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Evaluation of the efficacy of *Tian dan shu gan* rehabilitation exercise in improving the short-term quality of life of patients with acute myocardial infarction after percutaneous coronary intervention

Original Article

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Abstract: **Objective:** To evaluate the efficacy of *Tian dan shu gan* rehabilitation exercise in improving the short-term survival quality of patients after percutaneous coronary intervention (PCI) and explore whether patients' symptoms, physical function, cognitive function, and psychosocial function are improved after this exercise.

Methods: Patients with acute myocardial infarction who underwent PCI in Yueyang Hospital of Integrated Traditional Chinese and Western Medicine Affiliated to Shanghai University of Traditional Chinese Medicine from August to November 2020 were selected. A total of 110 patients were selected by the convenience sampling method. Patients in the control group were given routine nursing measures after PCI for coronary heart disease, and patients in the experimental group received *Tian dan shu gan* rehabilitation exercise in addition to routine nursing.

Results: After 3 wk, the quality of life in the experimental group was improved compared with that in the control group, and the differences in symptom scores, physical functions, cognitive functions, and psychosocial functions were statistically significant ($P < 0.01$). After 3 wk of *Tian dan shu gan* rehabilitation exercise, patients with body mass index (BMI) between 27 and 29.9 had the highest score of body function, which was statistically significantly better compared with that of other groups ($P < 0.001$). Patients who had remained bachelors for a long period of time had the highest score of symptoms, which was statistically significant compared with the other groups ($P < 0.001$). The nursing satisfaction of the experimental group was 96.3%.

Conclusions: *Tian dan shu gan* rehabilitation exercise was effective in improving the short-term quality of life of patients with acute myocardial infarction after PCI, and the nursing satisfaction rate was high, use of which should be further extended to more clinical patients.

Keywords: *acute myocardial infarction • percutaneous coronary intervention • quality of life • Tian dan shu gan rehabilitation exercise*

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1. Introduction

The number of patients with acute myocardial infarction in China has been increasing rapidly every year, and the success rate of rescue of acute myocardial infarction in China has been increasing year by year. However, literature reports[1,2] show that the quality of life of patients after acute myocardial infarction is uneven, affecting their physiological, psychological, and even social adaptation functions. Lack of exercise rehabilitation after percutaneous coronary intervention (PCI) directly affects the short-term quality of life of patients and gradually causes serious complications such as recurrence of myocardial infarction and sudden death. Therefore, this study focused on the relationship between early exercise rehabilitation and the short-term quality of life of patients after PCI and combined the *Tian dan shu gan* rehabilitation exercise[3] in the Department of Cardiology of our hospital to provide nursing guidance for early postoperative rehabilitation exercise with traditional Chinese medicine. This exercise has evolved from the "deer play" of Wuqinxi, which reduces the difficulty of the deer play itself. Deer play follows the principle of "the safety and comfort of the deer". The deer group is leisurely and comfortable, sometimes playing with their heads and sometimes running with their feet. They can be static and dynamic and adjust the overall state of the body with the music of the Five Elements.

1.1. Liver exercise - left and right styles

The upper body imitates the "Lu Di" in the deer play to move the waist and strengthen the waist and bones. The lower body imitates the "Deer Run" in the deer play to exercise the strength of the lower limbs, soothe the liver, and expel the breath. The flank is the area of the liver meridian and the area where the liver is. It can play the role of soothing the liver and regulating the breath, so as to relieve and eliminate anxiety and other adverse psychological emotions.

2. Methods

2.1. Diagnostic criteria

2.1.1. Western diagnostic criteria for acute myocardial infarction

The fourth edition of the Universal Definition of Myocardial Infarction was jointly formulated by European Society of Cardiology (ESC), American College of Cardiology Foundation (ACCF), American Heart Association (AHA), and World Heart Federation (WHF) in 2018.[4]

2.1.2. PCI surgical criteria

For PCI surgical criteria, refer to the Chinese Guidelines for Percutaneous Coronary Intervention (2016).[5]

2.2. Case selection criteria

2.2.1. Inclusion criteria

The following cases were included in the study: (1) patients admitted to Yueyang Hospital of Integrated Traditional Chinese and Western Medicine Affiliated to Shanghai University of Traditional Chinese Medicine from August 2020 to November 2020 and diagnosed with acute myocardial infarction by physicians; (2) patients who were 20–80 years old; (3) patients who had clear consciousness, had normal audiovisual function, and could successfully cooperate with the completion of the subject; and (4) patients who had signed the informed consent for the project.

