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Impact of Sarcopenia on Prognosis in Frail Elderly Patients with Chronic Kidney Disease

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Abstract: *Objective:* To investigate the impact of sarcopenia on the prognosis of frail elderly patients with chronic kidney disease. *Methods:* A total of 98 elderly frail patients with chronic kidney disease were included in this study from June 2020 to July 2022. The patients were randomly divided into a study group of 48 cases and a control group of 50 cases. The control group only received conventional treatment for chronic kidney disease. On the basis of conventional treatment for chronic kidney disease, the study group added sarcopenia intervention treatment. The quality-of-life scores, muscle mass and muscle strength, renal function, and incidence of complications of the two groups were observed and analyzed. *Results:* The quality-of-life score, muscle mass and muscle strength, and renal function of the study group were significantly better than those of the control group ($P < 0.05$); the incidence of complications in the study group was 12.5%, which was significantly lower than that of the control group 36% of the group ($P < 0.05$). *Conclusion:* There is a close relationship between sarcopenia and frail elderly patients with chronic kidney disease. Sarcopenia will further aggravate the frailty symptoms and increase the risk of complications in elderly patients with chronic kidney disease. For elderly patients with chronic kidney disease, sarcopenia should be screened and intervened as early as possible to improve the prognosis and quality of life of the patients.

Keywords: Sarcopenia; Elderly chronic kidney disease; Frailty; Prognosis

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1. Introduction

Sarcopenia is an age-related disease that reduces muscle mass and muscle function and is more common in the elderly. Elderly patients with chronic kidney disease are also often accompanied by sarcopenia, which can lead to decreased quality of life, worse prognosis, increased risk of death, increased incidence of cardiovascular events, and increased all-cause mortality. Thus, sarcopenia has a significant impact on the prognosis of frail elderly patients with chronic kidney disease. In recent years, the impact of sarcopenia on the prognosis of frail elderly patients with chronic kidney disease has attracted considerable attention. Many studies have shown that sarcopenia is an independent risk factor affecting the prognosis of frail elderly patients with chronic kidney

disease [1-3]. The intervention of sarcopenia in elderly frail patients with chronic kidney disease, including muscle training, protein supplementation, and improvement of metabolism, can effectively improve the prognosis of patients, improve the patient's quality of life, and reduce the incidence of complications and mortality. At the same time, studies have also shown that sarcopenia in elderly frail patients with chronic kidney disease is closely related to the incidence of cardiovascular events [4-6]. However, there are still some controversies and limitations regarding the impact of sarcopenia on the prognosis of elderly frail patients with chronic kidney disease. On the one hand, due to the small sample size of the study, there may be some bias in the research results; on the other hand, due to the short treatment cycle, it is difficult to comprehensively evaluate the long-term impact of sarcopenia on the prognosis of frail elderly patients with chronic kidney disease. Therefore, it is necessary to further expand the sample size and prolong the treatment period to more comprehensively evaluate the impact of sarcopenia on the prognosis of frail elderly patients with chronic kidney disease.

2. Materials and methods

2.1. General information

A total of 98 frail elderly patients with chronic kidney disease were included in this study from June 2020 to July 2022. They were over 60 years old and all suffered from different degrees of chronic kidney disease. They also had muscle loss and muscle functional impairment. This study adopted a randomized controlled design, including 48 cases in the study group and 50 cases in the control group. All patients received chronic kidney disease treatment, including dialysis and drug therapy.

2.2. Methods

2.2.1. Control group

The control group only received conventional treatment for chronic kidney disease [7-9], including the following aspects:

(1) Drug therapy: Patients with chronic kidney disease need long-term drug therapy, including drugs to control blood pressure, reduce urine protein, correct anemia, and correct electrolyte imbalance. Commonly used drugs include ACE inhibitors, ARB drugs, diuretics, calcineurin inhibitors, etc.

(2) Diet therapy: Diet therapy for patients with chronic kidney disease aims to control the intake of nutrients such as water, salt, and protein, reduce the burden on the kidneys, and delay the deterioration of renal function. Patients need to limit the intake of nutrients such as sodium, potassium, and phosphorus, avoid foods with high salt content and pickled products, and consume high-quality, low-protein foods in moderation.

