Effect of Resistance Exercise with Moderate and Low Intensity on Quality of Life and Mental Health in Maintenance Hemodialysis Patients

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Abstract: It was to explore the effects of resistance exercise with moderate and low intensity on quality of life (QoL) and mental health of patients with maintenance hemodialysis (MHD). From June 2022 to December 2022, 90 patients receiving MHD treatment in Blood Purification Center of XXX Hospital were randomly divided into observation group and controls, with 45 patients in each group. The controls received routine hemodialysis care, and observation group received resistance exercise with moderate and low intensity in addition to routine hemodialysis care. QoL measurement tool adopted 36-Item Short Form Health Survey (SF-36), Hamilton Rating Scale for Depression (HAMD), and Hamilton Anxiety Scale (HAMA) to evaluate patients. The physical function was 67.64±25.62 and mental health was 71.68±28.55 in controls, and those was 71.11±25.42 and 73.48±13.59 in observation group; in terms of physical function and mental health in QoL, observation group was obviously higher; and HAMD and HAMA scores in observation group were clearly lower as against controls (P < 0.05). The effect of resistance exercise with moderate and low intensity was obvious on the physical function and mental state of QoL in MHD patients, but not obvious on other aspects. Resistance exercise with moderate and low intensity was beneficial to improve patients’ mental health.

Keywords: Hemodialysis; Resistance Exercise; QoL; Mental Health.

1. Introduction

According to statistics, end stage renal disease (ESRD) is the fifth stage of chronic kidney disease. It is a common clinical syndrome in which various primary and secondary renal diseases progress to renal failure. In recent years, the number of patients with ESRD in China has continued to increase [1]. Patients must undergo renal replacement therapy, generally kidney transplantation, peritoneal dialysis, and hemodialysis to survive for a long time. Among them, MHD has been widely adopted. In China, the patients with ESRD who have chosen hemodialysis as a treatment account for 91% of the total dialysis patients. With continuous progress, hemodialysis technology has become increasingly mature and become a routine treatment method, enabling many ESRD patients to survive for a long time [2]. However, it also has its limitations. Hemodialysis is still a treatment with unsatisfactory QoL and high mortality. Skeletal muscle atrophy is a common yet easily overlooked problem in dialysis patients, and it has been reported that the incidence of skeletal muscle atrophy is about 50% in the population receiving dialysis [3]. At present, the definition is not uniform, and the pathological process is not clear. Skeletal muscle atrophy in dialysis patients is the result of a combination of reasons, involving malnutrition and too little exercise [4]. Skeletal muscle atrophy leads to muscle structure and function disorders, which must greatly affect the physical function and QoL of MHD patients. Studies have shown that muscle strength plays a key role in maintaining activities such as activities of daily living and is one of the most important factors affecting physical function [5]. Studies have shown that more than one third of patients require assistance to complete maintenance activities of daily living. Physical function is an important component of QoL, and most likely determines the patient’s own evaluation of QoL. Impairment of physical function translates into reduced QoL [6]. In addition, due to skeletal muscle atrophy, patients have lower levels of physical activity and a more sedentary lifestyle than age-matched normal populations. Low levels of physical activity interact with skeletal muscle atrophy, creating a vicious cycle that leads to reduced QoL and increased risk of death [7]. Therefore, if effective interventions can be taken to prevent and delay the progression of skeletal muscle atrophy and enhance the muscle strength of this population, it is expected to improve physical function, improve QoL, and reduce the risk of death [8]. However, there is no effective treatment for skeletal muscle atrophy in patients, but exercise therapy has become a routine recommendation [9,10]. Exercise therapy can be divided into exercise during dialysis and exercise for non-dialysis purposes, depending on the time: it can be roughly divided into aerobic training and resistance training, depending on the mode. Aerobic exercise requires the participation of major muscle groups throughout the body, has a long duration and a sense of rhythm, and the main purpose is to improve activity tolerance. Resistance exercise refers to the exercise that needs to overcome external resistance during muscle contraction [11]. It has long been recognized as one of the best ways to increase muscle strength, muscle mass, and endurance. It can improve skeletal muscle protein synthesis and help skeletal muscle growth.

It aimed to explore the effects of moderate and low intensity resistance exercise on QoL and mental health of MHD patients.

2. Materials and Methods

2.1. Subjects

90 patients who underwent MHD treatment in the Blood Purification Center of XXX Hospital from June 2022 to December 2022 were enrolled and randomly grouped:
observation group and controls, with 45 cases in each group. There were 25 men and 20 women in observation group. The mean age was 53.12. Controls had 22 men and 23 women, with mean age of 51.42. There was no clearly different in the basic data between two groups (P > 0.05). With the approval by the Medical Ethics Committee of XXX Hospital, all patients’ families signed the consent form to participate in the trial.

Inclusion criteria: (1) age ≥18 years old; (2) patients were given with hemodialysis for at least 90 days and their condition was stable; (3) Hemodialysis three times per week; (4) Muscle strength 3+ grade; (5) clear consciousness and normal intelligence.

Exclusion criteria: (1) uncontrolled hypertension (systolic blood pressure ≥200 mmHg or diastolic blood pressure ≥120 mmHg), heart failure, arrhythmia; (2) unstable angina; (3) uncontrolled diabetes; (4) acute lower extremity thrombosis; (5) patients with malignant tumors or acute diseases, infectious diseases.