2.2.2. Exclusion criteria

The following cases were excluded from the study: (1) patients with complicated severe organic heart and brain diseases; (2) patients with severe hepatic and renal dysfunction; (3) patients with malignant tumors; (4) pregnant or lactating women; (5) people suffering from mental illness; (6) patients who had difficulty in body movement; (7) patients with incomplete medical history records; (8) patients whose condition worsened or with other symptoms that affected the observation of the test results; (9) patients in the experimental group who did not take rehabilitation exercise or did not upload a video for more than 3 d in total; and (10) those unwilling to continue to participate in the research.

2.3. Subjective of the study

A total of 110 patients with acute myocardial infarction in the recovery stage who met the above criteria were admitted to Yueyang Hospital of Integrated Traditional Chinese and Western Medicine Affiliated to Shanghai University of Traditional Chinese Medicine from August 2020 to November 2020.

2.4. Specific implementation methods

Nurses in the cardiovascular department assessed the ward containing PCI postoperative Wk 1 patients; evaluation was done with reference to the 2016 edition of

the expert consensus on postoperative exercise rehabilitation after percutaneous coronary intervention",[6] to conform to the inclusion criteria. The patients should have signed informed consent and were divided into regular nursing instruction (control) group and *Tian dan shu gan* rehabilitation exercise nursing guidance (trial group). All patients were evaluated for recent quality of life 3 wk later.

The control group was given routine treatments and nursing, instructed to quit smoking, use bronchodilators, inhale glucocorticoids, take expectorants, and oxygen therapy. At the same time, in conjunction with the routine rehabilitation exercise of lip contraction breathing and abdominal breathing, the patients took a standing position, gently pressed their abdomen with their hands, their mouth shaped like a fish's mouth, slowly tried to exhale all the air, and then inhaled through their nose, with an inhaling/exhaling ratio of 1:2 to 1:3, with the frequency maintained at 7–8 times/ min. This was done once in the morning and once in the evening, for 30 min each time.

We also established a WeChat group for the experimental group and included all the patients in that group. The patients were required to upload the videos of their daily rehabilitation exercises to the WeChat group. If the video was not uploaded that day, the nurse would remind and supervise the patients. If patients had other disease-related questions, they were allowed to ask, and the nurse would reply on the same day. The specific actions of the patients were as follows.

2.4.1. Liver exercise [left type]

1. The patients bent the knee on the right leg, sat back, extended the left leg forward, slightly bent the left knee, and stepped on the left foot. Extended the left hand forward, slightly bent the left arm, palm of the left hand to the right, right hand on the inside of the left elbow, palm of the right hand to the left. 2. Both arms were in front of the body at the same time with counterclockwise rotation, the left hand rotation around the ring was bigger than that of the right hand, at the same time to pay attention to the waist, hip, and caudosacral part of the counterclockwise rotation, gradually transitioning to the waist, hip, and caudosacral part of the rotation to drive the rotation of the arms.

2.4.2. Liver exercise [right type]

The action was the same as the left type, but the direction was opposite from left to right, and the rotation direction around the ring is also different.

2.4.3. Liver exercise [soothe the liver and exhale]

Held and extended hands slowly up and down on the sides until the upper arms were fully extended over their head and the fingers were naturally spread. At the same time, made a sound of "Heh, Heh" in their mouth.

2.5. Evaluation tool

Coronary Revascularization Outcome Questionnaire (CROQ) was used in this study (Table 1). The CROQ is the only quality-of-life scale that has undergone rigorous psychological testing and can be used to evaluate patients after coronary revascularization. Previous studies have shown that the reliability of Coronary Revascularization Outcome Questionnaire-Percutaneous Transluminal Coronary Angioplasty-post (CROQ-PTCA-POST) scale is 0.798 - 0.937, and it has good validity,[7] which can be popularized and used in the clinic.

3. Results

A total of 110 patients with acute myocardial infarction who met the inclusion criteria and were admitted to Yueyang Hospital of Integrated Traditional Chinese and Western Medicine Affiliated to Shanghai University of Traditional Chinese Medicine from August 2020 to November 2020 were included in the study. Convenience sampling was adopted to examine the 110 subjects, while 3 cases were lost in the process for the following reasons: patients being "do not want to continue" and "make last-minute plans to travel". Finally, 107 patients finished the whole exercises on request, and the data on the 107 patients were analyzed. The 52 subjects in the control group (32 males and 20 females) were 56.21 ± 9.77 years old and had body mass index (BMI) of 27.01 ± 3.98; 42 patients had experienced a first heart attack and 10 had had a second attack. The experimental

Dimension	Number of entries	Theoretical score
Symptom score	7	7–35
Body score	8	8–24
Cognitive function	3	3–18
Psychosocial function	14	14–70
Adverse reaction control	6	6–30
Total score	38	38–177

Note: CROQ, Coronary Revascularization Outcome Questionnaire.

