

BENEFITS OF INTRADIALYTIC EXERCISE TO INCREASE MUSCLE STRENGTH, PREVENT MUSCLE MASS LOSS ON CHRONIC RENAL FAILURE PATIENTS ON HEMODIALYSIS: REVIEW

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ABSTRACT

Introduction: Prolonged exposure to hemodialysis treatments has a catabolic effect on muscles also compounding this expedited muscle loss associated decrease quality of life. The aim of this study is to investigate the benefits of intradialytic exercise programs, specifically on increase muscle strength and physical function. **Methods:** search in PubMed, ProQuest, and MEDLINE (EBSCO) about intervention intradialytic exercise program of CRF patients impairment muscle strength. Studies included intradialytic exercise program randomized controlled trials study design. **Result:** Most studies included in this review focused on intradialytic exercise program. These intervention program seems to increase muscle strength and improved physical function, and less decline in muscle cramp. **Conclusion:** Patients with CRF on hemodialysis need to do intradialytic exercise program. In addition, standardization of intradialytic exercise program, outcome and evaluation for patients with CRF on hemodialysis especially on muscle strength and muscle cramp, muscle mass, physically function is needed for further studies.

1. Introduction

Chronic renal failure (CRF) patients is associated to reduce muscle mass and decrease muscle strength and poor quality of life (Hsu et al., 2014). Patients with CRF experience a high symptom burden. The most common reported symptoms in non-dialysis-dependent (NDD)-CRF patients include fatigue, sleep difficulties, muscle weakness, restless legs, pruritus (i.e. itching) and bone or joint pain. This increased incidence of debilitating symptoms accentuates the reduced health-related quality of life in these patients, and high symptom burden is associated with increased hospitalization and mortality (Wilkinson et al., 2019).

Hemodialysis is one of the replacement therapy on CRF patients. In the past three

decades, the number of patients undergoing maintenance dialysis globally has increased dramatically. In 2010, it was estimated that the number of patients on dialysis was more than 2 million worldwide, and modelling data suggest this number will be more than double by 2030. Several factors have contributed to the increase: increase in the incidence of CRF, broadening of kidney replacement therapy acceptance criteria, and greater access to maintenance dialysis in low- and middle-income countries (C. T. Chan et al., n.d.), 2019.

Patients with CRF undergoing hemodialysis suffer changes in their daily life, becoming dependent on continuous therapy, in addition to its periodical procedures, makes the patient live with uncomfortable symptoms such as nausea, vomiting, hypotension and fatigue. These

processes are accelerated in elderly dialysis patients since both the uremic environment and aging cause loss of muscle mass and function that together predispose these patients to frailty (K. N. Chan et al., 2019). Pain due to muscle cramp is a common complication during hemodialysis (Poornazari, Roshanzadeh, Parsa, & Tajabadi, 2019). Studies have shown that exercise can reduce pain and fatigue through reduction of muscle stiffness and sensitivity, and improvement of blood flow.

Intradialytic exercise is defined as exercise training performed during hemodialysis to increase strength and endurance of CRF patients. (Poornazari et al., 2019). Current recommendations are regular exercise and adequate nutrient intake to prevent and manage aging-related adverse events in maintenance hemodialysis include provision of patients. The effects of exercise on CRF patients are to improve their physical potential.

There is limited information on mechanisms underlying the salutary effect of exercise patients with CRF. Moreover, the precise association between muscle wasting, loss of function and poor long-term outcomes in elderly CRF patients remains to be fully explored. Thus, there is a need for large-scale studies to establish the true benefits of exercise in this population. In addition, we postulate that the provision of a high calorie leucine-rich protein supplement at the time of acute exercise will enhance exercise-stimulated anabolic signaling.

Several studies have shown positive effect of intradialytic exercise, the implementation of a specific exercise program during dialysis is strongly desirable. Resistance training is considered as effective method in the prevention of muscle functional loss among dialysis patients, A study has analyzed the effects of intradialytic resistance training on the patient's lower extremity muscle functions (Zelko et al., 2019). In addition, renal function in patients with CRF is almost completely lost, and as the disease worsens, symptoms associated with sarcopenia such as muscle atrophy, decreased muscle strength, and decreased muscle function gradually appear. Different

methods of intradialytic exercise in chronic renal failure patients has showed benefits (Dong, Zhang, & Yin, 2019). International physical activity according to the evaluation of patient's sitting, walking, cycling and running, also showed benefits. Other study on strength physical exercise is a new therapeutic approach to reduce complication in renal failure patients and the effect of acute intradialytic strength physical (Esgalhado et al., 2015). Regarding result of a study (Lopes et al., 2019) with 12 weeks of intradialytic resistance therapy was performed three times per week. The training groups were high-load intradialytic group (8-10 repetitions), moderate-load intradialytic group (16-18 repetitions), and control group (stretching exercise). Other study of (Poornazari, Dehghani, Shahbazi, & Khaledi Sardashti, 2017) that the isotonic exercise combine included 10 sessions of exercise with a stationary bicycle lasting 10 minutes before hemodialysis. Data analysis using statistical, t test, and analysis of variance (ANOVA) were used for comparison of means of variables.

