

Intradialytic Exercises & Quality of Life

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Abstract

End-stage renal disease (ESRD) patients generally suffer from lower physical activities, muscle performance, and quality of life (QOL) compared to healthy humans. Dialysis is a medical procedure in which the technique of molecular separation is used to remove metabolic waste products or toxic substances from the blood. Patients who receive hemodialysis had limitations in a number of areas like vitality, physical activities and physical role limitations and assumed a significantly lower physical functioning when compared with that of general population. Intradialytic exercise interventions that are safe, and can be safely performed in the first 2 hours of dialysis without cardiac decompensation, these exercises done in between the hemodialysis sessions while patients are connected to machine are called as Intradialytic exercises. Exercises provided during hemodialysis do not cost patients extra time and will be effective in decreasing the level of fatigue and increasing potential for performing their daily activities. Providing these exercises with dialysis will improve the effectiveness of dialysis and alleviates long term complications of the same.

Keywords: Intradialytic Exercise; Aerobic Exercises; Resistance Exercise; Thigh Lift Maneuver; Passive Exercise; Electrical Stimulation.

Introduction

In medicine dialysis came from Greek dialysis, meaning dissolution, dia, meaning through, and lysis, meaning loosening or splitting is a process for removing waste and excess water from the blood, and is used primarily as an artificial replacement for lost kidney function in people with renal failure. Dialysis may be used for those with an acute disturbance in kidney function such as acute kidney injury, previously acute renal failure or progressive but chronically worsening kidney function—a state known as chronic or end stage kidney disease. The adequacy of dialysis is quantified by the removal of these toxic solutes and is an important parameter in the assessment of the therapy efforts to enhance urea

clearance have centered around factors such as increasing dialysis dose by increasing dialysis time or carrying out more frequent dialysis sessions. However this concept of intradialytic exercise is confronted with the barriers of patient compliance and cost implications. Many patients are resilient to increasing their dialysis time, presenting a major challenge for enhancing the efficacy of dialysis therapy. Therefore, alternative methods of improving dialysis adequacy, with interventions aimed at enhancing solute clearance, are highly warranted.

Intradialytic Exercise

It means Exercise interventions that are safe, and can be safely performed in the first 2 hours of dialysis without cardiac decompensation, these exercises done in between the hemodialysis sessions while patients are connected to machine are called as Intradialytic exercises Inter-dialytic exercise programs means between two hemodialysis sessions when patients are not connected to machine in terms of better adherence.

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Types Intradialytic Exercise

1. Intradialytic modified Tai Chi (IMTC) exercise; that can be performed while the patient is sitting in a recliner with one arm connected to the hemodialysis machine, requires no exercise equipment thus safer to practice, and is easy to learn
2. Aerobic exercises-cycle ergometer or bicycle training, walking
3. Resistance exercise
4. Combined aerobic and resistance exercise
5. Passive exercise
6. Electrical stimulation

Indications

1. Hemodialysis patients with higher risk of falls and renal osteodystrophy
2. Patient with Stage 5 Chronic Kidney Disease
3. Patient Receiving maintenance hemodialysis for > 3 months

Intradialytic Modified Tai Chi (IMTC) Exercise

IMTC did not involve any upper body movements or body translation by foot, so that a participant could perform the exercise while sitting in a recliner with one arm held still that had needle access for hemodialysis.

The exercise features performing the arm movements of the popular 24-form Tai Chi with legs, It is done effectively reduce the risk of fracture. Among different forms of exercise, Tai Chi (IMTC) exercise has been proven effective in reducing risk of falls in the elderly by improving gait, posture control and balance

Procedure

Patients do practice 45 minutes of IMTC during the first 2 hours of each hemodialysis session, 3/ week for 12 weeks, while receiving usual care.

Each 45-Minute Exercise Session IMTC

- A. 5 minutes of warm-up exercise, warm-up exercise was designed to loosen major joints for the subsequent IMTC, along with controlled breathing
- B. 35 minutes of IMTC
- C. 5 minutes of cool-down exercise..