Table 1. CROQ quality-of-life scoring criteria.

group consisted of 55 patients, including 30 males and 25 females with the following characteristics: 56.27 ± 9.44 years old and BMI of 27.15 ± 3.51; 43 patients had had a first heart attack and 12 had experienced a second heart attack. There were no significant differences between the two groups in terms of age, BMI, gender, educational background, whether the heart attack in the patients was the first onset, the severity of the disease, and the original quality of life of the patients ($P > 0.05$). The baseline characteristics of the two groups was consistent, and the experimental results were comparable.

Excel 2017 was used for data collection, and Statistical Package for the Social Sciences (SPSS) 24.0 statistical software was used for analysis. Measurement data were expressed as mean ± standard deviation ($\bar{x} \pm s$). Categorical data were tested by the chi-square test. Analysis of variance was used for comparison between groups, and $P < 0.05$ was considered as a statistically significant difference.

3.1. Comparison of quality-of-life scores between the two groups after 3 wk

Three weeks later, the symptom scores of the control group (14.54 ± 3.00), the physical function scores (10.85 ± 2.40), the cognitive function scores (8.63 ± 2.26), the psychosocial function scores (20.79 ± 6.49), and the adverse reaction control scores (20.10 ± 3.16) were compared with the symptom scores of the test group (23.85 ± 4.76); physical function scores (20.15 ± 1.69), cognitive function scores (12.80 ± 1.80), psychosocial function scores (59.87 ± 3.87), and adverse reaction control scores (21.85 ± 1.73) were significantly lower than those in the experimental group, with statistical significance ($P < 0.05$) (Table 2).

3.2. Comparison of quality-of-life scores of patients with different BMI values in the trial group after 3 wk

After 3 wk, patients with different BMI stratifications (Chinese standard) had statistically significant differences in physical function ($P < 0.001$), among which patients with a BMI of 27–29.9 had the highest score (21.21 ± 1.23), while those with a BMI > 30 had the lowest score (18.91 ± 1.51) (Table 3).

3.3. Comparison of quality-of-life scores of patients with different educational backgrounds in the experimental group after 3 wk

After 3 wk, there was a statistically significant difference in symptom scores among patients with different highest educational background ($P < 0.001$), among which, the symptom scores of patients with the highest undergraduate education were the highest (28.80 ± 4.21),

Group	Symptom score	Physical function score	Cognitive function score	Psychosocial function score	Adverse reaction control score
Control group	14.54 ± 3.00	10.85 ± 2.40	8.63 ± 2.26	20.79 ± 6.49	20.10 ± 3.16
Experimental group	23.85 ± 4.76	20.15 ± 1.69	12.80 ± 1.80	59.87 ± 3.87	21.85 ± 1.73
T-value	–12.183***	–23.067***	–10.515***	–37.544***	–3.546**

Note: **$P < 0.01$; ***$P < 0.001$.

Table 2. Comparison of quality-of-life scores between the two groups ($x \pm s$).

Age group, years	Symptom score	Physical function score	Cognitive function score	Psychosocial function score	Adverse reaction control score
18.5~23.9	24.30 ± 4.62	20.30 ± 1.70[ab]	13.00 ± 1.63	59.60 ± 5.02	22.10 ± 1.85
24~26.9	23.53 ± 4.58	19.60 ± 1.59[a]	12.73 ± 1.83	59.33 ± 4.22	22.13 ± 1.19
27~29.9	23.58 ± 5.04	21.21 ± 1.23[b]	12.89 ± 1.85	59.84 ± 3.55	22.00 ± 1.83
>30	24.36 ± 5.22	18.91 ± 1.51[a]	12.55 ± 2.02	60.91 ± 3.02	21.00 ± 2.00
F-value	0.109	6.551***	0.132	0.363	1.151

Note: *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$; a, b, and c represent significant differences at $P = 0.05$ using HSD plot test.
BMI, body mass index; HSD, honestly significant difference.

Table 3. Comparison of quality-of-life scores of patients with different BMI values in the experimental group after 3 wk ($\bar{x} \pm s$).

