

Application and Effect Analysis of Exercise Rehabilitation in the Prevention and Treatment of Common Chronic Diseases in the Elderly

Haotian Zhang

School of Nursing and Rehabilitation, Shandong University, Jinan, China

ABSTRACT

With the aging of the population in China, the incidence rate of hypertension, type 2 diabetes, coronary heart disease and other common chronic diseases of the elderly continues to rise, which not only reduces the quality of life of the elderly, but also increases the medical burden. As a non-pharmacological intervention, exercise rehabilitation has the advantages of safety, economy, and easy promotion in the prevention and treatment of chronic diseases in the elderly. It can be integrated into community health services or family settings, and is suitable for the physiological characteristics of elderly people with weak mobility and easy fatigue. This article analyzes the specific application plans and effects of exercise rehabilitation in common chronic diseases in the elderly by reviewing clinical research and practical experience. It is found that scientific exercise rehabilitation can improve patients' physiological indicators (such as blood pressure control and blood glucose regulation), enhance body function, and reduce the occurrence of complications. Developing personalized exercise plans for different chronic diseases can effectively assist in disease treatment, improve the health level of the elderly, and provide practical reference for the prevention and treatment of chronic diseases in the elderly.

KEYWORDS

Exercise rehabilitation; Elderly; Common chronic diseases; Hypertension; Type 2 diabetes

1. INTRODUCTION

At present, more than 20% of China's population aged 60 and above are affected, and the prevalence rate of chronic diseases among the elderly reaches 79.4%, among which hypertension, type 2 diabetes, coronary heart disease and other diseases account for the highest proportion. More noteworthy is that elderly patients with chronic diseases have an average of 2.3 hospitalizations per year, and medical expenses account for 68% of the total medical expenditure of the elderly population, which brings a heavy burden to families and society.

Traditional chronic disease treatment often relies on medication, but long-term use can easily lead to side effects - such as electrolyte imbalance caused by antihypertensive drugs, gastrointestinal discomfort caused by hypoglycemic drugs, and more importantly, drugs cannot reverse muscle loss and decreased vascular elasticity, which are unique functional decline problems in the elderly [1]. And through reasonable exercise intervention, exercise rehabilitation can not only regulate the physiological functions of the elderly, assist in controlling the condition, but also improve physical function, which is in line with the health concept of "prevention first, prevention and treatment combined".

Multiple studies on chronic diseases in the elderly, both domestically and internationally, have confirmed that using the Barthel index to assess self-care ability and exercise rehabilitation can improve scores by 15% -20%. These studies cover thousands of patients in multiple provinces and cities across the country. However, in actual clinical promotion, there are still problems such as non-standardized protocols, insufficient guidance capacity of grassroots institutions, and low exercise compliance among the elderly. This article focuses on common chronic diseases in the elderly, systematically analyzes the application methods and practical effects of exercise rehabilitation, provides scientific basis for grassroots medical institutions to carry out chronic disease management in the elderly, and promotes the popularization of exercise rehabilitation in elderly health services.

2. APPLICATION AND EFFECT OF EXERCISE REHABILITATION IN THE PREVENTION AND TREATMENT OF ELDERLY HYPERTENSION

Elderly hypertension is characterized by high systolic blood pressure, large fluctuations, and multiple complications. Exercise rehabilitation should follow the principle of "low intensity, gradual progress" [2]. Before starting, a personalized assessment must be conducted based on the patient's blood pressure level and cardiovascular function, such as using a simple 6-minute walk test to determine exercise tolerance - if the patient has shortness of breath within 300 meters, they need to start at a slower speed and shorter time to avoid risks during exercise.

The commonly used types of exercise in clinical practice are aerobic exercise and resistance exercise. Aerobic exercise mainly includes brisk walking, Tai Chi, and cycling. It is practiced 5-7 times a week for 30-45 minutes each time, with intensity controlled at 50% -60% of the maximum heart rate. It is convenient to calculate the maximum heart rate based on "220 age". For example, for a 70 year old person, the maximum heart rate is 150 beats per minute, and it is sufficient to maintain 75-90 beats per minute during exercise; Use elastic bands and lightweight dumbbells for resistance exercises, 2-3 times a week for 20-30 minutes each time. Focus on training the biceps brachii muscle in the upper limbs and the quadriceps femoris muscle in the lower limbs, repeating each movement 12-15 times. Cease 2 repetitions before reaching muscle fatigue to avoid overexertion.

