



The effect of a structured intradialytic exercise program on fatigue and quality of life of a patient on hemodialysis in an acute care setting: A case report

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Abstract

Purpose: Previous research has shown that physical activity during dialysis can improve adherence to exercise, and improve physical performance, resulting in healthier outcomes. This case report aims to determine the effect of a structured intradialytic exercise program on post-dialysis fatigue and quality of life of a patient with end-stage renal disease undergoing hemodialysis (HD) in an acute care setting.

Methods: The patient was a 43-year-old man with end stage renal disease who was admitted in an acute care hospital due to staphylococcus aureus septicemia. Prior to hospitalization the patient had been on hemodialysis for 3 years. Two weeks after admission, the patient was placed on the facility's structured exercise program that was implemented concurrent with the patient's dialysis session. He was treated three times during a seven-day period.

Results: The patient had stable vital signs throughout the entire episode of care, with the performance of the exercises neither hindering nor affecting hemodialysis. No increase in pain was reported. The patient's fatigue perception using the Fatigue Severity Scale (FSS) improved by 45% from initial report. The physical domain and the mental domain measures of Short Form 36 (SF-36) improved by 14% and 68% respectively, demonstrating an improvement in areas of general health and well-being.

Conclusion: The implementation of a structured exercise program resulted in positive benefits on perception of fatigue and quality of life in a patient with chronic kidney disease undergoing hemodialysis in an acute care setting. The exercise regimen was implemented safely without any adverse reactions.

Keywords: Intradialytic exercise, end stage renal disease, physical therapy, acute care, hemodialysis

Introduction

Patients on hemodialysis (HD) are reported to be less active than healthy sedentary individuals [1,2]. These patients present with decreased physical functioning and quality of life due to various co-morbidities associated with end stage renal disease (ESRD) [3]. These individuals demonstrate activity limitations and participation restrictions due to impairments such as the loss of muscle quality and quantity [3]. There is strong evidence to support benefits of increased physical activity in this population [4-7].

Traditional exercise protocols call for exercise after dialysis or

during non-dialysis days, with physical activity being deferred during HD. However this approach has been associated with low adherence rates resulting in decreased inclination of patients to exercise which is possibly due to increased fatigue and pain during this period [6-9]. Protocols that include both strengthening and aerobic exercises done intradialytically during dialysis sessions have shown to be safe, practical and effective in improving physical performance, cardiopulmonary function, and quality of life/psychological well-being [2,9-13]. Previous studies indicate that intradialytic exercises programs allow for facilitated medical supervision resulting in increased exercise use adherence [2,10].

Though this practice is more prevalent in other countries, it is not common in the United States. Moreover, the reported intradialytic programs are administered in outpatient settings in persons who may be more medically stable and physically mobile than those admitted in acute care facilities.

The purpose of this Case Report is to determine the effect of a structured intradialytic exercise program on post-dialysis fatigue and quality of life for a patient with end-stage renal disease undergoing HD in an acute care setting.

Description of the Structured Exercise Program

The Intradialytic Acute Care Therapeutic Exercise Design (I-ACTED) is a structured exercise program that was developed as part of the quality improvement initiatives of the acute care facility where the patient of this case report was admitted for treatment. The intent of the I-ACTED program was to provide a patient with ESRD who is undergoing HD an individualized set of exercises to perform concurrent with the HD session. The program was intended to be executed within the first two hours of the patient's dialysis session. It consists of aerobic training and lower extremity strengthening exercises. To participate in the program, a patient had to meet inclusion criteria as follows: aged 18 years or older; on maintenance HD, stable medication; dialysis and diet regimen; pre-dialysis blood pressure of 100-160/50-90 mmHg; ambulatory with or without assistive device; knowledge of English to consent and follow instructions. Patients were excluded from participating in the program for the following: unstable hypertension, angina, or cardiac disease; advanced liver cirrhosis with ascites; heart rate less than 50 beats per minute while on beta-blockers; Persistent hyperkalemia(>6.0); neurological or orthopaedic conditions that will limit participation (**Table 1**).

Subject and Methods

The patient was a 43- year-old male with End Stage Renal Disease (ESRD) who was admitted to an acute care hospital for staphylococcus aureus septicemia. He had been on

hemodialysis (HD) for 3 years. Past medical history included hypertension and obesity, anemia, hyperkalemia, Type 2 Diabetes Mellitus, hyperparathyroidism and UTI. Prior to the most recent admission to the acute care facility, the patient previously lived at home and was independent with activities of daily living and instrumental activities of daily living. He worked as an information technology manager at a biotechnology company. He reported progressive decline in function and had to move back with his parents who could provide assistance. He received HD at an outpatient facility three times a week. His previous exercise regimen consisted of self-paced walking in a park for 20 minutes at least twice a week.

The patient's chief complaint was bilateral lower extremity pain and easy fatigability. He reported fatigue after his previous hemodialysis sessions. His goal was to be able to return home and resume work.

Two weeks after hospital admission, the patient was screened for medical stability and inclusion to the I-ACTED program. He also received approval from the attending nephrologist to participate.

On evaluation, the patient was alert and oriented to person, place and time. He was able to follow multi-step commands. His blood pressure, pulse rate and respiratory rate were all within normal limits. He required minimal assistance for bed mobility and transfers from the bed to the chair. He stands with front wheeled walker (FWW) with moderate assistance of 1 person; weight bearing causes significant pain in the lower extremities. Active range of motion was within functional limits for both upper and lower extremities. Manual muscle testing (MMT) revealed a Fair to Fair plus (3 to 3+/5) to both upper and lower extremities. He also presented with Fair plus (F+) static and dynamic sitting/ standing balance.

