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Heart rate variability may predict intradialytic hypotension

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Objectives: Intradialytic hypotension (IDH) is an important complication associated with increased mortality in patients on prevalent hemodialysis. IDH may be due to autonomic dysfunction, and heart rate variability (HRV) analysis is a non-invasive method to estimate autonomic function.

Methods: Total 83 patients participated in this prospective observational study. All patients received dialysis three times a week for at least three months without hospitalization for acute illness within a past month. HRV data were obtained for the first, the middle, and the last 30 minutes during one session of dialysis. After measurement of HRV, the occurrences of IDH were monitored for 12 sessions of hemodialysis.

Results: Twelve patients were excluded, because the quality of HRV data was too low to analyze, and 8 patients were due to the occurrence of IDH during HRV measurements. It is because of that the present study is to evaluate whether HRV can predict future IDH. Consequently, data from 63 patients were analyzed. Twenty patients had experienced one or more than one IDH events during the observation period (IDH group), but 43 patients had not (non-IDH group). HRV data were compared between two group, low-frequency/ high-frequency ratio (LHR, sympathetic-to-parasympathetic ratio) component of HRV showed the statistically significant intergroup difference ($p = 0.35$, two-way repeated-measure ANOVA). Among the clinical parameters (age, sex, diabetes, coronary artery disease, etc.) and HRV data, only factor those with the p-value greater than 0.2 from univariate logistic regression were put into the multivariate logistic regression model. The model showed that LHR in the first 30 minutes of dialysis is a significant risk factor of IDH ($p = 0.043$, 1.204 (1.006 – 1.441)). ROC curve showed that the parameter may predict IDH ($p = 0.032$, AUC 0.668 (0.513 – 0.823)).

Conclusions: LHR component of HRV, from the first 30 minutes of dialysis, may predict IDH.

Table. HRV logistic regression result

Table. The results of univariate and multivariate logistic regression model.

		Univariate		Multivariate	
		p value	exp(β)	p value	exp(β)
LHR		0.037	1.171 (1.010 - 1.358)	0.043	1.204 (1.006 - 1.441)
Sex	Male		Reference		
	Female	0.140	0.429 (0.139 - 1.319)		
Age		0.192	1.028 (0.986 - 1.072)	0.026	1.072 (1.008 - 1.140)
CAD	No		Reference		
	Yes	0.133	3.417 (0.687 - 17.000)		
Temp.	36.0°C		Reference		
	36.5°C	0.102	0.300 (0.071 - 1.269)		
WBC		0.038	1.000 (1.000 - 1.001)	0.026	1.000 (1.000 - 1.001)
Hb		0.191	0.748 (0.484 - 1.156)		
Platelet		0.120	1.008 (0.998 - 1.018)		
serum sodium		0.104	0.836 (0.673 - 1.037)		
serum potassium		0.155	0.500 (0.192 - 1.299)	0.080	0.289 (0.072 - 1.157)
serum chloride		0.055	0.868 (0.751 - 1.003)		
blood urea nitrogen		0.116	1.030 (0.993 - 1.068)	0.019	1.067 (1.011 - 1.125)
spKt/V		0.187	0.349 (0.073 - 1.665)	0.102	0.144 (0.014 - 1.473)

Abbreviation: LHR, low-frequency/high-frequency ratio; CAD, coronary artery disease; Temp., temperature setting of dialysate; WBC, white blood cell; Hb, hemoglobin; spKt/V, single pool Kt/V.