2.2. Resistance Exercise Equipment
Scanning equipment and parameters: The elastic belt adopts Thera-Band elastic belt with eight colors produced by Hufu Company in China. With the change of color, the resistance of the elastic belt increased gradually. The sandbag was the leggings sandbag produced by Lijin Sports sandbag company. 1kg, 2kg, and 3kg sandbags were adopted.

2.3. Research Methods
Controls performed routine hemodialysis care: close observation of the patient’s vital signs and state of consciousness; monitoring of vascular access; monitoring of extracorporeal circulation every hour to observe whether the blood connection was tight and to prevent massive bleeding caused by joint loosen; monitoring of dialysis pathway; timely detecting the emergency complications in the process of dialysis, reporting to the doctor, and dealing with them in time; dealing with various alarms of dialysis machine. Nursing after hemodialysis: following the doctor’s advice to take blood test and observe the effect of dialysis treatment; after the end, re-measuring and recording the weight and checking the actual water removal.

On the basis of routine hemodialysis nursing, observation group carried out moderate and low intensity resistance exercise: the appropriate elastic band and ankle sandbag were selected according to the basic muscle strength of patients, and the exercise intensity was determined by Borg subjective fatigue score. During the exercise, the subjects were asked to evaluate their fatigue degree according to their subjective feelings. A score of 6 indicates no effort at all and a score of 20 indicates exhaustion. If subjects chose a range of 10 to 13 points, it indicated that moderate to low intensity exercise was appropriate for them. Exercise twice a week; exercise time: 2h to 4h after hemodialysis, depending on the time to complete the prescribed time. The progression cycle was 12 weeks.

2.4. Observation Indicators
QoL was measured by SF-36, which included 8 domains of somatic function, physiological function, somatic pain, general health, energy, social function, affective function, mental health. The sum of the scores of the 8 domains is a comprehensive score. The higher the score, the lighter the functional impairment and the better the QoL.

HAMD and HAMA were adopted to evaluate the mental status of patients before and after intervention. The higher the score, the worse the mental health status.

2.5. Statistical Analysis
All data were analyzed by SPSS 23.0 statistical package. Normally distributed data for continuous variables were presented as mean ± standard deviation, and unpaired t-test was adopted to compare continuous changes, univariate factor repeated measures and simple single effect analysis for multi-period comparison. Chi-square test was adopted, Log-Rank test to compare the differences between two groups. P < 0.05 was considered statistically meaningful.

3. Results
3.1. Comparison of Basic Information
There were 45 cases in each group. There were 25 men and 20 women in observation group. The mean age was 53.12. Controls had 22 men and 23 women. The mean age was 51.42 (Table 1).

<table>
<thead>
<tr>
<th>Categories</th>
<th>Observation group</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range (years)</td>
<td>53.12</td>
<td>51.42</td>
</tr>
<tr>
<td>Male/female (cases)</td>
<td>25/20</td>
<td>22/23</td>
</tr>
<tr>
<td>On/off the job</td>
<td>8/37</td>
<td>9/36</td>
</tr>
</tbody>
</table>

3.2. Comparison of QoL Scores after Intervention
The somatic function, physiological function, somatic pain, general health, energy, social function and affective function, and mental health of QoL scale were compared. Scores in somatic function, physiological function, somatic pain, general health, energy, social function, affective function, and mental health in observation group were found were markedly higher as against controls (P < 0.05). However, the other dimensions were not statistically meaningful (Figure 1).

3.3. Comparison of Mental State after Intervention
The HAMD score was 17.22±4.12 in observation group and 21.34±6.08 in controls (Figure 2). The HAMA score was 19.13±4.99 in observation group and 22.54±5.58 in controls (Figure 3). The scores of the two scales in observation group were clearly inferior as against controls (P < 0.05).
4. Discussion

MHD patients are prone to problems such as long course of disease, repeated course of disease, discomfort in dialysis treatment, high medical costs, dietary restrictions, and limited social activities, and are prone to anxiety, depression, and other adverse emotions, which seriously affect the QoL of social activities, and are prone to anxiety, depression, and other QoL dimensions from the eight dimensions, possibly influencing factors, and even if it improved physical function, largely determines the patient's own QoL evaluation [17]. The present results suggested that moderate-to-low intensity resistance exercise had no obvious effect on the other aspects. Moderate and low intensity resistance exercise can improve the correct cognition of patients, promote the improvement of their psychological, physiological, and social life status, and then improve their physical and mental health [25]. It was to explore the effects of moderate and low intensity resistance exercise on QoL and mental health of MHD patients.

5. Conclusion

In conclusion, moderate-to-low intensity resistance exercise has clear outcome on physical function and psychological state of QoL in MHD patients, but has no obvious effect on other aspects. Moderate and low intensity resistance exercise is beneficial to improve the mental health status of patients, improve their QoL, and promote the physical, psychological, and social rehabilitation of patients, which is worthy of promotion and application. More cases are needed to obtain more information and provide efficient and direct basis for clinical diagnosis and treatment.

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References


Figure 2. Contrast of mental state HAMD between two groups (x±s, score)

Figure 3. Contrast of mental status HAMA between two groups. (x±s, scores) (* represents relative to controls, P < 0.05)