(3) Exercise therapy: Patients with chronic kidney disease can take appropriate exercise therapy, which can help improve blood circulation, control blood pressure and blood sugar, and improve the body's immunity. Patients can choose low-intensity, low-volume exercise methods, such as walking, jogging, swimming, etc.

(4) Hemodialysis: When patients with chronic kidney disease develop into uremia, hemodialysis is required. Hemodialysis is a treatment method that uses a hemodialysis machine to exchange the patient's blood with the dialysate, remove metabolic waste and excess water in the body, and maintain water, electrolyte, and acid-base balance.

(5) Other treatments: Patients with chronic kidney disease can also choose other treatment methods such as traditional Chinese medicine treatment, immunotherapy, and anti-infection treatment to relieve symptoms and improve quality of life.

2.2.2. Study group

On the basis of conventional treatment for chronic kidney disease, the study group added intervention treatment for sarcopenia [10-12], including the following:

(1) Nutritional supplements: Supplements for nutritional deficiencies in muscle loss, including protein, amino acids, vitamin D, etc. It is recommended to consume high-protein foods, such as meat, eggs, beans, etc., and supplement vitamin D at the same time to promote the growth and repair of skeletal muscles.

(2) Exercise training: Carry out targeted exercise training, including strength training, aerobic exercise, etc., to increase muscle mass and strength. It is recommended to do strength training and aerobic exercise at least 3 times a week, each lasting more than 30 minutes.

(3) Improve living habits: Change bad living habits, such as quitting smoking, limiting alcohol consumption, and avoiding long-term sedentary work. At the same time, maintain adequate sleep and an optimistic attitude to promote good health and muscle growth and repair.

(4) Drug treatment: Under the guidance of a doctor, some drugs can be used to relieve the symptoms of sarcopenia, such as muscle relaxants, testosterone replacement therapy, etc.

(5) Overall assessment and care: Assess and care for the overall condition of the patient, including nutritional status, exercise capacity, daily living ability, psychological state, etc., and develop a personalized intervention treatment plan to maximize the quality of life of the patient and prognosis.

The study period of both the control group and the study group was 6 months.

2.3. Observation indicators

This study focuses on the impact of sarcopenia on the prognosis of frail elderly patients with chronic kidney disease. The specific observation indicators include:

(1) Quality of life score (QOL): The short 36-item health questionnaire (SF-36) was used to evaluate the quality of life of patients.

(2) Muscle mass and muscle strength: Measure the patient's muscle mass and muscle strength with a muscle mass instrument and a strength tester.

(3) Renal function: Serum creatinine and glomerular filtration rate were used to evaluate the renal function of the patients.

(4) Complication rate: Observe the occurrence of complications during treatment, including cardiovascular events, infection, etc.

2.4. Statistical methods

Statistical software SPSS 18.0 was used to analyze the data. Measurement data are expressed as mean ± standard deviation (SD), using the *t*-test; count data are expressed as %, using the x^2 test, $P < 0.05$ is considered statistically significant.

3. Results

3.1. Comparative analysis of quality of life scores, muscle mass and muscle strength, and renal function between the two groups

After 6 months of treatment, the study group was significantly better than the control group in terms of quality-of-life scores, muscle mass and strength, and renal function ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparative analysis of quality of life scores, muscle mass and muscle strength, and renal function between the two groups of patients

	Study group (n = 48)	Control group (n = 50)	t	P
Quality-of-life score	60.14 ± 4.35	48.50 ± 2.37	16.33	0.000
Muscle mass	8.66 ± 1.44	6.14 ±1.49	8.48	0.000
Muscle strength (N)	36.50 ± 2.60	28.16 ± 2.10	17.45	0.000
Glomerular filtration rate (mL/min/1.73 m^2)	63.10 ± 1.89	58.70 ± 3.51	7.75	0.000
Serum creatinine (μmol/L)	115.15 ± 5.87	188.06 ± 9.45	46.06	0.000

3.2. Comparison of complications between the two groups

The incidence of complications in the study group was 12%, which was significantly lower than that in the control group 36% ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of complications between the two groups

