Heart Rate Variability and Cardio-Metabolic Risk in Patients with Type 2 Diabetes

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Purpose: Patients with type 2 diabetes (T2D) are at risk of autonomic neuropathy (AN). An analysis of Heart-Rate-Variability (HRV) is useful in detecting AN.

Methods: Patients with T2D (n=45; age=56±6 years) underwent 24h ambulatory-ECG-monitoring, 24h ambulatory-blood-pressure-monitoring and fasting blood tests. A subset of the patients (n=27) had further abdominal magnetic resonance imaging (MRI) measurements. Time and frequency domain HRV parameters analyzed included 24-h triangular-index(TI), mean time interval between two R-waves (MeanRR), root-mean-square successive difference (RMSSD), standard deviation of all normal RR (SDNN), SDNN-index and High and low frequency(HF, LF).

Results: In multivariate regression models adjusted for age, sex, and waist, 24h TI (beta=.461; p=.011), MeanRR (beta=.514;p= .007), RMSSD, (beta=.445, p=.013), SDNN (beta=.348 p=.078) and SDNNi, (beta=.741 p<0.001) were associated with increased levels of HDL-c and with decreased levels of triglycerides (TG) (beta=-.656, p<0.001; beta=-.371, p= .050; beta=-.345, p=.048, beta=-.409, p=.029; beta=-.400, p=.023 respectively) but not with HbA1c or blood pressure. HF was significantly associated with decreased levels of TG (beta=-.472, p=.018). When lipid-lowering drugs, beta-adrenergic blockers and hypertensive medications were added to the models, the associations remained unchanged. 24-h TI was associated with decreased deep subcutaneous fat tissue (beta=-.453, p=0.033), but not with other abdominal adipose tissues i.e. superficial subcutaneous fat.

Conclusions: In patients with T2D, elevated TG and decreased HDL-c levels are mostly associated with poor HRV parameters. Thus, early subclinical detection of autonomic dysfunction is important for risk stratification and subsequent management.