The Fatigue Severity Scale (FSS) is a 9-item questionnaire, developed to measure the impact of fatigue on daily functioning. It has good reliability and validity, and possesses good psychometric properties when used on patients with chronic conditions [14-17]. The patient scored a 60 on the initial visit.

Table 1. Overview of the I-ACTED Program.

I-ACTED PROGRAM			
Frequency	2-3x/ week on dialysis days during the first 2 hours of treatment		
Intervention			
Strength	Leg press	3x15 reps at 15-16 (hard) RPE at 50% of 1 RM	Record: reps, resistance and RPE
Aerobic	Cycle ergometer	30 minutes (minimum) at or below target HR and RPE of 15-16 (hard)	Record: time and RPE
Monitor			
Vital signs	BP, HR, SpO ₂ , RPE	Monitor: before treatment, every 15 min, after treatment and 15 minutes into recovery	
Symptoms	Fatigue, pain, SOB, dizziness, nausea	Monitor constantly	

The SF-36 questionnaire is one of the most widely used measures of functional health and well-being from the patient's point of view [18-26]. It has been used to survey the opinions of patients with chronic conditions, as well as those with CKD [27]. The patient scored a 21 on the physical domain and 28 on the mental domain.

The patient performed the exercises during his dialysis sessions as part of the I-ACTED program. The exercise program was executed within the first two hours of HD session. The exercise components include the following: (1) aerobic training using the cycle ergometer up to 30 minutes (2) Lower extremity strengthening using the leg press machine. Exercises were progressed based on rate of perceived exertion (RPE), and maintenance of target heart rate, normal blood pressure and no adverse subjective symptoms.

The I-ACTED program was administered concurrent with a routine PT intervention consisting of therapeutic exercises and mobility training activities on non-HD days.

Results

The patient was able to complete 3 sessions in the I-ACTED program over a 7 day period. **Table 2** shows a summary of the exercises performed using the I-ACTED sessions.

The patient's Fatigue Severity Scale score improved by 45%, from 60 to 33 denoting less perception of fatigue from initial report. Improvement in SF-36 areas of general health and well-being improved from pretest to posttest in the following: physical domain: increased 14% (from 21 to 24); mental domain: increased 68% (from 28 to 47). The exercise regimen was implemented safely without any physiological or subjective adverse effects.

The patient was discharged to home with caregiver support.

Discussion

This case report shows the potential benefits of implementing an intradialytic exercise program in acute care. Literature is scarce on outcomes of exercise intervention administered concurrent with HD sessions in the United States. Moreover, majority of published international studies described intradialytic exercise interventions in outpatient HD settings, where patients are more medically stable and present with higher levels of functioning. Investigating the potential benefits of this intervention in the acute care settings shows that posi-

tive results are obtained in patients who are more impaired in function and mobility as shown in this case. Optimizing physical activity, function and psychological function in frail individuals supports their goal of improving their quality of life. Furthermore, this approach will lead to potential savings in healthcare expenditures following positive patient outcomes and potential earlier discharge from the facility.

The short duration of the intervention is reflective of short stays in acute care facilities. In this case report, notable improvements were obtained with short duration interventions. It is possible that more significant positive results could be obtained if the program was administered for a longer duration.

This case report provides evidence that a structured intradialytic program is safe to administer, cost effective and leads to positive outcomes. Operational and environmental constraints may pose potential challenges towards implementation of an intradialytic exercise program. Educational efforts and support of a progressive medical staff can help change prevailing culture that may be resistant to changing established norms.

Limitations

The effects of the routine physical therapy intervention is difficult to separate from the intradialytic activity alone. There was no control group to compare the results. The program can be limited by the patient's length of stay in acute care and their co-morbidities. This case study summarizes the response of one individual; therefore the results cannot be generalized to the population of patients undergoing hemodialysis in an acute care setting.

Conclusion

This case report shows the potential benefits of implementing an intradialytic exercise program in acute care. An intradialytic program in acute care can improve perception of fatigue and functional well being in patients with ESRD. Current research has confirmed the positive benefits of exercise in patients receiving HD. The prevailing protocols include exercise after dialysis or during non-dialysis days. However, in the acute care setting, patients experience limited participation due to fatigue, lack of energy and scheduling conflicts. Intradialytic exercise has been associated with positive outcomes in this population. Though this practice is prevalent in other countries, it is not a common practice in the United States.

Table 2. Summary of I-ACTED Sessions.

	I-ACTED Session (Hospital day)		
	Treatment Session 1	Treatment Session 2	Treatment Session 3
Treatment duration	40 minutes	35 minutes	30 minutes
Cycle ergometer	20 minutes	20 minutes	20 minutes
Leg press	10 minutes with intermittent rests	10 minutes with intermittent rests	10 minutes with intermittent rests

These positive results showed that there is a need to develop evidence-based intradialytic exercise protocols that will improve mobility, function and quality of life in people with end-stage renal disease.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors' contributions	RTL	MSC
Research concept and design	✓	✓
Collection and/or assembly of data	✓	✓
Data analysis and interpretation	✓	✓
Writing the article	✓	✓
Critical revision of the article	✓	✓
Final approval of article	✓	✓
Statistical analysis	✓	✓

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