

THE IMPACT OF INTRADIALYTIC EXERCISE ON ARTERIAL STIFFNESS AND ECHOCARDIOGRAPHIC PARAMETERS IN HEMODIALYSIS PATIENTS

Salah Said Ebraheem Naga*, Eman Salah Eldein Khaliel, Amira Hussein Mohamed, Amany Mohamed Seddik, Mona Saeed Abbas Ginidy

Department of Internal Medicine*, Faculty of Medicine, Alexandria University, and Department of Experimental and Clinical Internal Medicine, Medical Research Institute, Alexandria University.

Introduction

Cardiovascular disease (CVD) is the major cause of morbidity and mortality in patients with end-stage renal disease (ESRD) on haemodialysis (HD). The increased risks of cardiovascular events and mortality in dialysis patients is partly related to an increased prevalence of traditional cardiovascular risk factors, including diabetes mellitus, hypertension, obesity, physical inactivity, smoking and dyslipidaemia. However, these factors account for less than 50% of the excess risk of cardiovascular disease, leading many researchers to explore the roles of non-traditional risk factors, including anaemia, chronic inflammation, hyperhomocysteinaemia and uraemic toxins. Arterial stiffening is another major contributor to the heightened cardiovascular risk in ESRD, causing hemodynamic alterations via multiple pathways. Muscle wasting, abnormalities in muscle function, and effects on exercise performance are common in patients with ESRD. Exercise is one of the possible preventive maneuvers to reduce muscle protein loss and maintain muscle function. Therefore, various exercise programs, such as aerobic exercise, resistance exercise, combined aerobic and resistance exercise and passive exercise including electrical stimulation have been developed for hemodialysis patients.

- Complete physical examination.
- Laboratory investigations: Calcium, Phosphorus and PTH.
- Assessment of the hemodialysis dose: eKt/V and urea reduction ratio (URR).
- Arterial stiffness assessment: Central BP, PP, augmentation index and pulse wave velocity were calculated with an ambulatory oscillometric device (Mobil-O-Graph).
- Echo-Doppler examination: Left ventricular dimensions and mass index, Left ventricular systolic and diastolic function and assessment of the right ventricular dimension and function.

Exercise programs: Group (A) performed twelve week intradialytic aerobic training three times per week during the first half of the HD session for thirty minutes using a cycle ergometer. Group (B) performed elbow flexion using a free weight dumbbell before aerobic exercise. Group (C) did not perform any exercise.

Results

Table 1: Comparison among the three studied groups according to Augmentation index

Arterial stiffness	Group A (n = 15)	Group B (n = 15)	Group C (n = 15)	Test of sig.	p
AIx (%)					
Pre exercise					
Min. – Max.	11.0 – 44.0	5.0 – 40.0	2.0 – 35.0	H=4.905	0.086
Mean ± SD.	25.67 ± 8.04	18.60 ± 10.40	20.73 ± 11.06		
Median (IQR)	25(20.50–28.50)	15.0 (11.50–21.0)	21.0 (11.50–31.0)		
Post exercise					
Min. – Max.	10.0 – 40.0	4.80 – 38.0	5.0 – 40.0	H=5.777	0.056
Mean ± SD.	25.25 ± 7.96	17.50 ± 9.94	23.23 ± 11.94		
Median (IQR)	24.9(19.50–28.5)	14.80(10.90–20.90)	22.0 (13.50–35.50)		
Z (p₀)	1.330 (0.183)	3.318*(0.001*)	3.321* (0.001*)		
Decrease	0.42 ± 1.33	1.10 ± 1.33	-2.50 ± 2.38	H=28.140*	<0.001*
Sig. bet. grps	p ₁ =0.154, p ₂ <0.001*, p ₃ <0.001*				
% of decrease	1.91 ± 4.40	6.74 ± 9.88	-21.12 ± 36.71	H=29.946*	<0.001*
Sig. bet. grps	p ₁ =0.095, p ₂ <0.001*, p ₃ <0.001*				

p₁: p value for comparing between **group A** and **group B**
 p₂: p value for comparing between **group A** and **group C**
 p₃: p value for comparing between **group B** and **group C**