The Traditional TC's Unique Movements are:

1. Physical relaxation
2. Mental concentration
3. Deep breathing, were emphasized in the practice of IMTC.
4. The cool-down exercise gradually brought the body condition down to its pre-exercise level.

Actual IMTC

1. Commencing
2. Part wild horse's mane
3. White crane spreads wings
4. Repulse monkey
5. Grasp bird's tail – push
6. Single whip
7. Cloud hand
8. Left kick"- Yellow arrowhead indicates the direction of motion.

Procedure

1. An instructor teaches IMTC participant individually.
2. All IMTC participants were able to learn the exercise in 3 sessions.
3. Patients will be able to perform IMTC by themselves following a handout and under the supervision of the instructor during each session.
4. Before and after each IMTC session, each patient was monitored about the occurrence of any side effects in association with IMTC.
5. The compliance and the length of practice time for each participant's IMTC session were recorded.
6. Participants in the CON were asked to continue their regular activities throughout the treatment period, while receiving usual care
7. IMTC exercise improves QOL in terms of physical function, role physical and mental health and maintains 25-OH-VitD level in such patients.
8. The lack of significance in the results of balance, gait, and functional strength may be due to an already high performance in the participants at baseline.

Aerobic Exercises-Cycle Ergometer or Bicycle Training

It is an Exercise during Dialysis where Patients

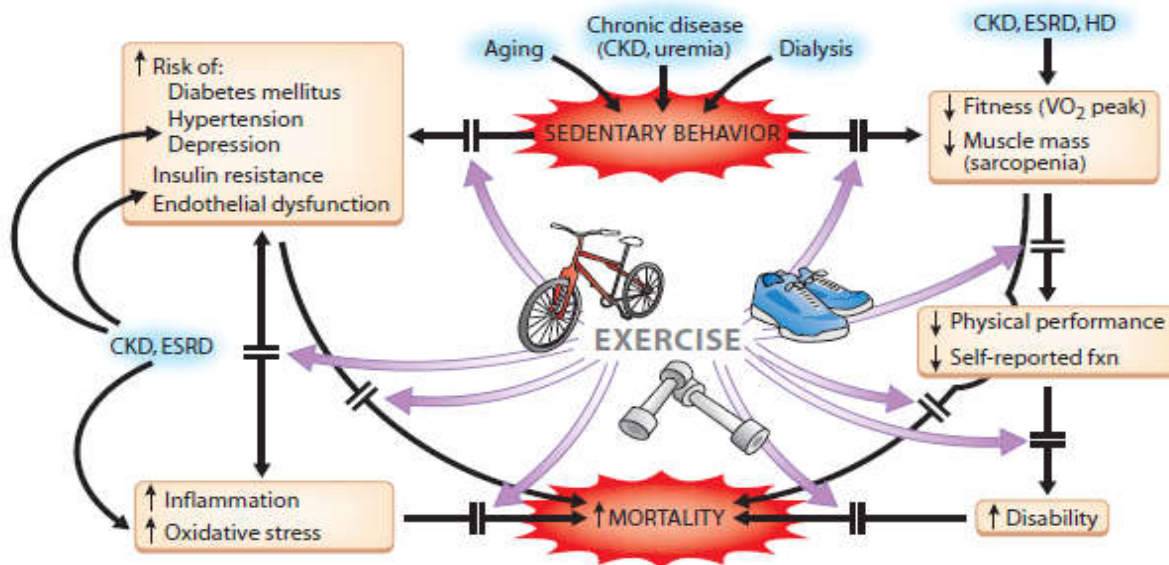


Figure: Illustrates the benefits of cycling in the intradialytic session

will be asked to carry out cycling exercise for 60 minutes during the third quarter of their routine hemodialysis session. Exercise can be carried out in ten minute bouts with several minutes rest between bouts.