Group	Symptom score	Physical function score	Cognitive function score	Psychosocial function score	Adverse reaction control score
Primary school	18.40 ± 2.41[a]	20.20 ± 1.48	14.80 ± 0.45	58.80 ± 3.83	21.00 ± 3.00
Junior high school	26.10 ± 3.31[bc]	20.00 ± 1.25	12.70 ± 1.70	59.90 ± 3.28	20.90 ± 1.73
High school	23.68 ± 4.85[abc]	19.95 ± 2.04	12.26 ± 1.76	61.37 ± 3.45	21.95 ± 1.47
College	22.81 ± 4.21[ab]	20.31 ± 1.74	12.94 ± 1.84	59.44 ± 4.21	22.37 ± 1.50
Undergraduate course	28.80 ± 4.21[c]	20.60 ± 1.52	12.60 ± 1.95	56.60 ± 4.16	22.6 ± 1.14
F-value	4.802***	0.201	2.192	1.858	1.779

Note: *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$; a, b, and c represent significant differences at $P=0.05$ using HSD plot test.
HSD, honestly significant difference.

Table 4. Comparison of quality-of-life scores of patients with different educational backgrounds in the experimental group after 3 wk ($x \pm s$).

and those of patients with the highest primary education were the lowest (18.40 ± 2.41) (Table 4).

4. Discussion

Huangdi Neijing, a classic work on theories of traditional Chinese medicine, explains the critical symptoms of chest pain and heartburn (coronary heart disease) as "evil heart, the heart pain is happy and sad, when dizzy", "with chest pain, the patient can not lie down".[8,9] Modern studies have shown that the incidence of chest pain and recurrence of myocardial infarction after stenting are still very high, which directly affects the quality of life of patients.[10] Therefore, early rehabilitation exercise after PCI has been advocated by experts in various countries and recommended in the guidelines.[11-14] In this study, traditional Chinese medicine rehabilitation exercise and conventional nursing measures were organically combined, so that patients could achieve "pulling the waist and moving the joints" by imitating "shaking the muscles and bones, moving the limbs", and achieve "relaxing and natural breathing" by coordinating the movements, and finally achieve "physical and mental preparation with external guidance and internal guidance, and internal and external unity". Postoperative adverse symptoms, such as chest tightness, chest pain, palpitation, and fatigue, were relieved, and the physical function recovered quickly and effectively, which was consistent with the research results of Li et al.[15]

This study shows that in PCI postoperative patients with acute myocardial infarction, liver function is good after rehabilitation using traditional Chinese medicine after operation, the short-term quality of life is significantly higher than in the conventional nursing group, the difference was statistically significant ($P < 0.001$). *Tian dan shu gan* rehabilitation exercise can enhance the patient's physical function, cognitive function, psychosocial function, and so on to accelerate the postoperative recovery process. The symptom score of patients with a bachelor's degree was the highest (28.80 ± 4.21), which was higher than that of patients with other education level (26.10 ± 3.31). The reason may be related to the fact that higher the degree of education, the better is the perception and understanding of disease symptoms, and the better is the sensitivity and acceptance of knowledge and information in the WeChat group. This is consistent with the research results of Liu et al.[16] In addition, the statistical results of physical function items in the scale showed that patients with BMI in the range of "overweight" had the highest score (18.40 ± 2.41 to 21.21 ± 1.23), while patients classified as "obese" had the lowest score (18.91 ± 1.51). The analytical reasons may be similar to "Locke's Law" in management. "*Tian dan shu gan* rehabilitation exercise" can be regarded as a small goal. Patients with a BMI slightly higher than the normal value believe that with a little effort, their body shape management can reach the normal standard, and such patients will work harder in exercise. However, "obese" patients who were far from the normal BMI value thought that functional exercise could not change the current situation; so, their attitude was more negative and the improvement of physical function was poor.

5. Conclusions

In this study, none of the patients fell and no other adverse nursing events occurred in the process of *Tian dan shu gan* rehabilitation exercise. Through online communication with patients and nurses through the WeChat group, patients had a deeper cognition of the disease and a higher adaptability of psychosocial function. After 3 wk, the satisfaction of patients in the experimental group reached 96.3%, which was higher than that in the conventional nursing group. In recent years, early postoperative exercise rehabilitation and quality of life of patients have gradually received attention.[17] *Tian dan shu gan* rehabilitation exercise movements are simple and short, patients' acceptance and compliance are high, and this exercise could be applied for more diseases in the future, but attention should be paid to the

different characteristics of the population; when promoting nursing instruction, attention should be paid to more individualized regimens, attention should be given to the patients in the form of feedback in a timely manner to improve their involvement,[18] make them feel respected, provide care and understanding, and finally promote the rapid and comprehensive recovery from the disease.

Ethics approval

Ethical issues are not involved in this paper.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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