7 Exercise Intervention for Kidney Transplant Recipients: Recent Progress and Remaining Issues

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Abstract

Renal transplantation is a type of renal replacement therapy, and many patients' desire to undergo transplantation is primary aim for improving their quality of life and life prognosis. Exercise intervention is expected to improve the transplant recipients' exercise tolerance, which in turn improves their quality of life by increasing their daily activities. Exercise interventions have been reported in numerous articles. In recent years, several systematic reviews and meta-analyses have been published. These papers show that exercise improves the quality of life, exercise tolerability, and muscle performance of kidney transplant patients. However, whether the results of these randomized controlled trials and meta-analyses can be applied to daily clinical practice remains unknown. Recommendation of the strength and type of exercise for Japanese transplant patients remains unclear. A tailor-made exercise prescription for the individual recipients is required.

Keywords

Exercise intervention · Kidney transplant recipients · Rehabilitation

7.1 Introduction

Renal transplantation is one type of renal replacement therapies, and many transplant recipients' wish is to improve their quality of life (QOL) and life prognosis. Exercise therapy is expected to maintain the transplant recipients' exercise

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tolerance and improve their QOL as stated by guideline for renal rehabilitation in Japan. According to the guidelines for internal and pediatric complications after kidney transplantation [1], metabolic syndrome after kidney transplantation is a risk factor for chronic transplant renal dysfunction, and the therapeutic intervention is diet and lifestyle improvement by exercise. A previous study showed that weight gain 1 year after kidney transplantation reduces allograft survival [2]. Another study showed that weight increase within 1 year after kidney transplantation was about 10%, and that this weight increase may be important regarding change in morbidity of cardiovascular disease [3]. Exercise intervention for transplant recipients is also expected to prevent cardiovascular disease by improving obesity [4]. About 22% of living kidney transplantation in Japan are over 60 years old according to the Annual Progress Report from the Japanese Renal Transplant Registry. A recent systematic review pointed out that prevention of flail and sarcopenia is also an important issue [4]. Recently, some evidence on exercise therapy after kidney transplantation has been reported. In this review, we describe recent advances and remaining issues of exercise therapy after kidney transplantation and also describe various benefits of exercise intervention.

7.2 Systematic Review and Meta-Analysis About Exercise Intervention for Transplant Recipients

Exercise interventions, either aerobic training, resistance training, or both, have been reported in numerous articles. Aerobic exercise includes, for example, treadmill; resistance exercise includes weight training [5]. Several systematic reviews and meta-analyses on this topic have been performed in recent years. One paper discussed randomized controlled trials (RCTs) of exercise interventions in patients who underwent solid organ transplantation, but a meta-analysis was not performed [6]. Two systematic reviews and meta-analyses regarding exercise treatment for kidney transplant recipients were recently performed. One paper concluded that exercise intervention significantly improved transplant recipients' exercise tolerability and QOL, but a significant improvement in allograft kidney function was not observed [4]. The other paper revealed that exercise intervention improved transplant recipients' aerobic capacity, their muscle performance and QOL [7]. The exercise intervention periods in all of the RCTs included in these systematic reviews and meta-analyses were too short.

7.3 Expectations of Exercise Therapy for Transplant Recipients

Recent RCTs have pointed out some beneficial effects of exercise therapy for transplant recipients. The details of these effects of exercise therapy are described below.

7.3.1 Exercise Tolerance

The peak VO_2 was used to assess exercise tolerance in many reports. Painter et al. [8] performed an RCT involving 95 kidney transplant recipients in whom exercise intervention (home-based exercise and cardiovascular exercise of walking or cycling) improved the peak VO_2. Kouidi et al. [9] performed an RCT of 23 kidney transplant recipients in whom the peak VO_2 increased by 15.8% during an exercise training program consisting of four 60- to 90-min weekly sessions in a municipal gym. Riess et al. [10] also performed 31 kidney transplant recipients in whom 12 weeks of supervised endurance and strength training caused increase in the peak exercise cardiac output and peak VO_2.

7.3.2 Quality of Life

Some RCTs have been performed to assess the efficacy of exercise treatment for QOL, and improvements in QOL with exercise therapy have been reported in several of these RCTs. Riess et al. [10] reported that 12 weeks exercise treatment caused improvement of QOL using the 36-Item Short Form Health Survey (SF-36). Another report was published by Painter et al. using SF-36 [8]. Karelis et al. [11] suggested that resistance training seemed to improve QOL using a well-being score. Pooranfar et al. [12] reported that exercise intervention of 10 weeks improved quality and quantity of life regarding sleep in kidney transplant recipients.

7.3.3 Metabolic Syndrome and Muscle Strength

Juskowa et al. [13] reported muscle strength correlates improvement of allograft function in the exercise intervention versus the standard care groups. Pooranfar et al. [12] reported that 10 weeks of exercise intervention might improve the lipid profile in kidney transplant recipients. Painter et al. [14] reported that only exercise intervention did not decrease the coronary heart disease risk within one year after transplantation. O'Connor et al. [15] reported that significant between-group differences in pulse wave velocity existed when comparing resistance exercise training with usual care. It was reported that longer-term observation is required to fully assess the effect of exercise therapy on improving metabolic syndrome [4].

7.3.4 Graft Function

With respect to native kidney function as measured by the estimated glomerular filtration rate, one study involving 12 months of exercise therapy for patients with CKD showed a significant mean difference in the rate of change between the rehabilitation and usual care groups [16]. However, the authors concluded that the effect

of 1 year of exercise was not evident because of the small sample size in their study [16]. They suggested that the improvement in renal function could be explained by reductions in waist circumference and was probably related to central adiposity [16]. Another study showed that aerobic or resistance training had no significant improvement regarding the estimated glomerular filtration rate in kidney transplant recipients [5]. Tzvetanov et al. [17] showed that physical rehabilitation (resistance-based body weight training) improved allograft function, although the study population was small. Graft function improvement with exercise therapy in transplant recipients is still controversial. The muscle mass increase associated with exercise therapy should also take into consideration of a poor estimate of kidney function by creatinine production [4].

7.4 Remaining Issues and Future of Exercise Therapy for Transplant Recipients

Whether the findings of RCTs and subsequent meta-analyses regarding exercise intervention for kidney transplant recipients can be applied to daily clinical practice remains unknown. Recommendation of most appropriate exercise method and duration of exercise are unclear [4]. For example, what kind of exercise is appropriate for a transplant patient whose altitude obesity and lower limb muscular strength are declining? When considering the opinions of experts in exercise rehabilitation, it is necessary to also comprehensively consider the timing of transplantation, age, activities of daily living, and degree of obesity when choosing the most appropriate exercise intervention. Studies evaluating the adverse events due to exercise therapy are never according to recent systematic review [4], and comprehensive studies on this topic are necessary.

High-quality research on exercise interventions for transplant patients from Japan is needed. An appropriate tailor-made exercise prescription for the individual patient is required.

7.5 Conclusion

Recent advances in clinical research are expected to make exercise therapy useful in transplant recipients. However, recommendation of the strength and type of exercise for Japanese transplant patients remains unclear. A tailor-made exercise prescription for the individual transplant recipients is required.

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