	6.847/0.001	3185 ± 464	96.41 ± 3.60**$^{\Delta}$	−78.754/0.001
CR group	7.96 ± 2.52	628 ± 2.10**	6216/0001	3315 ± 476	9446 ± 411**	−64469/0.001
L	−0527	−3.408		−1332	2428	
P	0600	0001		0186	0017	

Note: TSK-SV Heart: Exercise Fear Scale for Heart Disease Patients, BI: Barthel Index. *$P < 0.05$, **$P < 0.01$; Compared with CR group, $^{\Delta}P < 0.05$, $^{\Delta\Delta}P < 0.01$.

4. Discussion

Compared with patients with stable coronary heart disease, the incidence of phobia in AMI patients is higher, and there is a significant time effect. In the study of Brunetti et al.[9], the incidence of phobia in patients with acute coronary syndrome was 86%, and 79% in patients with acute heart failure, while in the study of patients with stable coronary heart disease, the incidence of phobia was 20%[15]. The existence of phobia will not only reduce the compliance of patients with CR[5], but also is not conducive to the patients' return to work and recovery of social functions[17], so it emphasizes the necessity of early screening and intervention. TSK-SV Heart is a screening tool for patients with heart disease phobia, which has been translated and applied in the assessment of coronary heart disease, heart failure, pulmonary hypertension and other phobias in India, Poland, Switzerland and other countries[18,19]. However, the scale is not widely used in clinical practice in China, so its applicability needs to be further discussed in future clinical work.

In terms of the intervention of phobia, research shows that early CR and education can effectively reduce the incidence of phobia. CBT refers to a psychotherapy method that changes individual behavior (exercise) level by changing the way of thinking and behavior[20]. Through questions and interviews, we can help patients find out the unreasonable places in their thinking, correct their bad cognition through certain behavioral skills, and help them establish new cognition [21]. It has been proved that CBT can effectively improve the level of phobia in patients with chronic low back pain, knee joint replacement, and lumbar disc herniation[22,23]. Keessen et al.[24] showed that CR can effectively reduce the phobia of patients. Baykal et al.[12] found that after the patients with coronary heart disease participated in CR, the incidence of phobia decreased from 74.5% to 34.6%, and the score of phobia decreased from (41.4 ± 6.2) to (34.9 ± 5.7). This is consistent with the results of this study, and the TSK-SV Heart score of the combined intervention group is significantly lower than that of the CR group after the intervention. The reason is that CBT can effectively fight against emotion driven withdrawal behavior, encourage patients to pay attention to the present and observe their internal experience and external reality in an objective way, which can disrupt the futile process of rumination and anxiety, promote early CR exercise, and improve patients' ability to take care of themselves in life.

Anxiety and depression are risk factors for patients with coronary heart disease to develop phobia[25,26], so reducing the anxiety and depression of patients is conducive to reducing the level of phobia in patients to a certain extent. Anxiety and depression will not only increase the incidence of cardiovascular events[27], but also lead to patients' compliance behavior and CR compliance greatly reduced[28]. The anxiety and depression of patients with coronary heart disease may be related to the repeated attacks of chest pain and chest distress, the lack of patient's knowledge of the disease, the lack of communication with medical staff, the lack of trust in medical staff and social support. In the study of coronary heart disease, CBT has been proved to improve the anxiety and depression of patients, and improve the quality of life of patients[29]. This study shows that, compared with CR group, after intervention, the score of HADS anxiety and depression subscale in the combined intervention group decreased more significantly, and the BI score increased more significantly, suggesting that CBT can significantly reduce the anxiety and depression level of AMI phobia patients, and

improve their self-care ability. The results are consistent with those of Zhang et al.[30] and Jia[31]. The reason may be that after the patients in the combined intervention group were admitted to the hospital, the medical staff taught the patients about the pathogenesis, risk factors, treatment points and other disease related knowledge of coronary heart disease, which can reduce the anxiety and fear of patients due to lack of knowledge to a certain extent.

This study found that CR combined with CBT can improve the ability of daily life of patients, reduce the level of phobia in AMI patients, and relieve anxiety and depression. However, because the study only selected patients from one hospital as the study object, there may be bias. The study also found that although the level of phobia in AMI patients decreased with the passage of time, more patients still had higher levels of phobia after several months. Therefore, the follow-up research needs to further expand the sample size and extend the intervention duration to ensure the effectiveness of the intervention, so as to better guide the clinical work.

Conflict of interest

The authors declare no conflict of interest.

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