1. Once the aerobic exercise is planned, heart rate reserve (HRR) or rating of perceived exertion (RPE) should be considered to tailor exercise intensity in individual patients
2. Intradialytic training requires patient's to train on cycle ergometer within the first two hours of each dialysis session, three times per week for 6 months.
3. Intensity will be individualized on the basis of perceived exertion, exercise heart rate and blood pressure.
4. Participants will be requested to exercise at an RPE of 12-13 on the Borg 6-20 scale.
5. In cases where patients' training heart rates are low at a reported RPE of 12-13, the nursing supervisor will increase the resistance to elicit a greater cardio respiratory response, in such case patients will be permitted to stop and rest or request to train at a lower intensity.
6. In the event that exercise blood pressure exceeds predetermined safe levels for the participant, (>200/110 mmHg) they will be instructed to temporarily cease exercise and will be monitored until blood pressure returns to safe levels.
7. Patients on medications that affect cardiac sinus rhythm will be trained strictly according to

reported RPE. Over the duration of the exercise intervention,

8. Nursing supervisors will periodically increase the resistance of the ergometer to maintain RPE. While patients will be encouraged to start and progress the duration of exercise according to their individual capabilities
9. A general guideline will be given for patients to complete fifteen minutes of exercise per session in the first two weeks of the intervention, progress to thirty minutes of exercise per session by week 12 and to forty-five minutes by week 24.
10. Power output (w) and duration (minutes) of each exercise session will be recorded to estimate participants' individual energy expenditure per session during the training period.

Walking as Aerobic Exercise

1. Patients who reactive Home-based dialytic care perform thrice weekly unsupervised walking for six months at perceived exertions of 12-13 on the Borg 6-20 scale.
2. Home-based patients will be requested to start and progress their walking program according to individual capabilities but better to encourage patients to start at fifteen minutes per session for the first two weeks and to progress to 30 minutes by week 12 and to forty-five minutes by week 24.
4. Patients will be phoned fortnightly to provide encouragement and to allow feedback on progress about walking any abnormalities or

discomforts observed.

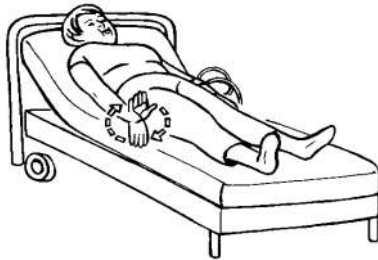
5. Only the duration and number of steps of each walking session will be monitored.
6. Patients will be encouraged to regularly increase intensity by walking faster or walking on routes with some degree of incline.
7. Usually patients will be requested to maintain their usual daily activities and will be reminded of the importance of this regularly throughout their life.

Resistance Exercise

These are the exercise that can be performed on the bed in lying position it named as resistance because certain time pressure is given to the specific muscles Patient is advised to do this exercise 30 minutes to 1hr before the dialysis session.

Circumduction of Wrist

The wrist is rotated round by Circumduction

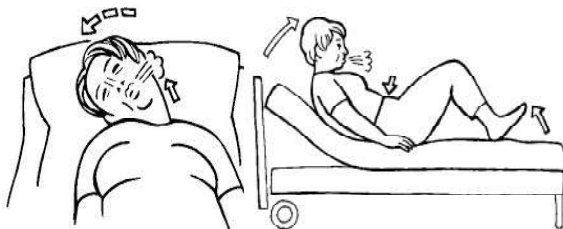


Head Lift, Tummy Tuck Maneuver

The patient is advised to lift up the head with purse lipped breathing and allowed to bend the legs, dorsal part of the foot is taken up with only the heels touching the bed, as the patient lifts the head the pressure is applied to the abdomen.

