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Clinical Significance of Heart Rate Variability Monitoring in End-Stage Renal Disease Patients

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Objectives : Cardiac autonomic dysfunction is a major cause of death in end-stage renal disease (ESRD). However, suitable parameters to monitor real-time cardiac autonomic function have not been investigated. We aimed to determine whether heart rate variability (HRV) is related with the cardiac autonomic dysfunction and heart failure in ESRD patients.

Methods : This study was a prospective observational study performed in Seoul St. Mary's hospital between Jun 2017 and Feb 2017. A total of 25 ESRD patients and 32 healthy controls (HCs) were asked to wear the continuous ambulatory HRV monitor (T-REX®; Taewoong Medical, Gyeonggi do, Korea) for 24 hours. HRV measures included both time domain methods (SDNN, RMSSD) and frequency domain methods (VLF, LF, HF, LF/HF ratio, Total power). We compared HRV parameters between ESRD patients and HCs, and also investigated which factors affected the parameters in ESRD patients.

Results : HRV measured by both time domain and frequency domain methods were significantly lower in ESRD patients compared with HCs ($p<0.001$). Among ESRD patients, HRV parameters tended to be more decreased in patients receiving renal replacement therapy compared with the patients having residual kidney function. HRV parameters of patients on hemodialysis, especially LF and HF results recovered during dialysis session ($p<0.05$). It was shown that serum albumin level had a positive correlation with SDNN, VLF, LF and total power ($p<0.05$). And E/e' which is a representative parameter for diastolic dysfunction of heart, had a negative correlation with SDNN, VLF, LF, HF and total power ($p<0.05$).

Conclusions : HRV were markedly reduced in ESRD patients, and diastolic heart dysfunction and poor nutritional status were associated with the decline of HRV. Continuous HRV monitoring may be useful for evaluation of cardiac function in ESRD.

Keywords : ESRD, autonomic function, heart rate variability