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Autonomic Modulation of Ankle Brachial Index Assessed by Heart Rate Variability in Healthy Young Male and Female Volunteers

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Introduction: Autonomic regulation analysis is useful as risk stratification in a wide variety of cardiac, neurologic, and metabolic diseases. Sympathovagal balance assessed by heart rate variability (HRV), both in time and frequency domains, correlates with peripheral arterial disease determined by ankle-brachial index (ABI) in patients with known cardiovascular disease. The aim of this study is to assess the association of HRV and ABI in healthy young volunteers.

Methods: Two hundred twenty-eight healthy volunteers, 110 males (20.7 ± 2.0 years) and 118 females (20.2 ± 1.6 years) participated in the study. Five-minute recordings of HRV time- and frequency-domain indices were analyzed and correlated with ABI. The root mean of the squared successive interbeat intervals differences (RMSSD) was taken as the time domain measure of HRV. High-frequency (HF: 0.15–0.4 Hz), low-frequency (LF: 0.04–0.15 Hz), very-low-frequency (VLF: < 0.04 Hz) band power, and HF power or LF/HF ratio were calculated on the electrocardiogram recordings obtained. All time- and frequency-domain indices were automatically calculated by the commercially available Norav ECG Management System (Wiesbaden, Germany). ABI was measured by noninvasive methods.

Results: For all volunteers: mean RMSSD, 57.5 ± 30.7; LF, 157.0 ± 79.3; HF, 240.3 ± 96.7; VLF, 144.8 ± 82.2; LF/HF, 0.88 ± 0.79; and ABI, 1.05 ± 0.09. RMSSD had a direct correlation with ABI (.191, P = .005). No correlation was observed between ABI and any of the other HRV data.

Independent analysis of male and female groups was as follows:

Male: Mean ABI (1.05 ± .08) and RMSSD (53.3 ± 30.9) had a positive correlation (.229, P = 0.19). No other correlation was observed.

Female: Mean ABI (1.04 ± .09) and RMSSD (61.3 ± 30.2), had no correlation with each other or with other HRV variables.

T-test for equality of means: RMSSD, male (53.3 ± 30.9) and female (61.3 ± 30.2), (P = .05); LF, male (174.0 ± 84.0) and female (141.3 ± 71.6), (P = .02); HF, male (201.4 ± 81.7) and female (276.1 ± 96.0), (P < .001); and LF/HF, male (1.09 ± 0.86) and female (0.69 ± 0.67), (P < .001).

Conclusion: Differences in sympathovagal balance in time and frequency domain analysis between male and female healthy volunteers was observed. RMSSD only correlates with ABI in healthy young male volunteers, and may be related to an augmented sympathetic tone (LF).

Even though no difference in ABI between sexes is found at this age, autonomic balance control related to time-domain analysis may explain its correlation with a higher sympathetic tone in healthy young men compared with healthy young women.