EXERCISE RESISTANCE EFFECT ON ADVERSE REACTION RATE IN HEART FAILURE

EFEITO DE RESISTÊNCIA AO EXERCÍCIO NA TAXA DE REAÇÃO ADVERSA DA INSUFICIÊNCIA CARDÍACA

EFECTO DE LA RESISTENCIA AL EJERCICIO EN LA TASA DE REACCIÓN ADVERSA EN LA INSUFICIENCIA CARDÍACA

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ABSTRACT

Introduction: Heart Failure is a common disease in the elderly. In the end stage, patients usually accompany a reduction in fat content and lean body mass in addition to heart failure. Objective: Study the exercise resistance effects and adverse reaction rate in patients with heart failure. Methods: 52 patients with chronic heart failure (38 males, age 67 ± 2.2 years) were randomly divided into two groups. According to New York Heart Association Functional Classification, 27 patients with grade II and 25 with grade I was randomly divided. The experimental group was submitted to aerobic exercises under heart rate control for seven months and the control group with no exercise prescription. In the comparison, the 6-minute walk test and a cardiac function test were employed by Agilent 4500 EcoDoppler at a frequency of 2.5MHz. The indices of systolic and left ventricular function were recorded on ECG simultaneously using the improved Simpsons method, and the following indices were measured: left ventricular systolic and end-diastolic; left ventricular ejection fraction; left ventricular diastolic function; early, late peak velocity and its ratio; mitral valve diastole. Results: Compared to the control group, heart rate decreased to different degrees ($P < 0.05$), exercise endurance increased significantly ($P < 0.01$), and left ventricular function index improved significantly ($P < 0.01$). Conclusion: We observed a positive impact of aerobic exercise directed at the rehabilitation of the cardiovascular system and mental health in elderly patients. ***Evidence Level II; Therapeutic Studies – Investigating the results.***

Keywords: Heart Failure; Exercise; Elderly.

RESUMO

Introdução: A insuficiência cardíaca é uma doença comum em idosos. No estágio final, além da disfunção cardíaca, os pacientes geralmente acompanham uma redução no teor de gordura e da massa magra. Objetivo: Estudar os efeitos da resistência ao exercício e da taxa de reação adversa em pacientes com insuficiência cardíaca. Métodos: 52 pacientes com insuficiência cardíaca crônica (38 homens, idade de 67 ± 2,2 anos) foram divididos aleatoriamente em dois grupos. Segundo a classificação funcional da IC NYHA, 27 pacientes com grau II e 25 com grau I foram divididos aleatoriamente. O grupo experimental foi submetido a exercícios aeróbicos sob controle da frequência cardíaca por 7 meses e comparado ao grupo controle sem prescrição de exercício algum. Na comparação, foram utilizados o teste de caminhada de 6 minutos, teste de função cardíaca por EcoDoppler Agilent 4500 em frequência de 2,5MHz. Os índices de função sistólica e ventricular esquerda foram registrados no eCG simultaneamente utilizando o método Simpsons melhorado e os seguintes índices foram medidos: sistólica ventricular esquerda e diastólica final; fração de ejeção ventricular esquerda; função diastólica ventricular esquerda; velocidade de pico precoce, tardio e sua razão; diástole da válvula mitral. Resultados: Comparado ao grupo controle, a frequência cardíaca diminuiu em diferentes graus ($P<0,05$), a resistência ao exercício aumentou significativamente ($P < 0,01$) e o índice de função ventricular esquerda melhorou significativamente ($P < 0,01$). Conclusão: Observou-se um impacto positivo do exercício aeróbico direcionado à reabilitação do sistema cardiovascular e da saúde mental nos pacientes idosos. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Insuficiência Cardíaca; Exercício Físico; Idoso.*

