

Heart rate asymmetry in relation to the respiratory phase in healthy people and patients with hypertension

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Heart rate asymmetry (HRA) is a physiological phenomenon considered a physiological attribute of a healthy subject. In the following, we assess HRA in 18 healthy adults (CG: age: 45 ± 14) and 19 patients with hypertension (HG; age: 53 ± 13). All subjects were examined in supine position and had a regular breathing pattern. The data contains 20-minute recordings of ECG and respiration. We obtain RR signals from the ECG for each patient. Then we assign RR intervals to one of four states corresponding to the phase of breathing: inspiration (IN) or expiration (EX), and two possible breathing phase transitions: from inspiration to expiration (IN→EX) or from expiration to inspiration (EX→IN).

Poincaré plots for pairs of RR intervals from subsequent respiratory phases for both groups were obtained. Then the HRA was estimated by the Guzik's Index (GI) and Porta Index (PI). The indexes estimate the distribution of points relative to the identical line on the Poincaré plot.

The calculation for the whole RR signals shows that GI tended to be different in healthy subjects and patients ($p < 0.07$), and the value of GI for healthy people was significantly different from 50% ($p < 0.005$), which means that asymmetry has been found in the CG. However, the asymmetry of RR intervals was not detected by PI. At the same time, there are statistically significant differences between values of asymmetry indexes (GI and PI) obtained from RR intervals divided according to the respiratory state. Although, the difference in the heart rate asymmetry between CG and HG groups was not found.