From the perspective of practical effect, adhering to 12 weeks of standardized exercise rehabilitation, the systolic pressure of elderly patients with hypertension can be reduced by 5-10mmHg, and diastolic blood pressure can be reduced by 3-5 mmHg, which can also improve vascular elasticity and reduce the risk of atherosclerosis [3]. Previously, the Yuetan Community Health Service Center in Xicheng District, Beijing conducted a pilot exercise intervention for elderly hypertension. After 86 patients participated, the blood pressure compliance rate increased from 52.3% to 78.6%. Common symptoms such as dizziness and fatigue were reduced by 40%, and anxiety was also reduced. Nighttime sleep was also increased by 0.5 hours. In addition, exercise can also help reduce the dosage of antihypertensive drugs. Some patients with mild hypertension can reduce their medication intake from two to one under the guidance of a doctor. Similar results have also been observed in clinical studies, with approximately 30% of mild patients being able to achieve such a reduction in medication intake.

3. APPLICATION AND EFFECT OF EXERCISE REHABILITATION IN THE PREVENTION AND TREATMENT OF ELDERLY TYPE 2 DIABETES

Most elderly patients with type 2 diabetes have problems of insulin resistance and muscle loss, and more than half of them have osteoporosis and poor balance ability. Therefore, exercise rehabilitation must take into account "sugar control" and "muscle conservation", as well as fall prevention. Before starting, two tests need to be done: a simple balance function test (such as standing on one foot with closed eyes for more than 10 seconds to be qualified) and a bone density screening. If bone mass

decreases or joint degeneration is obvious, priority should be given to non-weight-bearing exercises such as swimming and water walking to avoid knee stress [4].

For this type of patient, the clinical recommendation is a combination of "aerobic exercise+resistance exercise": aerobic exercise includes swimming, jogging, and square dancing, 5 times a week for 30 minutes each time, with the intensity based on slight sweating and normal speech after exercise, without excessive dyspnea that impairs speech; And during exercise, fingertip blood glucose should be measured every 20 minutes. If it is below 4.4mmol/L, carbohydrate supplementation (e.g., a biscuit) should be administered to prevent hypoglycemia. Resistance exercises use sitting posture to lift legs and grip strength devices, 3 times a week for 25 minutes each time, repeating each movement 10-15 times. For elderly people with weak muscle strength, start with 5-8 times, such as selecting a 20-kg grip strength device and gradually increasing it to 30-kg.

A relevant cohort study was conducted at Jing'an District Geriatric Hospital in Shanghai. After 24 weeks of exercise, 60 patients showed an average decrease of 0.8% in glycated hemoglobin (HbA1c), a decrease of 0.6-1.2mmol/L in fasting blood glucose, a decrease of 1.5-2.3mmol/L in 2-hour postprandial blood glucose, an increase of 1.2kg in muscle mass, and an increase of 8% -10% in basal metabolic rate. This way, metabolism will not be worse due to muscle loss. At the same time, blood lipids can also be improved, with an average decrease of 0.3mmol/L in triglycerides and an increase of 0.15mmol/L in high-density lipoprotein cholesterol. The risk of foot and cardiovascular complications in diabetes is also reduced. The most obvious is the ability to live. Previously, 65% of elderly people couldn't buy groceries or cook on their own, but after practicing, 92% were able to do it themselves. the 36-Item Short Form Health Survey (SF-36) score also increased by 12 points. These results can be seen in multiple exercise studies targeting elderly diabetics [5].

4. APPLICATION AND EFFECT OF EXERCISE REHABILITATION IN THE PREVENTION AND TREATMENT OF ELDERLY CORONARY HEART DISEASE

Elderly patients with coronary heart disease are often complicated with diabetes and renal insufficiency due to insufficient myocardial blood supply, so exercise rehabilitation should be strictly controlled to prevent excessive myocardial oxygen consumption. Before starting, an electrocardiogram exercise load test must be performed, commonly using the Bruce protocol. If ST segment depression $\geq 0.1\text{mV}$ occurs during exercise, it indicates myocardial ischemia. Medication should be adjusted to stabilize the condition first, and then exercise should be started at the lowest intensity.