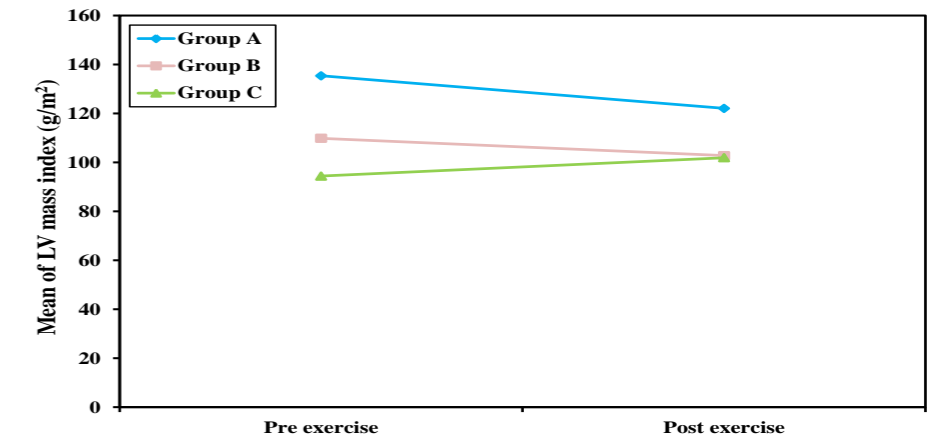


Figure 1: Comparison among the three studied groups according to LV mass index

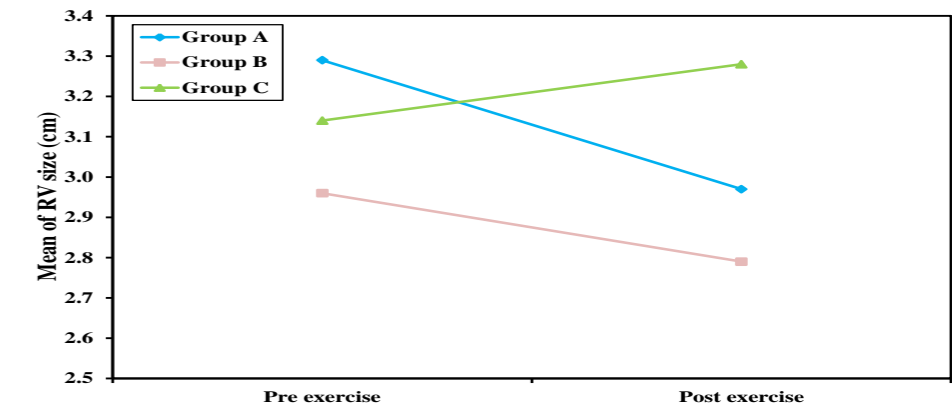


Figure 2: Comparison among the three studied groups according to right ventricular size

Conclusion

Cardiovascular comorbidities affects hemodialysis patients, so intradialytic exercise can have a powerful effect in improving dialysis efficacy especially with combined exercise. Arterial stiffness shows marked reduction among exercise groups. Cardiovascular assessment shows improvement of parameters including LVEF%, LV mass index and RV size in HD who received exercise therapy.

Aim of the work

The aim of this study was to compare the effect of intradialytic aerobic exercise alone versus combined aerobic and resistance exercise on arterial stiffness and the echocardiographic findings among hemodialysis patients.

Patients and Methods

PATIENTS: This study was conducted on 45 chronic kidney disease stage 5(CKD-5) patients receiving regular maintenance hemodialysis 4 hourly sessions 3 times per week at Medical Research Institute Dialysis Unit.

The patients were randomly assigned into 3 groups:

Group (A): Aerobic exercise group, where 15 patients were assigned to a 30-minute aerobic exercise program per dialysis session, 3 times a week, for 3 months.

Group (B): Combined exercise group, where 15 patients were assigned to a combined exercise program per dialysis session 3 times a week, for 3 months.

Group (C): Control group, where 15 patients receiving regular maintenance hemodialysis were not assigned to any exercise program.

METHODS: Experimental study with pre and post assessment after 12 weeks of intradialytic exercise training program.

All patients were subjected to the following:

- Written informed consent.
- Full history taking.