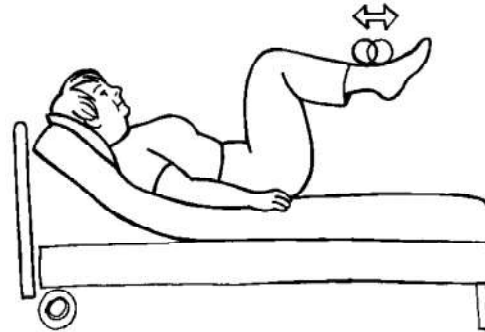
Abduction of Head with Purse Lipped Breathing

Patient is asked to abduct the head by turning the head from the centre to either side along with purse lipped breathing.



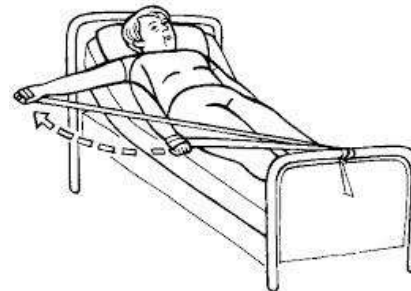
Thigh Lift Maneuver

the patient is asked to sleep in dorsal recumbent position with thighs and both legs lifted right angle to the abdomen, and both legs with pointed knees showing the forward and backward movement of the legs, foot without touching the be.



Abduction of the Right Hand

It is done by abducting the right hand from the centre of the body and moving the arm away from the body and bring towards the body, same manner it is repeated for 5minutes.



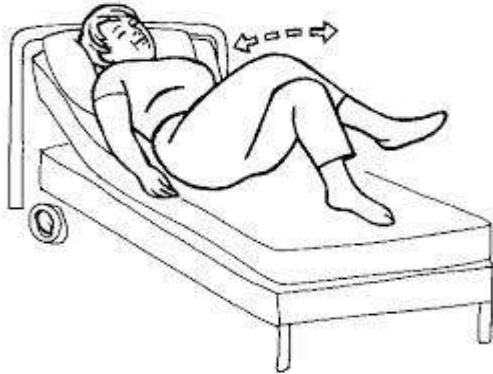
Leg inversion and Eversion

It the pressure given to the toes where the toes are moved inward and outward direction.

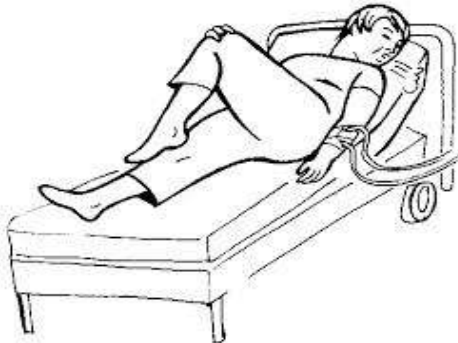


Tilting Leg Over Leg

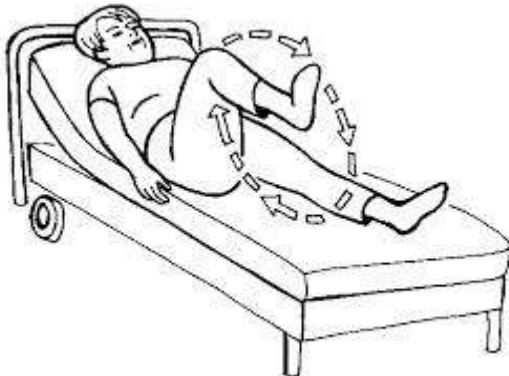
One leg is placed on the other and moved from side to side.

*Purse Lipped Breathing with One Leg Lift*

Patient is asked to lift one leg bent on the knees and turn the head to the side with purse lipped breathing, similarly done on both legs.

*Circumduction of Leg*

Leg is lifted and circumducted around both the legs done one after another.

*Combined Aerobic and Resistance Exercise*

Combination of aerobic exercise-cycling, walking and doing resistance exercise together one after other before dialysis start from simple to complex that is with resistance exercise done on the bed, then walking, and finally cycling this is an effective exercise that removes maximum waste, toxic products by dialysis.