	The number of cases of complications	Complication rate
Study group (n = 48)	6	12.5%
Control group (n = 50)	18	36.0%
x^2		5.151
P		0.023

4. Discussion

Elderly patients with chronic kidney disease will experience decreased muscle strength leading to fatigue and muscle atrophy. Chronic kidney disease often leads to disorders in the excretion of metabolites in the patient's body, and at the same time, loss of appetite, poor digestion, and absorption, which then easily lead to malnutrition, manifested as weight loss, anemia, and hypoalbuminemia. Patients with chronic kidney disease often combined with cardiovascular disease manifested as palpitations, chest tightness, and dizziness. Calcium and phosphorus metabolism disorders in patients with chronic kidney disease also easily lead to osteoporosis fractures and low back pain. Patients with chronic kidney disease have decreased immune function, and are prone to infections, colds, pneumonia, and other diseases. Hence, elderly patients with chronic kidney disease are weak, including decreased muscle strength, malnutrition, cardiovascular disease, osteoporosis, and decreased immune function wait. These symptoms not only affect the quality of life of patients but also increase the mortality of patients. Therefore, early detection and intervention treatment are very important.

There is a strong relationship between sarcopenia and frailty in older patients with chronic kidney disease. Sarcopenia is an age-related disorder of sarcopenia that results in decreased muscle strength and function [13]. Elderly patients with chronic kidney disease are prone to sarcopenia due to aging and the impact of chronic kidney disease. Sarcopenia will further aggravate the debilitating symptoms of elderly patients with chronic kidney disease, increasing their mortality and the incidence of cardiovascular events [14].

Firstly, sarcopenia can lead to decreased muscle strength and function, which can affect exercise capacity and activities of daily living in elderly patients with chronic kidney disease [15]. The decline in exercise capacity will lead to long-term sedentary patients, increasing the risk of complications such as blood clots and infection.

At the same time, the decline in exercise capacity will also affect the treatment effect and prognosis of patients.

Secondly, sarcopenia can lead to malnutrition and metabolic disorders in patients. Elderly patients with chronic kidney disease already have malnutrition and metabolic disorders, and sarcopenia will further aggravate these problems. Malnutrition and metabolic disorders can lead to muscle loss and functional decline in patients, forming a vicious circle.

Finally, sarcopenia can lead to osteoporosis and fractures in patients. Elderly patients with chronic kidney disease already have osteoporosis, and sarcopenia will further increase the risk of fracture. Fractures will cause patients to stay in bed for a long time, increase the risk of complications, and also affect the treatment effect and prognosis of patients.

Sarcopenia has a significant impact on the prognosis of frail elderly patients with chronic kidney disease, mainly manifested as decreased quality of life, poor prognosis, increased risk of death, and increased incidence of cardiovascular events. Intervention and treatment of sarcopenia in the study group, including muscle training, protein supplementation, and improvement of metabolism, can effectively improve the prognosis of patients, improve the quality of life of patients, and reduce the incidence of complications and mortality.

The results of this study showed that the quality of life score, muscle mass, and muscle strength of the study group was higher than those of the control group, and the difference was statistically significant ($P < 0.05$). In terms of renal function, the study group is also higher than the control group, and the difference is statistically significant ($P < 0.05$). These data show that the study group is better than the control group in terms of quality of life, muscle mass and muscle strength, and renal function. Therefore, early identification and intervention of sarcopenia in frail elderly patients with chronic kidney disease should be strengthened to improve the prognosis of patients. At the same time, this study also has certain limitations, such as a small sample size and a short treatment cycle. It is necessary to further expand the sample size and extend the treatment cycle to more comprehensively assess the impact of sarcopenia on prognosis in frail elderly patients with chronic kidney disease.

In summary, there is a close relationship between sarcopenia and frail elderly patients with chronic kidney disease. Sarcopenia will further aggravate the frailty symptoms and increase the risk of complications in elderly patients with chronic kidney disease. Therefore, for elderly patients with chronic kidney disease, early screening and intervention for sarcopenia should be performed to improve the prognosis and quality of life of patients.

Disclosure statement

The authors declare no conflicts of interest.

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