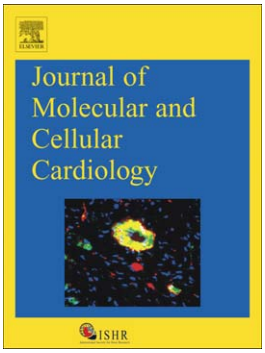

Interactive effect of beta-adrenergic stimulation and mechanical stretch on low-frequency oscillations of ventricular action potential duration in humans

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Full title:

Interactive effect of beta-adrenergic stimulation and mechanical stretch on low-frequency oscillations of ventricular action potential duration in humans

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Abstract

Ventricular repolarization dynamics are crucial to arrhythmogenesis. Low-frequency oscillations of repolarization have recently been reported in humans and the magnitude of these oscillations proposed to be a strong predictor of sudden cardiac death. Available evidence suggests a role of the sympathetic nervous system. We have used biophysically detailed models integrating ventricular electrophysiology, calcium dynamics, mechanics and β-adrenergic signaling to investigate the underlying mechanisms. The main results were: (1) Phasic beta-adrenergic stimulation (β-AS) at a Mayer wave frequency between 0.03 and 0.15 Hz resulted in a gradual decrease of action potential (AP) duration (APD) with concomitant small APD oscillations. (2) After 3-4 minutes of phasic β-AS, the mean APD adapted and oscillations of APD became apparent. (3) Phasic changes in haemodynamic loading at the same Mayer wave frequency (a known accompaniment of enhanced