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IMPAIRED T-WAVE AMPLITUDE ADAPTATION TO HEART-RATE INDUCED BY CARDIAC DECONDITIONING AFTER 5-DAYS OF HEAD-DOWN BED-REST

Abstract

Purpose. The study of QT/RR relationship is important for the clinical evaluation of possible risk of acquired or congenital ventricular tachyarrhythmia, predisposing to life-threatening arrhythmias. Our aim was to assess the effects of 5-days of strict head-down (-6 degrees) bed-rest (BR) on ventricular repolarization dependence to RR. Methods. 12 healthy men (mean age 35+\-3) were enrolled at MEDES (Toulouse, France) as part of the European Space Agency BR studies. High fidelity (1000 Hz) Holter ECG (12-leads, Mortara Instrument) was acquired before (PRE), the last day of BR (HDT5), and four days after its conclusion (POST). The night (23:00-06:30) was selected for analysis. X,Y,Z leads were derived using inverse Dower matrix and vectorcardiogram computed. Selective beat averaging was used to obtain averages of P-QRS-T complexes preceded by the same RR (10 msec bin amplitude, in the range 900-1100 msec). For each averaged waveform (i.e., one for each bin), T-wave maximum amplitude (Tmax), T-wave area (Tarea), R-Tapex and R-Tend were measured, and median values for each bin among all subjects linearly correlated to RR. Results. At PRE, all the parameters showed a good linear correlation (r2>.80) with the RR duration. Conversely, at HDT5 a worsening of this relationship was observed in both Tarea (r2=.73) and Tmax (r2=.26), associated with a slope reduction of 42% (from 16.8 to 9.8 microV) and 36% (from .31 to .20 microV/msec), respectively, while for R-T apex (PRE: .059 1/msec, r2=.87; HDT5: .061 1/msec, r2=.92) and R-Tend (PRE: .1 1/msec, r2=.93; HDT5: .117 1/msec, r2=.94) it did not change . At POST, the strength of the relation of Tmax and Tarea with RR appeared restored, with a slight increase in their slope values compared to PRE control values (18.3 and .36, respectively). Conversely, for R-Tend the correlation was weaker (r2=.65) and with a reduced slope (.067 1/msec, equal to -33% vs PRE), thus potentially evidencing a different adaptation to RR in the T-wave down-slope portion after BR. Conclusions. Despite the short-term BR, cardiac adaptation

to deconditioning affected ventricular repolarization thus modifying the T-wave amplitude adaptation to RR during the night period. Selective beat averaging approach allowed to quantify these changes. In particular, the RR dependency of Tmax and Tarea was less pronounced at HDT5, thus suggesting an impairment in the regulation of the ventricular repolarization process that has been previously associated with an increased risk for life-threatening arrhythmias.