Cardiac autonomic tone as an indicator of exercise capacity and aerobic fitness in hemodialysis patients: correlation with the Duke Activity Status Index questionnaire

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Background

- Cardiovascular disease is the leading cause of death in patients with chronic kidney disease (CKD), despite treatment of traditional risk factors
- Reduced cardiac autonomic tone (CAT), specifically withdrawal of contribution from the parasympathetic limb of the cardiac autonomic nervous system, has been shown to predict poor cardiac outcomes specifically in end-stage CKD populations requiring dialysis
- The Duke Activity Status Index (DASI) questionnaire is a reliable and accurate tool for estimating exercise capacity and aerobic fitness in end-stage CKD
- Whether measurements of CAT and DASI scores are clinically related has not been investigated in the hemodialysis population

Objective

- We sought to examine whether parameters of CAT representative of sympathetic and parasympathetic CAT were correlated with DASI scores in stable, thrice weekly hemodialysis subjects

Methods

- **Subjects:** 13 stable, thrice weekly hemodialysis patients with no history of cardiovascular events or related hospitalizations in the previous 6 months were studied on the first day of their weekly dialysis schedule
- Ambulatory 24-hour Holter heart monitors were applied to each subject at initiation of dialysis run and worn for at least 12 hours
- DASI questionnaires completed in the dialysis unit no more than 4 weeks prior to heart monitoring, with high scores indicating poor exercise capacity
- **Outcome:**
  - First 12 hours of CAT (power spectral density analysis of heart rate variability)
    - *a) LF (low-frequency sympathetic tone)*
    - *b) HF (high-frequency vagal tone)*
    - *c) LF:HF (sympathovagal balance)*
- **Statistical Analysis:**
  - Parameters of CAT and DASI scores were compared using Spearman's correlation test
  - Linear regression assessed the associations between CAT parameters and DASI scores, accounting for age and gender differences

Table 1. Subject characteristics

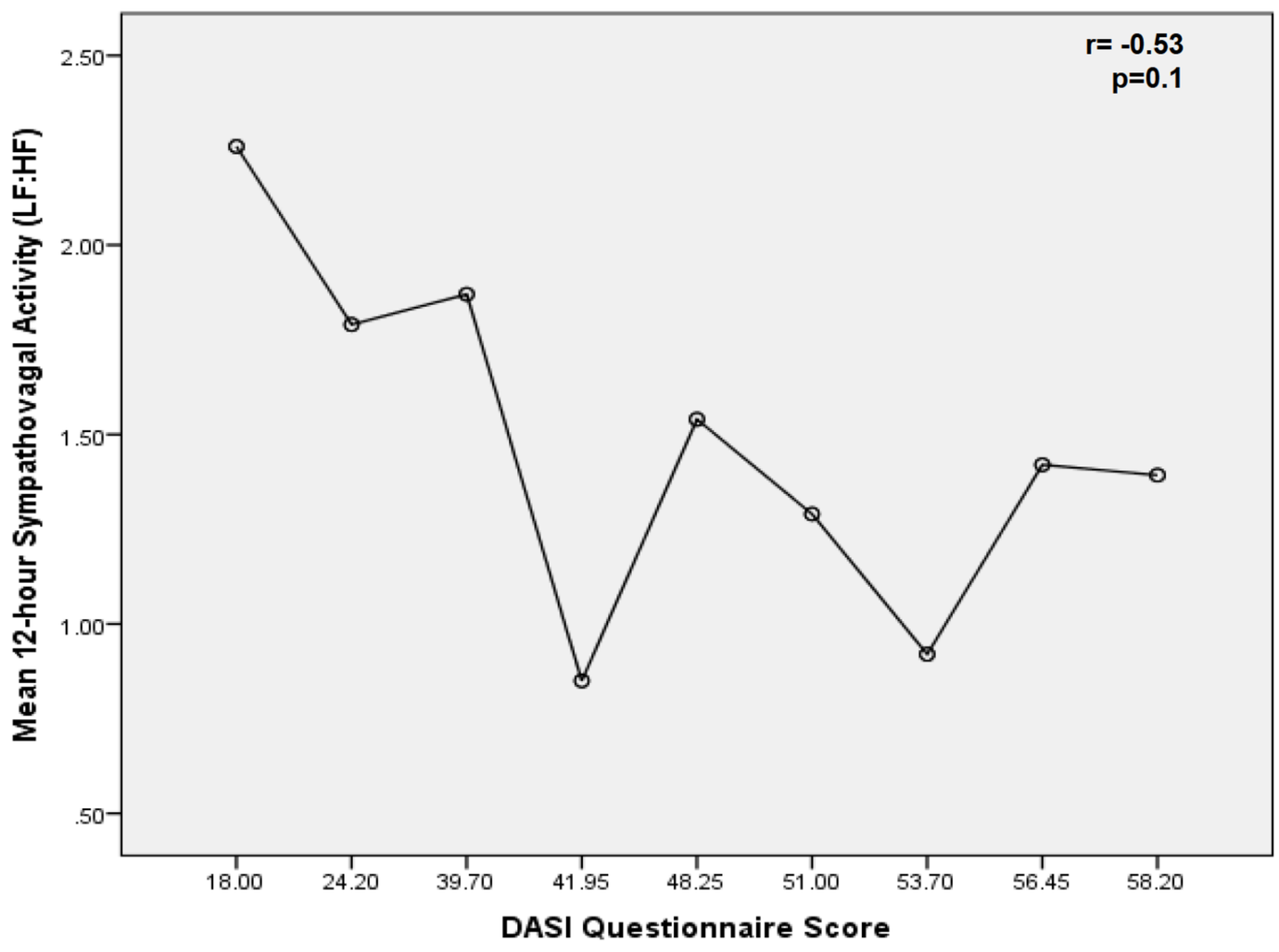
	End-stage CKD requiring hemodialysis (n=13)
Age (years)	70 ± 5
Male (%)	77%
DASI score (Range)	47.3 ± 3.7 (18.0 – 52.0)
Total power (ms^2)	1338 ± 603
Very low frequency (ms^2)	645 ± 253
LF (normalized units)	57.5 ± 5.1
HF (normalized units)	29.7 ± 2.7
LF:HF	1.45 ± 0.1

Table 2. Correlations between CAT parameters and DASI Scores

	DASI Score	
	Spearman's correlation (r)	p-value
Total power (ms^2)	0.01	0.9
Very low frequency (ms^2)	-0.15	0.7
LF (normalized units)	-0.33	0.4
HF (normalized units)	0.46	0.3
LF:HF	-0.53	0.1

Abbreviations: LF, low-frequency cardiac autonomic tone; HF, high-frequency cardiac autonomic tone; LF:HF low to high frequency ratio
All data are expressed as mean±SE unless otherwise indicated.
† p<0.05 compared to baseline
‡ p<0.05 compared to pre-supplementation

Figure 1. Modulation of 12hr sympathovagal balance in relation to DASI questionnaire scores



Conclusion: In this small study, measures of CAT within the first 12 hours of initiation of dialysis were not significantly correlated with DASI estimates of exercise capacity and aerobic fitness. However, a possible trend between poor DASI scores and reduced CAT was observed, which warrants larger studies in order to validate the accuracy of the DASI Questionnaire in evaluating not only aerobic capacity, but also cardiovascular risk in this populati

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H) Clinical Nephrology, Chronic Kidney Disease (CKD). H1) Lab methods, progression & risk factors for CKD 1-5, nutrition in CKD, renal diseases (except GNs and cystic diseases).
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