RESUMEN

Introducción: La insuficiencia cardíaca es una enfermedad común en los ancianos. En la fase final, además de la disfunción cardíaca, los pacientes suelen acompañar una reducción del contenido de la grasa y de la masa magra. Objetivo: Estudiar los efectos de la resistencia al ejercicio y la tasa de reacción adversa en pacientes con insuficiencia cardíaca. Métodos: 52 pacientes con insuficiencia cardíaca crónica (38 varones, edad de 67 ± 2,2 años) fueron divididos aleatoriamente en dos grupos. Según la clasificación funcional de la IC de la NYHA, se dividieron aleatoriamente 27 pacientes con grado II y 25 con grado I. El grupo experimental fue sometido a ejercicios aeróbicos bajo control de la frecuencia cardíaca durante 7 meses y comparado con el grupo de control sin prescripción de ejercicios. En la comparación se utilizó la prueba de marcha de 6 minutos y la prueba de función cardíaca mediante el EcoDoppler Agilent 4500 a una frecuencia de 2,5MHz. Los índices de la función sistólica y del ventrículo izquierdo se registraron en la eCG simultáneamente mediante el método mejorado de Simpsons y se midieron los siguientes índices: sistólica y diastólica final del ventrículo izquierdo; fracción de eyección del ventrículo izquierdo; función diastólica del ventrículo izquierdo; velocidad máxima temprana y tardía y su relación; diástole de la válvula mitral. Resultados: En comparación con el grupo de control, la

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frecuencia cardíaca disminuyó en diferentes grados (P < 0,05), la resistencia al ejercicio aumentó significativamente (P < 0,01) y el índice de función ventricular izquierda mejoró significativamente (P < 0,01). Conclusión: Se observó un impacto positivo del ejercicio aeróbico dirigido a la rehabilitación del sistema cardiovascular y la salud mental en pacientes de edad avanzada. ***Nivel de evidencia II; Estudios terapéuticos - Investigación de resultados.***

Descriptores: *Insuficiencia Cardíaca; Ejercicio Físico; Persona Mayor.*

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INTRODUCTION

Chronic heart failure is a complex clinical syndrome. Ventricular filling or impaired ejection capacity caused by abnormal cardiac structure or cardiac function. The clinical manifestations were dyspnea, fatigue and fluid retention. Previous treatment of chronic heart failure emphasized short-term hemodynamic improvement.[1] In recent years, with the deepening of research and understanding, the treatment strategy has undergone fundamental changes, focusing on the long-term repair of cardiac function and the prevention of myocardial remodeling. The drug treatment is also traditional. Cardiotonics, diuretics and vasodilators have been transformed into a combination of neuroendocrine inhibitors and a variety of drugs. In recent years, aerobic exercise therapy has been paid more and more attention to the treatment of chronic heart failure (CHF). The treatment mode of chronic heart failure has developed from drug therapy to drug exercise therapy. CHF heart failure is a common disease and common disease in the elderly.[2] Heart failure is mainly caused by inflammation, myocardial infarction, cardiomyopathy and other reasons, which leads to myocardial damage and the decline of ventricular pumping function and filling capacity, which seriously affects the health of patients. Exercise intervention is one of the commonly used methods in the clinical treatment of patients with heart failure. It can improve the ultrasonic structure and neuromuscular function of skeletal muscle in patients with heart failure, and improve muscle quality and endurance.[3] The study confirmed that moderate intensity CAE and IAE training can significantly reduce the serum adhesion molecular markers of patients with chronic heart failure and prevent the change of oxygen uptake.[4,5]

METHOD

Subjects

Participants 52 patients with CHF, 38 males and 20 females, aged 67 ± 2.2 years. After medical history, physical examination, chest film and echocardiography, CHF patients were diagnosed. According to NYHA classification, 27 patients with central function grade II and 25 patients with grade I1 were randomly divided into two groups. 38 patients in the treatment group were given routine anti heart failure treatment and aerobic exercise training guidance, and 20 patients in the control group were given routine anti heart failure treatment. The following patients were not included in this study: asthma, pulmonary insufficiency and other lung diseases, severe sinus bradycardia, conduction block, acute heart failure, grade IV cardiac function and inflexible limb activities. There was no difference between the two groups in age, sex, weight, blood pressure, heart rate, course of disease, cardiac function, educational level and primary diseases (P > 0.05).