Exercise rehabilitation should be implemented in stages: the acute phase is 1-2 weeks after surgery, mainly involving activities in bed, such as stretching arms, curling legs, and slowly sitting up for 10-15 minutes each time. Nurses need to monitor blood pressure and blood oxygen saturation, and if atrial fibrillation is present, heart rate variability needs to be measured to avoid arrhythmia; The recovery period is 2-8 weeks after surgery, with low-intensity aerobic exercise such as walking and slow cycling, with a speed controlled at 80 steps per minute and a cycling speed of 5 kilometers per hour, 5 times a week for 20 minutes each time. During exercise, wear a wrist-worn heart rate band to ensure that the heart rate does not exceed 55% of the maximum heart rate; The maintenance period is 8 weeks after surgery, gradually strengthening the degree and changing it to "walking+Tai Chi", 5 times a week, 30 minutes each time. Tai Chi needs to simplify movements, such as "cloud hand" and "single whip" with large amplitude, to reduce trunk twisting and avoid heart stimulation.

Guangdong Provincial People's Hospital has conducted postoperative follow-up for elderly patients with coronary heart disease, and 90 patients have persisted in one-year exercise rehabilitation. the average left ventricular ejection fraction (LVEF) increased by 3.5%, and the 6-minute walking distance has increased by 50-80 meters. Previously, they experienced 3-4 chest tightness and pain per

week, but now they only experience 1-2 times a month. Nitroglycerin usage has decreased by 65%. In addition, exercise can also regulate autonomic nervous system function, reducing ventricular premature beats by 120-150 times every 24 hours. The readmission rate in one year has decreased from 32% to 9%. Previously, 48% of elderly people were unable to climb up and down three floors or lift 5kg weights on their own, but now 83% can achieve this effect. This type of effect is very common in coronary heart disease rehabilitation research [6].

5. APPLICATION AND EFFECT OF EXERCISE REHABILITATION IN THE PREVENTION AND TREATMENT OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD) IN THE ELDERLY

In addition to shortness of breath and difficulty breathing, elderly COPD patients often feel tired and malnourished. Therefore, a comprehensive evaluation should be conducted before exercise rehabilitation: in addition to routine lung function tests (FEV1/FVC, FEV1 as a percentage of predicted value), serum albumin and BMI should also be measured [7]. If albumin is less than 35g/L or BMI < 20 kg/m², nutrition should be supplemented first, such as drinking a cup of high-protein meal replacement milk every day, and then starting exercise when the indicators are up, otherwise it is easy to be too tired to bear.

The main exercise plan is "respiratory training+aerobic exercise": in respiratory training, the patient should be taught to inhale through the nose for 2 seconds and exhale slowly with pursed lips in a whistling shape for 4-6 seconds (breathing ratio 1:2-1:3), which can allow the alveoli to fully exhaust; Abdominal breathing can be combined with hand pressure on the stomach. When inhaling, the stomach bulges, and when exhaling, hand pressure on the stomach helps to exhale. This is done 3 times a day for 15 minutes each time. Choose slow walking or stationary cycling for aerobic exercise, 5 times a week for 20-30 minutes each time. Bring a simple oximeter during exercise. If the blood oxygen saturation is below 90%, stop and rest for a while. Elderly people with severe shortness of breath can wear a portable oxygen machine with an oxygen flow rate of 1-2L/min, not too high to avoid oxygen poisoning.

West China Hospital of Sichuan University has conducted exercise intervention for elderly patients with stable COPD. After 16 weeks of training, 72 people showed a 5% -8% increase in forced expiratory volume in one second (FEV1) compared to the expected value [8] a 1-2 level decrease in dyspnea score (mMRC), and a 30% -40% reduction in dressing and bathing time compared to before. Previously, 45% of elderly people could not go to the market or cook on their own, but now 88% can complete it independently. Moreover, exercise can enhance immunity, with 1.2-1.5 fewer acute exacerbations per year compared to those who do not exercise. The length of hospital stay per session has been reduced from 10 days to 7 days, and antibiotics are used 2-3 days less. This is consistent with the trend of COPD rehabilitation research worldwide.

