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Mini Review

Renal rehabilitation: Recommendations of exercise therapies in patients with kidney diseases

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Abstract

Renal rehabilitation is a process to conduct treatments for the patients suffering from kidney disease and support to help them for their smooth achievement of social rehabilitation. Patients with dialysis-dependent kidney failure carry some additional burden of co-morbidity, such as, diabetes mellitus, hypertension, cardiovascular disease, infections, and many other. Approximately 10% of the world population is affected by chronic kidney disease and the incidence of dialysis is quite high. The patients those undergoing hemodialysis are at increased risk of sarcopenia or frailty and serious health problems as compared to people with normal kidney function. Such complications lead to kidney transplantation and ultimately lead to adverse health outcomes such as functional dependence, hospitalization, and death. Exercise rehabilitation is a well established therapy in patients with kidney disease. Despite more than three decades of exercise research in patients with kidney disease, its applications were not very common in practice. It is only in recent days it gets some attraction. Thus, in the present study, an attempt has been made to elaborate the exercise therapies in renal rehabilitation.

Keywords: Renal rehabilitation, Exercise therapy, Kidney disease, Dialysis

Introduction

As per WHO, rehabilitation is defined to include all means to alleviate the effects of conditions that may bring about disabilities and social disadvantages and achieve social integration of people with such conditions [1]. Therefore, renal rehabilitation is defined as a long-term comprehensive program consisting of exercise therapy, diet therapy and water management, drug therapy, education, psychological/mental support, etc., to alleviate physical/mental effects based on kidney disease and dialysis therapy, prolong the life expectancy, and improve psychosocial and occupational circumstances [2]. Nevertheless, renal rehabilitation, in its actual meaning, is to conduct all treatments and support to help all patients with kidney disease smoothly achieves social rehabilitation instead of simply implementing exercise therapy. In recent years, a concept of renal rehabilitation has become widely popular among nephrology specialists, dialysis specialists, kidney transplantation specialists, rehabilitation specialists, nutrition specialists, guideline specialists, nurses, physiotherapists, and representatives of patients.

Chronic kidney disease (CKD) is not only a major risk factor for dialysis but also increases the risk of cardiovascular diseases and is closely related to lifestyle-related diseases such as diabetes mellitus and hypertension. In addition, dialysis patients develop complications including cardiovascular diseases, infections, and malignant neoplasms and have a very poor prognosis. Approximately 10% of the population worldwide is affected by CKD, and millions die each year because they do not have access to affordable treatment [3,4].

Positions of Exercise Therapy

Exercise therapy for adults and children with glomerulonephritis or nephrotic syndrome are well discussed primarily regarding the necessity of rest and exercise restriction. The quality of life (QOL) of adults and children with glomerulonephritis or nephrotic syndrome is expected to be improved by adopting aggressive exercise therapy appropriate for the disease stage, e.g., the stable period of glomerulonephritis and remission period of nephrotic syndrome. For the future, appropriate exercise restriction in the acute and unstable periods of the disease, in the remission induction period of drug therapy, and for the prevention of recurrence, avoidance of excessive exercise restriction, and exercise prescriptions in the stable and remission periods as well as methods for their assessment should be established.

Renal Rehabilitation for Patients with CKD

In CKD patients, the physical function is reduced to about 70% as compared with healthy individuals [5-7]. CKD patients often develop various complications including cardiovascular disease, renal anemia [8], reduced bone strength [9], and neuropathy [10]. All these complications directly lead to a decline in physical function, and rehabilitation is expected to have multiple beneficial effects on them. CKD patients are likely to develop a condition called protein-energy wasting (PEW), in which body protein mass is reduced by protein catabolism, etc. Also, the endurance capacity is reduced due to mitochondrial dysfunction [11-13]. Such abnormal muscle metabolism associated with CKD may be improved by renal rehabilitation. The present review is expected to lead to future improvements in the health of CKD patients by clarifying the evidence at present and promoting understanding of unresolved problems.

Lifestyle Modification, Dietary Counseling, and Medications

For renal rehabilitation of CKD patients, multifaceted lifestyle guidance including nutritional management and psychosocial care for improvement of health status is important in addition to exercise therapy [14]. For nutritional management of CKD patients, control high energy (30–35 kcal/kg/day), low protein (0.6–0.8 g/kg/day), and low salt (3–6 g/day) diet is the basic recommendation, which may be modified taking into account of the individual's health condition. With the increase in older patients, malnutrition has emerged as a problem for CKD patients. Appropriate dietary guidance from a dietician is important for the prevention of malnutrition.

