# Aerobic intradialytic exercise: an effective approach to improve heart rate variability?

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## Introduction

- Haemodialysis (HD) patients have been shown to have less variability in their heart rate compared to healthy controls.
- Reduced heart rate variability (HRV) is known to be a independent prognostic factor for cardiac mortality.
- The effect of HD on HRV is unclear and no data exists on whether aerobic intradialytic exercise (IDE) can improve HRV.
- The aims of this study were two fold:
    1) To investigate changes in HRV during the HD period.
    2) To investigate the effect of 6 month programme of regular IDE on baseline HRV.

## Methods

- 48 hour (h) Holter monitoring was performed on 18 HD patients to include a 4h HD session and the proceeding 44h.
- Time domain HRV calculation was performed using Cardiscope™ (HASIBA Medican GmBH supplied by SMART medical); it was expressed as the root mean square of successive interval differences over heart rate (rMSSD/HR).
- Baseline HRV was obtained as a 4 h average on a non-HD day (BASE) and compared to the average value for each h of HD.
- 6 of the 18 patients underwent a 6 month programme of aerobic IDE (30 min of cycling at a Borg rating of perceived exertion 12-14) as part of the CYCLE-HD randomised control trial (ISRCTN: 11299707).
- To assess the effect of a 6 month programme of IDE on HRV, they underwent repeat Holter monitoring from which a second baseline HRV value was obtained on a non-HD day (6M).
- Changes in HRV over the course of the HD period were assessed using Friedman's ANOVA and the effect of an IDE programme was analysed using an unpaired t-test.

**Figure 1:** *A patient undertaking aerobic intradialytic exercise*

## Results

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

| | All (n=18) | Exercise (n=6) |
|---|---|---|
| Age; years (mean ± SD) | 55±16 | 58±17 |
| Gender; male | 9 | 3 |
| HD vintage; months (median [IQR]) | 52(25) | 61(50) |
| Diabetes mellitus; n(%) | 7(39) | 1(17) |
| Hypertension; n(%) | 12(67) | 4(67) |
| Cardiovascular disease; n(%) | 6(34) | 3(50) |

- There was a non-significant increase (p= 0.44) in HRV from baseline to the first 1 h of HD (BASE 34.83 ± 40.90; 1h 36.33 ± 41.21).
- Over the following 3 hours, there was a non-significant trend suggesting a consistent decline in mean HRV (2 h 35.17 ± 36.16; 3 h 33.22 ± 36.18; 4 h 31.22 ± 32.96; P=0.47, see Figure 2).
- When the baseline HRV values were compared between BASE and 6M, there was trend towards improved HRV (BASE 36.35 ± 41.63; 6M 68.67 ± 44.17; p=0.09).

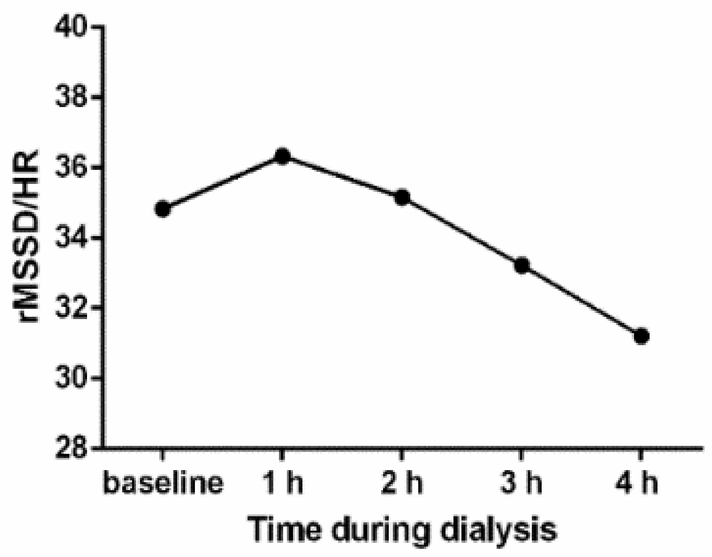


**Figure 2:** *Change in heart rate variability over the course of the HD period*

## Conclusions

- Despite an increase in the first hour, over the course of HD, the ability to vary HR is blunted before being overtly reduced.
- It is possible that these changes are either due to ultrafiltration rate or hypotensive myocardial ischaemia or a combination of both.
- A programme of IDE was shown to lead to a non-significant improvement in baseline HRV.
- Since reduced HRV has been shown to be a poor prognostic factor, IDE may have the potential to reduce HD patient's risk of cardiac mortality.

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