

The Effects of Physiological Stress on Global and Regional Repolarisation in the Human Heart in Vivo

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Abstract : Introduction: Sympathetic stimulation has been recognised as a potent stimulus of arrhythmogenesis in various cardiac pathologies, possibly by augmenting dispersion of repolarisation. The effects of sympathetic stimulation in healthy subjects however remain unclear. It is, therefore, crucial to first establish the effects of physiological stress on dispersion of repolarisation in healthy subjects before understanding these effects in pathological cardiac conditions. We hypothesised that activation-recovery interval (ARI; which is a surrogate of action potential duration) and dispersion of repolarisation decrease on sympathetic stimulation. Methods: Eight patients aged 18-55 years with structurally normal hearts underwent head-up tilt test (HUTT) and exercise tolerance test (ETT) while wearing the electrocardiographic imaging (ECGi) vest. Patients later underwent CT scan and the epicardial potentials are reconstructed using the ECGi software. Activation and recovery times were determined from the acquired electrograms. ARI was calculated and later corrected using Bazett's formula. Global and regional dispersion of repolarisation were determined from standard deviation of the corrected ARI (ARic). One-way analysis of variance (ANOVA) and Wilcoxon test were used to evaluate statistical significance. Results: Global ARic increased significantly [$p<0.01$] when patients were tilted upwards but decreased significantly after five minutes [$p<0.01$]. A subsequent post-hoc analysis revealed that the decrease in R-R was more substantial compared to the change in ARI, resulting in the observed increase in ARic. Global ARic decreased on peak exercise [$p<0.01$] but increased on recovery [$p<0.01$]. Global dispersion increased significantly on peak exercise [$p<0.05$] although there were no significant changes in regional dispersion. There were no significant changes in both global and regional dispersion during tilt. Conclusion: ARic decreases upon sympathetic stimulation in healthy subjects. Global dispersion of repolarisation increases upon exercise although there were no changes in global or regional dispersion during orthostatic stress.

Keywords : dispersion of repolarisation, sympathetic stimulation, Head-up tilt test (HUTT), Exercise tolerance test (ETT), Electrocardiographic imaging (ECGi)

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