Method

1. Aerobic exercise training method in the treatment group: before discharge, walking training was started under ECG monitoring for 5-10 minutes, and rest for 1 minute every 2-4 minutes. The exercise time can be gradually increased to more than 6 minutes according to the length of - two minutes, and the 6-minute walking test was completed. After exercise, the increase of heart rate shall not exceed 20 times / min and the patient does not feel tired. Observe the changes of blood pressure and heart rate. After discharge, gradually increase the walking time until each activity lasts for 30-40 minutes, 5 times a week, follow-up guidance every 2 months to 6 months, and outpatient follow-up. Both groups continued to take medicine according to the doctor's advice, and 3 Cases Terminated aerobic exercise training due to the aggravation of heart failure symptoms.[6]

2. The 6-min walking test reported by Vera Bittner was used to observe the walking distance within 6 minutes before and after exercise. Cardiac function test: American Agilent SONOS 4500 color Doppler ultrasound instrument with probe frequency of 2.5MHz was used. ECG and left ventricular systolic function indexes were recorded simultaneously: using the improved Simpsons method, the subjects took the flat position 2 minutes after resting quietly, and the following indexes were measured through the left ventricular long axis section and apical four chamber section: left ventricular systolic and end diastolic (lveds, LVEDd), left ventricular ejection fraction (LVEF). Left ventricular diastolic function: the early and late peak velocity indexes (E, A) and their ratio (E / A) of mitral valve diastole were measured by color Doppler.

INDICATORS

The curative effects of the two groups were compared; Average length of stay; BNP index, cardiac ultrasound results and six minute walking distance before and after treatment; Adverse reactions. Remarkable effect: BNP index, cardiac ultrasound results and six minute walking distance returned to normal, and symptoms and signs disappeared; Effective: BNP index, cardiac ultrasound results and six minute walking distance were improved by more than 50%; Ineffective: the improvement of BNP index, cardiac ultrasound results and six minute walking distance was less than 50%. Total effective rate = sum of markedly effective and effective percentages.

Statistical analysis

All data are expressed as mean standard deviation, and t test is used for significance test.[7]

RESULTS

The cardiac function indexes of patients with heart failure in the two groups after 6 months are shown in Table 1.

Comparison of 6-min walking distance between the two groups before and after exercise training: exercise group (165.5 ± 67.1) m before

Table 1. ratio of left ventricular function indexes before and after exercise in the two groups.

Project	Exercise therapy group (n = 28)		Control group (n = 20)	
Average heart rate	When selected	At the end	When selected	At the end
Systolic pressure	146.0±13.2	133.0±11.3	144.23±12.6	122.0±14.3
Diastolic pressure	87.3±5.3	83.2±5.2	85.2±7.6	84.3±8.1
Left ventricular diameter	56.2±1.23	56.1±3.3	54.6±5.6	56.0±5.6
LVEF	43.5±5.23	35.79±1.23	42.3±2.0	48.0±2.6

treatment and (324.5 ± 70.8) m after treatment. The control group was (166.7 ± 66.4) m before treatment and (244.8 ± 76.4) m after treatment. The exercise group was significantly higher than that before treatment and after treatment in the control group (P < 0.01). As shown in Table 2.

It can be seen from table 3 that in this study, the NT Pro BNP level decreased, 6MWT was significantly prolonged, and the quality of life score was significantly reduced. It also shows that exercise rehabilitation treatment can improve cardiac function, improve exercise endurance and improve the quality of life of patients. In this study, the incidence of adverse reactions in the control group was 9.52%, and the incidence of adverse reactions in the observation group was 7.14%. There was no significant difference between the two groups, suggesting that the use of rehabilitation exercise therapy on the basis of conventional drug treatment will not increase adverse reactions, and the application safety is high. To sum up, exercise rehabilitation therapy can effectively improve cardiopulmonary function, exercise endurance and quality of life of patients with chronic heart failure.[8]

Table 2. Comparison of curative effects between the two groups [n (%)].

Group	Reciprocal (n)	Remarkable effect	Effective	Invalid	Total effective rate
Control group	38	15	19	17	32 (66.23)
Auxiliary group	20	42	9	0	47 (99.00)
x^2	20	16	2	3	8.126
P value	15	13	0	0	0.005

Table 3. Comparison of BNP indexes, cardiac ultrasound results and six minute walking distance before and after treatment($\overline{x} \pm s$).