Positions of Exercise Therapy

There used to be an opinion-based recommendation for the restriction of physical activity in patients with renal insufficiency; however, many scientists emphasize comprehensive, favorable effects of exercise therapy on the health status, such as improvements in activity of daily living (ADL), cardiovascular function, and psychosocial conditions, and recommend moderate exercise therapy for patients with stable CKD [15,16]. Moderate exercise therapy is recommended for patients with non-dialysis-dependent CKD in consideration of their age and physical function.

Renal Rehabilitation for Patients on Hemodialysis

Positions of exercise therapy

The physical activity level has been reported to be reduced in dialysis patients, because dialysis patients tend to have sedentary lifestyle on the day of dialysis probably due to inactivity during the dialysis procedure and the post-dialysis fatigue syndrome [17,18]. In consequence, the physical function of elderly dialysis patients is reportedly about half that of the general population [19]. Moreover, a possible relationship of exercise with a favorable prognosis has also been suggested [20]. Physical activity on dialysis days was restricted due to large fluctuations in vital signs during treatment or symptoms such as fatigue [21]. On the basis of these reports, maintenance of the physical activity level and exercise therapy are attracting attention as measures to improve or maintain the survival, physical functions, ADL, and QOL. In this context, the Exercise and Sports Science Australia issued a position statement concerning exercise therapy for CKD patients describing specific methods of exercise therapy for patients with end-stage kidney disease both during dialysis and on non-dialysis days [22]. The American College of Sports Medicine issued guidelines for exercise testing and prescription [23], and specific methods and cautions about exercise therapy for dialysis patients.

Exercise therapy is recommended for hemodialysis patients, because it has been suggested to improve exercise tolerance, walking ability, and physical QOL. The survival, exercise tolerance, QOL, physical ability (walking ability), physical function (muscle strength), muscle mass, albumin, ADL, dialysis dose (Kt/V), and C-reactive protein (CRP) were selected as outcomes. Earlier report on exercise therapy [24] demonstrated that greater improvements were observed in exercise tolerance (VO_2) in clinical studies with an intervention period of ≥6 months than in those with an intervention period of <6 months. Moreover, the study also showed that the improvement in exercise tolerance was greater in clinical studies using both aerobic exercise therapy and resistance training in combination than aerobic exercise therapy alone. Also, there was a report that the improvement in exercise tolerance was greater by exercise therapy under supervision on non-dialysis days compared with that during dialysis despite a larger number of dropouts [25]. In conducting exercise therapy, the relationship between such specific methods and effectiveness of exercise therapy must be considered.

Exercise Intervention after Kidney Transplantation

It was reported that exercise therapy for patients with kidney transplant improved physical performance and quality of life [26], but most of this evidence targeted chronic, stable patients. A positive effect of an early-phase exercise program on physical performance and activity, quality of life, and kidney functions of the renal transplant patients were also reported [27]. The program consisted of supervised aerobic training by physical therapists and physical activity in the ward and at home. In fact, the patients were advised to start the program on day 6 after transplantation. It was reported that supervised aerobic training was conducted during hospitalization and was performed for 3–4 weeks until discharge. Participants attended one or two sessions of supervised structured aerobic training per day at a rehabilitation center in the hospital 5 days/week. Aerobic training consisted of a 35–45 min/session on a treadmill walking or cycle ergometer exercise including a warmup and cool-down [27]. As a result, exercise capacity and lower extremity muscle strength were significantly higher in the exercise group than in the control at 2 months after kidney transplantation. Regarding kidney function, in both the control and exercise groups, all patients succeeded in withdrawing from, or avoiding dialysis therapy.

Conclusion

In the future, it is necessary to validate the optimal method of exercise therapy for peritoneal dialysis patients and its effectiveness. At any rate, the ultimate objective of dialysis therapy is social rehabilitation, and renal rehabilitation per se shares the goal. It is very significant that physical ability and QOL were improved by exercise, which is a major component of renal rehabilitation. In this respect, renal rehabilitation plays a major role in achieving the goal of dialysis therapy.

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