A six month programme of intradialytic exercise improves resting heart rate in haemodialysis patients

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Introduction

- Cardiovascular disease is the most common cause of death in haemodialysis (HD) patients.
- This is largely driven by 'non-traditional' risk factors which arise secondary to renal failure and the process of HD.
- Attempts to modify traditional risk factors have largely proved ineffective in this patient population so novel interventions are required.
- Therefore the aim of this study is to assess the effect of 6 months of intradialytic exercise on a range of measures of cardiac function.

Methods

- 27 HD patients from a randomised controlled trial (CYCLE-HD, ISRCTN: 11299707) were randomised either to an intradialytic exercise group (EX, n=11) or a usual care control (CON, n=16) group.
- EX group performed 30 minutes of intradialytic cycling at a rating of perceived exertion (RPE) 12-14 thrice weekly over a 6 month period; the CON group continued with their usual care.
- All patients had a range of cardiac measures taken using a non-invasive cardiac output monitor (NICOM™, Cheetah Medical, Maidenhead, UK): heart rate (HR), cardiac index (CI), stroke volume index (SVI), mean arterial pressure (MAP), total peripheral resistance index (TPRI), systolic blood pressure (SBP) and diastolic blood pressure (DBP).
- These measures were taken immediately before the 2nd or 3rd HD session of the week at baseline and after 6 months.
- Data from baseline and 6 months were compared between the 2 groups using a two way repeated measures ANOVA (Ex v CON x time) (see Table 2).
- Paired sample t-tests were used for post hoc analysis.

Table 1: *Baseline characteristics for all patients at time of consent.*

	Control (n=16)	Exercise (n=11)
Age; years (mean ± SD)	58.4±12.8	51.1±16.7
Gender; male	12	7
HD vintage; months (median [IQR])	22.0 (34.5)	29.0 (52.0)
BMI; kg/m^2 (median [IQR])	26.0 (4.3)	28.0 (7.0)
Diabetes mellitus; %(n)	37.5% (6)	18.2% (2)
Hypertension; %(n)	75% (12)	63.4% (7)
Cardiovascular disease; %(n)	25% (4)	45.5% (5)

Results

- There was a statistically significant reduction in pre-dialysis heart rate (HR) in the EX group at 6 months compared to baseline (p=0.043) (see figure 1).
- There was also a corresponding significant decrease in cardiac index (CI) in the EX group (p=0.033) compared to the control group at 6 months versus baseline (see figure 2).

Table 2: *Cardiac measures taken using NICOM™ at baseline and after 6 months. P values are for time x group effects.*

	Control group		Exercise group		
	Baseline (mean ± SD)	6 months (mean ± SD)	Baseline (mean ± SD)	6 months (mean ± SD)	P value
HR (BPM)	72.14 ± 11.41	75.31 ± 13.95	77.17 ± 8.59	72.45 ± 9.36	0.05
CI (L/min/m^2)	3.20 ± 0.77	3.28 ± 0.80	3.86 ± 0.84	3.26 ± 0.94	0.01
SVI (ml)	45.64 ± 8.75	44.55 ± 11.66	50.18 ± 10.35	44.95 ± 11.39	0.31
MAP (mmHg)	100.59 ± 15.98	102.06 ± 14.06	103.70 ± 15.71	99.55 ± 13.33	0.42
TPRI (Dynes.sec/cm^5/m^2)	2695.73 ± 834.15	2649.13 ± 647. 77	2245.92 ± 503. 97	2784.45 ± 1120. 88	0.92
SBP (mmHg)	145.68 ± 26.57	148.5 ± 28.23	146.19 ± 29.88	142.27 ± 25.99	0.59
DBP (mmHg)	78.15 ± 13.61	79.06 ± 11.98	82.51 ± 10.15	77.91 ± 8.73	0.25

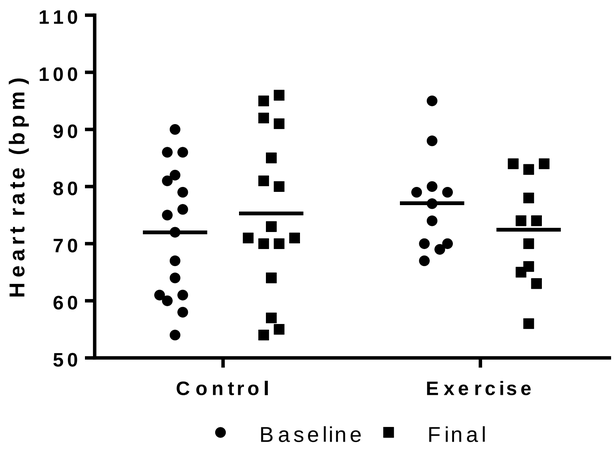

Figure 1: *Change in heart rate between baseline and after 6 months in the EX and CON groups.*

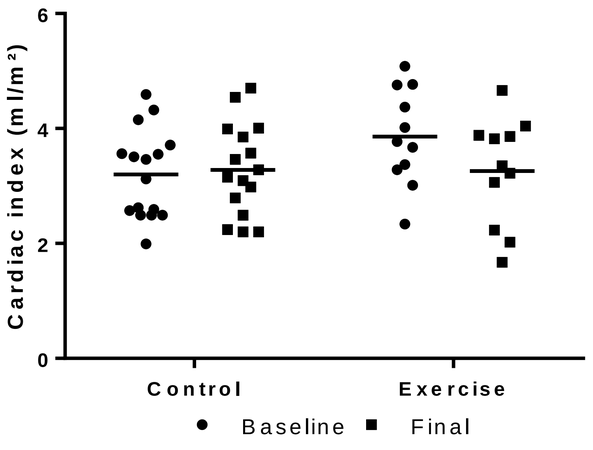

Figure 2*: Change in cardiac index between baseline and after 6 months in the EX and CON groups.*

Conclusions

- Whilst changes in HR and CI were statistically significant, they did not result in any significant change in BP or TPR.
- It has previously been reported (Isaki et al., 2011) that pre-dialysis HR was a significant predictor of survival and found that mortality was higher in those with a higher HR.
- The findings from this study suggest that intradialytic exercise may be effective in improving some measures of cardiac function.
- This reduction in pre-dialysis heart rate may be clinically relevant which suggests that intradialytic cycling could improve long term outcomes for HD patients.

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Dialysis - Cardiovascular complications II

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DOI: 10.3252/pso.eu.54ERA.2017

ePosters supported by F. Hoffmann- La Roche Ltd.