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Effectiveness of Heart Rate Variability for Predicting Intradialytic Hypotension in Chronic Hemodialysis Patients

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This is a multicenter, prospective, observational study analyzing the usefulness of heart rate variability (HRV) test in predicting intradialytic hypotension (IDH). HRV test is a non-invasive test that provides an indirect measure of autonomic nervous system function. IDH is known to be caused by a variety of factors, including decreased autonomic nervous system function. To date, the definition of IDH has varied from study to study, and a recent meta-analysis reported that the nadir 90 criterion was associated with increased mortality among various criteria for IDH. This study analyzed the predictive power of HRV test in the occurrence of IDH according to the nadir 90 criteria. A total of 70 patients were analyzed: 37 patients occurred IDH and 33 patients did not. The proportion of women and diabetes was significantly higher in the group with IDH. Body composition measurement analysis and echocardiography results did not differ between the two groups. We developed a prediction model (HRV index model) using various parameters of HRV test (standard deviation of normal-to-normal interval (SDNN), root-mean-square of successive differences (RMSSD), normal-to-normal interval > 50ms (NN50) count, percentage of NN50 count (pNN50), total power (TP), very low frequency (VLF), low frequency (LF), high frequency (HF), and LF/HF ratio) (Table 1). The developed HRV index model had an area under the receiver operating characteristic curve (AuROC) value of 0.776 for predicting patients occurring IDH even in one dialysis session. Furthermore, an AuROC value of the model was 0.803 for predicting patients with repeated episodes of IDH over 10% of dialysis sessions (Figure 1). IDH remains an unsolved problem in the field of hemodialysis. This study is the first to report the usefulness of HRV test in predicting IDH based on nadir 90, providing important information for the future utilization of this test.

Table 1. Development of HRV index model for predicting IDH

	B	SE	P-value	OR (95% CI)
NN50	0.1850	0.084	0.027	1.203 (1.021-1.418)
TP	-0.0344	0.015	0.025	0.966 (0.938-0.996)
VLF	0.0359	0.016	0.023	1.037 (1.005-1.069)
LF	0.0341	0.018	0.055	1.035 (0.999-1.071)
LF/HF ratio	-0.2301	0.125	0.065	0.794 (0.622-1.014)
Constant	1.7394	0.648	0.007	5.694

All patients (100%) were included in the model. P-value for regression model was 0.003, Nagelkerke's R² was 0.307, and p-value of Hosmer and Lemeshow test was 0.665. Accuracy value was 0.714, recall value was 0.784, precision value was 0.707, and F1 score was 0.744. B, beta coefficient; CI, confidence interval; HF, high frequency; HRV, heart rate variability; IDH, intradialytic hypotension; LF, low frequency; NN50, normal to normal interval > 50ms; OR, odds ratio; RMSSD, root-mean-square of successive differences; SE, standard error.