

Assessing Heart Rate Asymmetry According to Respiratory Phases

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Heart rate asymmetry (HRA) is considered a physiological feature of a healthy organism. This study evaluated HRA in two groups: 18 healthy adults (CG, mean age: 45 ± 14 years) and 19 patients with hypertension (HG, mean age: 53 ± 13 years). During the examination, all participants were in a supine position and maintained regular breathing. Simultaneous ECG recordings and respiratory motion recordings were conducted. From the 20-minute ECG recordings, RR intervals were extracted and categorized into one of four phases corresponding to respiratory activity: inspiration (IN), expiration (EX), and the transitions between these phases (IN→EX and EX→IN).

Poincaré plots were constructed for both groups, illustrating pairs of consecutive RR intervals assigned to specific respiratory phases. Two indices were used to evaluate HRA: the Guzik index (GI) and the Porta index (PI), which allow the analysis of the distribution of points relative to the line of identity on the Poincaré plot.

Analysis of RR intervals without respiration phase-based categorization showed that the GI value differed between the healthy and hypertensive groups at a significance level of $p < 0.07$. Furthermore, the GI value in the healthy group (CG) was significantly different from 50% ($p < 0.005$), indicating the presence of asymmetry in this group. In contrast, the PI index did not detect an asymmetry in the RR intervals. Significant differences were observed in the values of the asymmetry indices (GI and PI) calculated for RR intervals categorized by respiratory phases. However, no significant differences in heart rate asymmetry were detected between the CG and HG groups.