Variability of the Systolic and Diastolic Electromechanical Periods in Healthy Subjects

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Our aim was to assess: 1) the variability of the systolic and diastolic periods, using as estimators, of the first one, the electromechanical interval measured from the R wave maximum to the systolic peak of the pressure wave (RPre), and of the second, the interval from this pressure to the next R wave (PreR); 2) the effect of two cardiac autonomic activity modifying maneuvers on these estimators. ECG, noninvasive arterial pressure and respiratory movements were recorded from 21 healthy volunteers during three 5-min conditions: supine (S), 0.2Hz controlled breathing (CB) and 100W exercise (E). Spectral analysis of the RR, RPre, PreR and respiration series was performed using the Welch periodogram method to obtain the high (HF) and low (LF) frequency components. During the maneuvers both LF and HF components of PreR changed in parallel with those of RR intervals, but the HF of PreR was slightly greater ($p<0.001$). The HF component of PreR intervals increased from 473 ± 372 ms2 in S to 1854 ± 1263 ms2 ($p<0.001$) in CB and decreased drastically to 2 ± 1ms2 in E ($p<0.001$). In contrast, the maneuvers did not affect the LF component of RPre intervals ($p>0.05$) and had a minimal effect on its HF component, which increased from 3 ± 2ms2 in S to 15 ± 7ms2 in CB and decreased to 1 ± 0.5ms2 in E ($p<0.001$); these averages were very small in relation to those of PreR ($p<0.001$). From the fact that the maneuvers modify in an important and parallel manner both the HF and LF components of the RR and diastolic PreR intervals but not those of the systolic RPre intervals, our findings indicate that the cardiac autonomic modulation is evident in the diastolic period but not in the systolic one. In addition, they suggest that the systolic period is relatively constant, while the diastolic interval shows considerable flexibility.