This evaluate the effect the groups after the isotonic exercise program ($P < 0.001$), the frequency of muscle cramp in the in the experimental group was significantly lower after the intervention, for improving fatigue and daily physical activity levels among CRF patients. Measurement on a muscle scale strength and a physical activity were done at the time of enrollment, and again on the eighth weeks until twelve weeks. we expect that exercise therapy will increase muscle strength and reduce muscle mass loose and improve psychosocial health, strength, balance and counteract muscle wasting and reduce cardiac risk factors. Together, these measures should allow us to determine whether the home-based exercise regimen is effective in counteracting loss of muscle function and mass common in elderly maintenance hemodialysis patients, along with reducing cardiovascular risk.

2. Methods

Searching strategy potential studies resources PubMed, ProQuest, and MEDLINE (EBSCO), International Journal, databases were searched from December 2018 to

August 2020 more than 120 articles to selective regarding study on intervention intradialytic exercise program CRF patients impairment muscle strength because each HD treatment contributes to a loss of amino (Parker, 2016). Studies were included following criteria (1) investigated intradialytic exercise program (2) Randomized controlled trials (RCT) study design, (3) study were included CRF patients following hemodialysis (4) the full-text article was available in English. Article selection: identified inclusion criteria 10 studies examined the title, abstract, method, result and conclusion regarding intradialytic exercise on CRF patients. All studies were included full text review, RCT methodology, significant result and conclusion that intradialytic exercise. Start searching 200 articles only 10 articles validity assessment performed using in this review articles were good quality studies level.

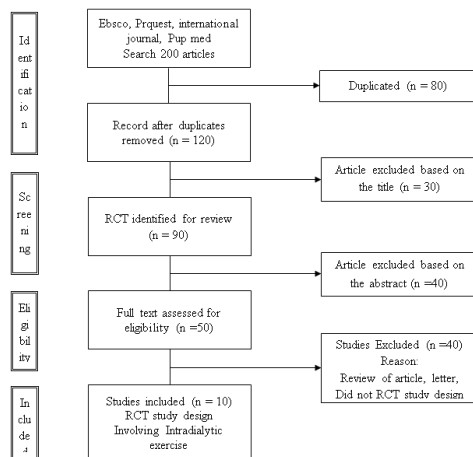


Diagram 1 Flow diagram of the review process

No	Author/Year	Intervention and duration	Method	Sample age	Long lasting on HD	Follow up	Outcome
1.	(K N Chan et al., 2019)	Home-based exercise program, 3x30min/week protein supplementation, or both	RCT	59 55-59	>4 month	12-weeks	Increase muscle strength
2.	(Dong et al., 2019)	Intradialytic resistance exercise with high or moderate intensity 3x30min/week	RCT	55-60	>4 month	12 weeks	Increase physical function
3.	(Po & Paimala, 2020)	Intradialytic Stretching Exercises 2-3 x/week	Quasi experimental Pre-test and post-test	30 sample 41-50 years	≥4 month	12 weeks	Reduce muscle cramp

4.	(Manfredini et al., 2017)	6-minute walking test and the five times sit-to-stand test 2-3 x/week	RCT Exercise=E Control=C E:151 C:145	S:296	≥ 4month	6-month	Increase muscle strength And physical function
5.	(Mohammad Abd Elbaky, Mohamed Zaki, Mohamed Amin, & Mohamed Nagib Ali, 2018)	Breathing exercise includes Diaphragmatic breathing is to sit comfortably with the knees bent and the shoulders, head and neck relaxed.	Quasi experimental divided in two groups 30 for each	Sampling: 60 18 years - 65year Male and female	≥ 4month	3 month study	improvement in patients cardiac and pulmonary function
6.	(Salem & Elhadary, 2017)	Intra-dialytic stretching exercises on leg 1. Ankles 2. Knees 3. Hip flexors 4. Inner thigh muscle 2-3 x/week	quasi-Experimental one group	S:60	≥ 4month	3month study	Increase muscle strength And muscle volume
7.	(Poomazani, Roshanzadeh, 2017)	Intradialytic Stretching Exercises 2-3 x/week	Quasi experiment Pre-test post-test	30 samples 41-50 years	≥ 4month	3month study	Reduce muscle cramp
8.	(Carletti et al., 2017)	exercise with a ergometric bicycle during the first two hours of hemodialysis session for 50-60 minutes 3 x/weeks	RCT Postural balance	Male and female	>4 month	12-weeks	gains in lean body mass and leg lean mass
9.	(J. Abraham & Malarvizhi, 2017)	intradialytic stretching exercises in two groups of 30 for each of extremities Ankle dorsiflexion? Gastrocnemius stretching Soleus stretching Hamstring Quadriceps during the third and fourth hour of hemodialysis	RCT design pre-test post-test with control group	60 patients 35-74 years	>4 month	3month 15 minutes every session	Reduce muscle cramps
10.	(Monyama et al., 2019)	Resistance exercise program during hemodialysis	This retrospective observational study		≥ 4month	6-month	improved muscle strength and physical perform
11.	(Wilkins et al., 2019)	Twelve weeks of supervised exercise	RCT	36 sample	≥ 4month	12 weeks	reduced number of symptoms

