INTRADIALYTIC EXERCISE AND MYOCARDIAL STUNNING IN PATIENTS RECEIVING HEMODIALYSIS THERAPY

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OBJECTIVES

Chronic kidney disease is a "silent epidemic" affecting up to 10% of the EU population. Cardiovascular diseases are the main cause of mortality in end-stage renal disease (ESRD) patients, especially those receiving hemodialysis (HD) therapy[1]. One side effect of HD is recurrent myocardial ischemia and global or segmental left-ventricular dysfunction known as myocardial stunning which is associated with intradialytic hypotension, long-term loss of systolic function, and high incidence of cardiovascular events and death [2]. Exercise training has beneficial effect for cardiovascular fitness and reducing mortality in ESRD[3]. Whether there is an acute benefit of exercise during HD on a reduction in myocardial stunning is not known. **The aim of the current study was to investigate whether a single bout of intradialytic exercise could attenuate myocardial stunning observed during HD.**

METHODS

Twenty one (4F/17M, age 56±19, BMI 27.1±6.2, months in dialysis 40±44) stable HD patients participated in the study. All participants completed two different HD trials on two different days, separated by one week: (1) normal HD and, (2) HD including a single bout of intradialytic exercise. Echocardiographic assessment of ejection fraction was completed before HD, half an hour before the end of HD and 30 min after the end of HD. Echocardiographic scans were performed using an iE33 echocardiographic system (Philip Medical Systems, Andover, MA, USA). All images were acquired with the subject lying in the left lateral decubitus position with a 2.5 MHz transducer. Myocardial stunning was assumed when a **>20% reduction in ejection fraction** was observed. Generalized linear model (GLM) repeated measures were used to compare the 2 trial days.

Tables & Graphs

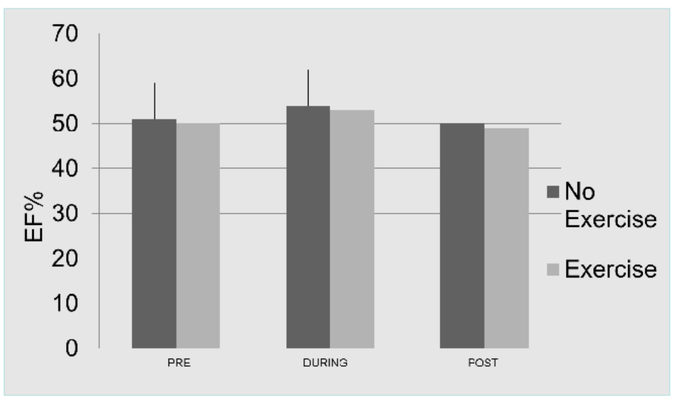

Fig. 1. Ejection Fraction (EF%) at baseline, during and post dialysis with and without the implemented exercise session

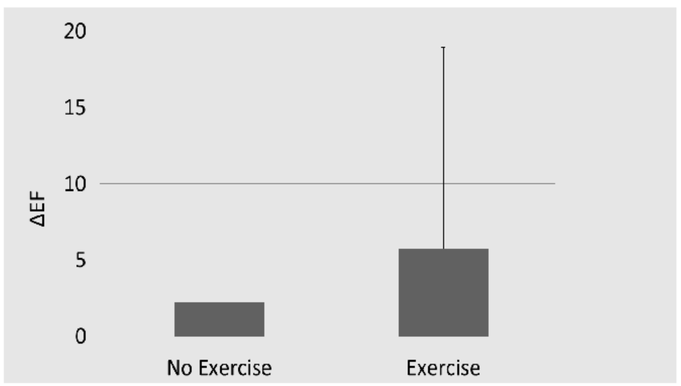

Fig. 2. ΔF (peak dialytic stress) during dialysis with and without the implemented exercise session.

Parameter	Scenario	Baseline	During	Post
Preload				
Systolic Function				
EF (%)	No Exercise	51 ± 8	54±8	50±10
	Exercise	50 ± 12	53±9	49±13
Δ EF (peak	No Exercise		2.26 ± 9.5	
dialytic stress)	Exercise		5.74 ± 13.18	
S' (m/s)	No Exercise	0.08±0.01	0.11±0.02*[a]	**0.11±0.02†[a]**
	Exercise	0.09±0.02	0.11±0.02	0.11±0.02
Diastolic Function				
E (m/s) *	No Exercise	0.87±0.26	0.62±0.13	0.70±0.16
	Exercice	0.88±0.18	0.64±0.11	0.73±0.12
A (m/s) *	No Exercice	0.92±0.37	0.82±0.35	0.84±0.34
	Exercice	0.93±0.31	0.78±0.32	0.80±0.32
E/A	No Exercice	1.00±0.34	0.85±0.32	0.94±0.38
	Exercice	0.97±0.19	0.93±0.29	1.04±0.41
E' (m/s)	No Exercice	0.09±0.02	0.08±0.02	0.09±0.03
	Exercise	0.09±0.02	0.09±0.03	0.08±0.03
A'(m/s) *	No Exercise	0.09±0.02	0.08±0.02	0.09±0.02
	Exercise	0.09±0.02	0.09±0.02	0.10±0.02
E'/A'	No Exercise	1.12±0.50	1.03±0.48	1.06±0.54
	Exercice	1.01±0.40	1.04±0.46	0.84±0.40
E/E'	No Exercice	10±5	9±5	8±3
	Exercice	11±5	8±3	10±5

Table 1. Echocardiographic data for loading, systolic and diastolic function at baseline, during and post dialysis in the two scenario.
All data are mean ± SD. Δ , delta, EF, ejection fraction, S', annular systolic tissue velocity, E, transmitral doppler early diastolic wave; A, transmitral doppler atrial diastolic wave; E/A, ratio of E and A wave peak velocities; E', annular early diastolic myocardial velocity; A', annular late diastolic myocardial velocity; E'/A', ratio of early to atrial diastolic myocardial velocity; E/E', ratio of transmitral blood flow velocity to tissue doppler velocity. *Significant main effect of time

RESULTS

No differences were observed for any variable of echocardiographic indices of LV structure at baseline before the initiation of dialysis between the two scenario days. EF did not change across both trials (Table 1, Figure 1). Similarly the change in EF from baseline to peak dialysis was not different from zero although some individual variability was noted (Figure 2). From the systolic functional variables only **S'** presented with a significant main effect for time (with an increase during dialysis and recovery in both trials compared to baseline. Indices of diastolic function are also presented in Table 1. There was a significant main effect of time for **E, A and A'.** Data for E were reduced during dialysis compared to baseline in both trials with only a partial return recovery at the post-dialysis assessment. The same pattern was observed for A with absolute changes slightly smaller. Data for A' increased slightly at post assessment when compared to baseline and during dialysis time-points. All other variables did not change across either time point.

CONCLUSIONS

In the current study we attempted to investigate whether an acute bout of exercise could ameliorate the myocardial stunning often seen at the end of the hemodialysis therapy in ESRD patients. A single bout of intradialytic exercise did not affect myocardial stunning in our study population. It's important to determine if the long term exercise training could reduce myocardial stunning improving thus post-dialysis fatigue, mortality and overall quality of life.

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52 ERA 447--SP
J7) Chronic Kidney Disease. Rehabilitation.
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DOI: 10.3252/pso.eu.52era.2015
ePosters supported by F. Hoffmann- La Roche Ltd.
52nd ERA-EDTA CONGRESS London 2015 UNITED KINGDOM MAY 28TH - 31ST
PosterSessionOnline.com