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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+ $\sqrt{3}$ ) 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 T<sub>max</sub> and T<sub>area</sub> 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.