Passive Exercise

It is an activity that the patient is encouraged to do by themselves such as activities of daily living without any help such as bathing, grooming, doing simple house hold activities.

Electrical Stimulation

Trans cutaneous nerve stimulation -TENS it is a type of exercise done with electrical pad like device that supply the heat to the muscles activating the muscle activity by electrical stimulation, but it has no much benefit since the actual physical activity is less, but useful for the bedridden patient who have the contraindication for physical movements.

Interventions and Test Applied to Check the Benefits of Intradialytic Exercise

1. *A 6-Minute Walk Test and Aortic Pulse Wave Velocity: Outcomes & Measurements* Primary outcome measures were distance traveled during.
2. *Augmentation Index* (augmentation pressure as a percentage of central pulse pressure), peripheral (brachial) and central blood pressures (measured noninvasively using radial Tonometer).
3. *Good Physical Activity* and self-reported physical functioning.
4. *Arterial Stiffness Measurement*: taken in the hour preceding dialysis. Aortic (carotid-femoral) pulse wave velocity (PWV) is the primary outcome measure for arterial stiffness.
5. The method involves electrocardiogram-gated sequential application Tonometer on the common carotid and femoral (groin) arteries using the foot-to-foot method.
6. Central blood pressures and Arterial stiffness will be estimated by pulse wave analysis (PWA) involving radial application tonometry performed on the non-fistula arm using customized software with a validated and reproducible generalized transfer function. In patients with a fistula in both arms, the brachial artery (medial to biceps) of the dominant arm will be used.

Benefits

1. Functional mobility and muscle flexibility has been proved(-A Randomized Controlled Trial done on the Intra dialytic Exercise for Adequacy and Solute Removal in Chronic Kidney Disease Patients: Enhancing Dialysis Adequacy: Effects of Intradialytic Exercise done by B. Braun, Avitum AG published in the year 2007 in the journal American Society of Nephrology Exercise in the End-Stage Renal Disease Population).
2. For patients with severe chronic kidney disease, regular dialysis to remove toxins and waste products from the blood is essential to maintain life.
3. By exercising during dialysis, blood flow to the muscle is increased to sustain the demand for oxygen and energy, thereby allowing toxic solutes to be removed and cleared through the dialysis machine.
4. Improves the patients quality of life, reducing strong mortality in ESRD patients.
5. Better urea clearance measured by continuously sampling waste dialysate from an entire dialysis session.
6. It reduces muscle protein loss; maintain muscle function and Prevent muscle wasting in ESRD patients.
7. It improves fitness, physical function, and reduces markers of cardiovascular disease such as arterial stiffness

Contraindications

1. Unable to give consent
2. Patient with Hemoglobin <11 g/dL
3. Patient with Chronic persistent hypotension with pre dialysis systolic blood pressures <100mgHg.
4. Patient with Episodic treatment induced hypotension with frequent drops in intra dialytic systolic blood pressure >30mmHg
5. Patient with any Unstable medical condition
6. Patient currently taking medication affecting serum urea or creatinine

Conclusion

One such intervention could be exercising during hemodialysis (HD). 85% of the body is comprised of lean tissue, of which 73% is water. As many toxic solutes are water based, large amounts will be stored in the muscle. When sitting at rest during HD the blood flow to the muscles is four times less compared to the major organs. Additionally, the HD process causes blood vessels to constrict, further restricting blood flow to the muscle. Consequently there is insufficient blood flow to remove the toxins stored in the muscle. Therefore the aim of this article is to implement an efficient exercise intervention during dialysis and determine its effects on dialysis adequacy in comparison to the traditional prescription of increased dialysis time, intradaylatic exercise is highly beneficial for people on dialysis as it improves their well being and quality of life. With the implementation of this program as standardize clinical practice will make big difference in their lives. Strongly structured large scale researches and controlled trials are needed to more convincingly show the importance of intradaylatic exercise for dialysis patients.

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