

Inferolateral J waves are caused by regional conduction slowing

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INTRODUCTION J waves in the inferolateral leads (early repolarization (ER) pattern) are associated with a higher risk for arrhythmic death. However, the mechanism responsible for inferolateral J waves is a debated issue. We aimed to investigate the role of conduction slowing, increased transient outward current and reduced coupling on the occurrence of inferolateral J waves.

METHODS Computer simulations were performed to evaluate the effect on J-point elevation of reduced sodium channel conductivity (G_{Na}), increased conductivity of the transient outward potassium channel (G_{to}) and cellular uncoupling in three predefined regions within the heart: lateral left ventricle (LV), anterior LV and septum. We studied the presence of J-point elevations and QRS duration after each simulation. We also performed experiments in a pig model. Two hearts from male pigs were Langendorff perfused, and selective perfusion of the left marginal coronary artery (LMA, 1 pig) or left anterior descending coronary artery (LAD, 1 pig) was performed. Volume conducted pseudo-ECG were recorded from 64 positions surrounding the heart. We studied the presence of J-point elevations in the pseudo-ECGs before and after regional flecainide perfusion. We simultaneously recorded epicardial electrograms from which activation times (AT) were measured.

RESULTS The simulation data showed that conduction slowing in the lateral, but not in the other regions induced inferolateral J waves. A regional increase in transient outward potassium current or cellular uncoupling did not induce J waves, but elicit minor J-point elevations when intervention was applied to the lateral zone. The experimental data confirmed that conduction slowing – induced by flecainide infusion – in the lateral LV region but not in the anterior LV region induced inferolateral J waves. The J waves coincided with the delayed activation of the perfused region.

DISCUSSION Conduction slowing in the left lateral ventricular myocardium causes inferolateral J waves on the ECG.