Table 1. Studies included in this review

3. Result

The results showed that hemodialysis patients spent longer time lying down, shorter time walking or standing and presented decrease muscle strength, sedentary lifestyle in this population. Exercise training during dialysis or in the interdialytic period has been recommended (Martins do Valle et al., 2019). Most study is investigate the effects of intradialytic resistance training (IRT) on lower extremity muscle functions, quality of life on chronic hemodialysis therapy. (Zelko et al., 2019). To improve the applicability of interventions needed a better understanding of intradialytic exercise, functional and psycho-social

adaptation in dialyzed patients following a physical training. Intradialytic resistance training (IRT) protects patients' muscle mass and functions against protein-energy wasting. However, the evidence of the effects of an intervention intradialytic exercise patient is limited and not conclusive. Despite that some the results of the research showed a significant reduction in the severity and frequency of muscle cramps after exercise and increase physical function. During the 12 until 16 weeks of intervention, subjects in both the active reduced their fatigue levels significantly, with the exception of sedentary subjects in the control group. Only active subjects in the experimental group demonstrated an increase in activity levels.

Discussion

The number of persons undergoing maintenance dialysis globally has increased dramatically estimated that the number of patients on dialysis were more than 2 million worldwide, and modelling data suggest this number will more than double by 2030. Patients with chronic Renal Failure (CRF) undergoing hemodialysis suffer changes in their daily life, becoming dependent on continuous therapy periodical hemodialysis procedures. The patient live with uncomfortable symptoms such as nausea, vomiting, hypotension and fatigue, which may lead to decrease comfort and loss of muscle mass and function that will be predisposed patients to frailty (K. N. Chan et al., 2019). Pain due to muscle cramp is a common complication during hemodialysis (Poornazari et al., 2019). Intradialytic exercise is perform exercise training during hemodialysis to increase patients muscle strength and endurance Chronic Renal Failure patients (Poornazari et al., 2019). The HD sessions usually takes two until three days a week of inactivity will by the time of gradual dismiss in physical activity. The failure of physical functions for HD patients regardless of age, results dependence in activities of daily living. The treatment of HD carried out in a semi or supine sitting position from 3 to 6 hours per visit, which add up around 400 to 900 hours per year patients suffering from HD are significantly sedentary individuals, less active than healthy.

Some studies have shown that exercise can reduce pain and fatigue through reduction of muscle stiffness, and improvement blood flow. Current recommendations regular exercise and adequate nutrient intake to prevent and manage aging- related adverse events in Maintenance Hemodialysis patients. The effects of exercise on chronic kidney disease patients increase muscle strength and decrease muscle cramp for improving their physical potential.

4. Conclusion

The many reasons for low levels of physical activity in CRF on Hemodialysis, three factors contribute most: (1) Reduced muscle strength caused by muscle catabolism and wasting, (2) increased cardiovascular risk in which is in part of further impairing physical activity (3) reduced physical fitness. Aerobic endurance exercise training has been shown to improve physical functioning and QoL in patients with CRF (Anding et al., 2015).

HD Patients need intradialytic rehabilitation program provided by highly qualified critical care nurse to minimize complication risk. Rehabilitation program include resistance exercise on regular basis and breathing exercise for about 30 min for "3" sessions per week. The resistance exercise will improve the muscular activity.

Exercise during the HD sessions will reduce the stasis of circulation which promote solute removal by increasing muscle strength, blood flow and efflux of urea and other toxins into the vascular compartment where they can be removed. Exercise for CRF patients helps in improvement of arterial stiffness decrease in pulse pressure, increase oxygen diffusion, which leads to promote aerobic capacity.

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