Group	Number of cases (n)	Period	BNP(pg/L)	Six minute walk Distance (m)
Control group	52	Before treatment	996.131±35.86	301.25±63.25
		After treatment	452.31±13.21	523.12±95.26
Observation group	52	Before treatment	985.23±156.32	302.11±63.11
		After treatment	788.21±78.96	356.12±85.36

DISCUSSION

In the treatment of CHF patients, bed rest is still an important treatment method for chronic heart failure, but long-term bed rest will bring physical weakness, muscle atrophy, lung infection and so on. Because the cardiac insufficiency leads to the decrease of stroke output, the insufficient cardiac output leads to the lack of oxygen transported to the exercise muscles, so anaerobic metabolism will occur at a lower level of exercise. Anaerobic metabolism occurs when the oxygen consumption reaches twice that of resting state, while it occurs only when it reaches 10 times in normal people. This is an important reason for the obvious decline of exercise endurance, limited physical activity and ultimately the decline of quality of life in CHF patients. Recent studies have shown that aerobic exercise training plays a good role in improving the clinical symptoms of CHF patients. Because it can improve the oxidative metabolism of patients' skeletal muscle; Improve the histological and biological shape of skeletal muscle: improve the function and tolerance of skeletal muscle; Improve the endothelial function of peripheral blood circulation; Improve the patient's auto balance ability. Finally, it can reduce the symptoms of fatigue and dyspnea. Exercise can also change heart function, myocardial systolic function, front and rear load and heart rate.

It can be seen from Figure 1 that in a study on the effect of endurance training on the density of capillaries and arterioles of fast

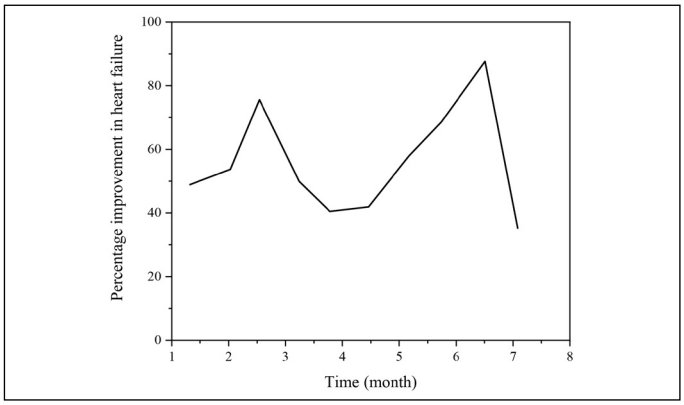

Figure 1. Effect of endurance training on mental failure.

and slow muscles in rats with chronic heart failure, rats with chronic heart failure 4 weeks after operation were subjected to 10 weeks of endurance training. The results showed that endurance training was beneficial to fiber type specific revascularization in hindlimb skeletal muscle of rats with chronic heart failure. Fifty sedentary patients with heart failure and implantable cardioverter defibrillator (ICD) or cardiac resynchronization therapy defibrillator (CRT-D) underwent 4 weeks of stretching exercise. The results showed that 4 weeks of stretching exercise could pass.[9] Including yoga, Baduanjin and Taijiquan. Taking 40 patients aged about 60 years as the research object, after 12 weeks of yoga intervention, the results show that yoga can improve health-related quality of life and may reduce the depressive symptoms of patients with heart failure. The study suggests that exercises such as spa are similar to yoga. Patients were recruited from two large medical centers in the north. Participants with heart failure were randomly divided into intervention group (n = 39) and control group (n = 41) for 12 weeks of Baduanjin Exercise. The results showed that the fatigue and quality of life in the intervention group were significantly improved. Then take the patients with chronic systolic heart failure as the research object and carry out Taiji exercise for 12 weeks. The results show that Taiji exercise can improve the patients' physical perception and psychological adaptability.[10]

CONCLUSION

The results support these theories, suggesting that aerobic exercise can significantly improve the cardiac function and quality of life of patients with heart failure. The compliance of aerobic exercise patients was good. Case B was hospitalized and terminated aerobic training because of the aggravation of heart failure. This paper holds that aerobic exercise training is an effective method to improve cardiac function and quality of life in the elderly. The research on exercise intervention of heart failure mostly focuses on aerobic exercise, high-intensity intermittent exercise and endurance exercise. The intervention methods mostly use single exercise, and the combined intervention of multiple exercises is less. Most of the subjects were elderly outpatients, and randomized controlled trials were used in the research design. The related research contents are mostly related to the cardiopulmonary exercise test of patients with heart failure, mainly including different minute walking distance and so on. The main research direction is the improvement of exercise intervention on patients' cardiovascular system, exercise ability and mental health.

All authors declare no potential conflict of interest related to this article

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