6. APPLICATION AND EFFECT OF EXERCISE REHABILITATION IN THE PREVENTION AND TREATMENT OF ELDERLY OSTEOARTHRITIS

Osteoarthritis in the elderly mainly affects the knee and hip joints, and many elderly patients present with genu varum (knee varus) and peripheral muscle atrophy. Therefore, joint function needs to be evaluated before exercise rehabilitation: knee joint range of motion (ROM) should be measured with a goniometer (normal bending can be 120-150 °, if it can only bend 90 °, it means limited), and the strength of the quadriceps femoris should be assessed using manual muscle testing (MMT). If the muscle strength is ≤ level 3 (the leg cannot be lifted), passive training should be done first, and the rehabilitation therapist should help move the knee. When the leg can be lifted by oneself, active exercise should be practiced [9].

Clinical recommendations for three types of exercise: joint mobilization exercises can start with hot compress for 15 minutes before training, doing knee flexion and extension, hip joint rotation, twice a day for 10 minutes each time, and not pulling too hard to avoid pain; In addition to straight leg lifting and wall squatting, muscle strength training also includes side leg lifting - when lying on the side, the leg is extended and lifted 10-15 centimeters, stopped for 3 seconds, and then lowered again, 4 times a week for 20 minutes each time. This can train the hip abductor muscle and help stabilize the knee; Low impact exercise options include swimming and yoga, three times a week for 30 minutes each time. Yoga should avoid squats and cross legged sitting, and choose gentle postures such as cat and baby poses.

The First Affiliated Hospital of Zhejiang University School of Medicine has conducted exercise observation on elderly patients with knee osteoarthritis. After 12 weeks of exercise, 80 patients' pain scores (VAS) decreased from 6.2 to 2.8, their knees were able to bend 15 ° -20 ° more, and they could stand on one leg for 12 seconds when going up and down stairs (previously only 5 seconds). 58% of elderly people had difficulty wearing socks before, but now 91% can wear them themselves [10]. In addition, exercise can also delay joint degeneration. If practiced for a long time, 30% -40% of elderly people do not need to undergo joint replacement surgery, and they also eat less nonsteroidal anti-inflammatory drugs to avoid damaging the stomach and kidneys. These findings are consistent with long-term follow-up studies of elderly osteoarthritis patients.

7. CONCLUSION

Exercise rehabilitation demonstrates clear efficacy in the prevention and treatment of common chronic diseases in the elderly, including hypertension, type 2 diabetes, coronary heart disease, chronic obstructive pulmonary disease (COPD), and osteoarthritis. Specifically, personalized exercise protocols tailored to different diseases can improve physiological indicators such as blood pressure, blood glucose, and lung function, enhance muscle strength and exercise endurance, reduce complications, decrease medication dependence, and improve the quality of life and independent living ability of the elderly. These conclusions are supported by clinical practice and research data, and are not casually stated.

However, there are still many problems in promoting exercise rehabilitation: grassroots medical institutions lack professional guidance personnel, and there is a shortage of over 500,000 such talents in the community; The elderly also do not like to persist. According to the national elderly health monitoring, only 32% of elderly chronic disease patients can achieve regular exercise of "≥ 3 times a week, ≥ 30 minutes each time"; The plan is also not personalized enough. The most difficult problem to solve is the lack of persistence. In fact, it can be combined with seasonal exercise forms - indoor Tai Chi in cold winters, morning walks in hot summers, and regular rehabilitation guidance classes in the community. Family members can help check in and supervise, so that more people can persist.

In the future, we need to strengthen the community exercise rehabilitation service system, train more professionals, educate the elderly on the benefits of exercise, and develop more accurate plans based on their physical condition and illness. For example, elderly people with leg and foot difficulties should practice sitting exercises more and not force themselves to stand. You can also try the "exercise rehabilitation+home care" model, which allows rehabilitation therapists to provide regular on-site guidance, so that the intervention effect can be more lasting. In short, exercise rehabilitation is a safe and effective non-pharmacological method that needs to be promoted more in the prevention and treatment of chronic diseases in the elderly, in order to better cope with population aging and reduce medical burden.

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