Gender Related Differences in Scaling Structure of Heart-Rate and Blood-Pressure Variability as Assessed by Detrended Fluctuation Analysis

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The fractal structure of heart rate variability (HRV) is traditionally described by two scale coefficients, the short- and the long-term self-similarity exponents, calculated by the Detrended Fluctuation Analysis (DFA) for box sizes shorter and longer than n=12 beats, respectively. Recently we showed, however, that the scale structure of Blood Pressure Variability (BPV) and HRV is better described by a spectrum of scale exponents, the alpha(n) function estimated for each box size n, rather than by the classic two-coefficient model. Aim of our study is to test whether gender may influence the fractal structure of HRV and BPV, as described by the DFA alpha(n) function. We enrolled 32 male (M) and 20 female (F) healthy volunteers matched by age (M:32.0 +7.6 yrs; F:31.1 +10.1 yrs, m+sd, p=0.71). We collected R-R intervals (RRI) from ECG, and systolic (SBP) and diastolic (DBP) finger blood pressures for 10 minutes in supine and sitting positions. For each beat-by-beat series, we calculated alpha(n) for n between 5 and 108 beats as described in (Castiglioni et al, IEEE Trans Biomed Eng. 2009). Alpha(n) spectra of male and female groups were compared separately for the supine and sitting positions (unpaired t-test). While we did not find any gender-related difference in sitting position, we observed significant changes in the alpha(n) patterns in supine positions. Indeed, for SBP, alpha(n) was close to 1 over all the box sizes in the female group, while in males it progressively decreased from 1.16 (at n=5) to 0.80 (at n=108). As to DBP and RRI, alpha(n) was significantly greater in males than in females for $n<8$. These results indicate marked gender differences in the cardiovascular response to the lying position presumably reflecting differences in the autonomic strategy to counteract the blood centralization occurring in clinostatic condition.