

Renal rehabilitation in patients with chronic kidney disease

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Abstract

Chronic kidney disease (CKD) is a worldwide public health problem. Physical activity and exercise endurance are low in patients with CKD, and a sedentary lifestyle contributes to increased morbidity and mortality risk. However, there are a few studies evaluating regular exercise in non-dialysis CKD patients. This review focuses on the importance and benefits of regular exercise in non-dialysis CKD patients. Systematic reviews and meta-analyses of randomized controlled trials reported that exercise-based renal rehabilitation improved aerobic capacity, muscular functioning, cardiovascular function, walking capacity, and quality of life in dialysis patients. However, few studies indicated that regular exercise or exercise therapy could improve not only physical function but also renal function and lower risk of overall mortality and renal replacement therapy in non-dialysis CKD patients. Animal studies have demonstrated that chronic exercise has renoprotective effects in several CKD models. Exercise therapy could be an effective clinical strategy for improving renal function, lowering the risk for renal replacement therapy and cardiovascular disease in non-dialysis CKD patients.

Introduction

Chronic kidney disease (CKD) is a worldwide public health problem. For example, more than 320,000 patients undergo hemodialysis (HD) in Japan, which corresponds to every 1 in 400 people. Furthermore, the numbers of patients with CKD in Japan is more than 15% of the total population. Cardiovascular disease (CVD) remains a major cause of hospitalization and mortality in CKD patients across all stages, and CKD is one of the most potent known risk factors for CVD [1]. CKD patients with HD have a high rate of mortality with CVD, such as chronic heart failure, and a higher mortality risk has been reported for sedentary HD patients [2]. The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI) guidelines recommend moderate intensity aerobic exercise most days of the week for the prevention of CVD in dialysis patients [3]. However, guidelines pertaining to the earlier stages of CKD remain to be developed and integrated into clinical practice. The lack of established guidelines pertaining to regular exercise for the prevention of CVD in these early stages of CKD is noteworthy, because these individuals are more likely to die from CVD than progress to renal failure [1]. Thus, this review focuses on the importance and benefits of regular exercise or exercise therapy in non-dialysis CKD patients as renal rehabilitation [4].

Physical capacity in CKD patients

Physical inactivity is well-recognized as a major health issue today. Regular exercise is important in maintaining health and preventing chronic disease, and is increasingly accepted as a valuable therapeutic intervention in many long-term conditions.

Exercise endurance is lowered in CKD patients, and this phenomenon becomes more distinct as renal dysfunction advances. Aerobic capacity is impaired ranging from 50 – 80% of normative values in the early stages of CKD (Stages 1–4) [5]. Impaired physical function has also been reported in these earlier stages of CKD [6] with declines in self-reported function becoming apparent around Stage 3 [7]. When patients reach Stage 5 CKD and commence renal replacement therapy (RRT), physical activity levels are approximately 25% of those recorded in age-matched sedentary healthy individuals

[8]. CKD is also associated with a higher prevalence of disability, and difficulty with activities of daily living (ADL) was reported by 17.6%, 24.7%, and 23.9% of older (65 years) and 6.8%, 11.9%, and 11.0% of younger (20–64 years) adults with no CKD, stages 1 and 2, and stages 3 and 4, respectively [9].

The mechanisms responsible for the impaired physical capacity in CKD patients are not fully elucidated. While factors such as anemia [7] and inflammation [10] may play a role, the impaired physical function including 400-m walk time, lower-extremity performance, grip strength and knee extension strength was associated with declining glomerular filtration rate (GFR) independently of age, anemia and comorbidity [11]. The relationship between renal function and physical function is thought to be mediated through muscle strength in mild to moderate CKD [11]. Additionally, lower extremity physical performance including gait speed, timed up and go, 6-min walk is substantially impaired in non-dialysis CKD patients and is associated with all-cause mortality after adjustment [12]. Associations with mortality were similar in magnitude to renal function and were stronger than traditionally measured biomarkers of CKD. The impaired physical capacity leads to reduce the quality of life (QOL) and further aggravated by a sedentary lifestyle. As well as being a strong cardiovascular risk factor, physical inactivity is associated with an increased risk of rapid GFR decline in CKD patients [5,13].

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