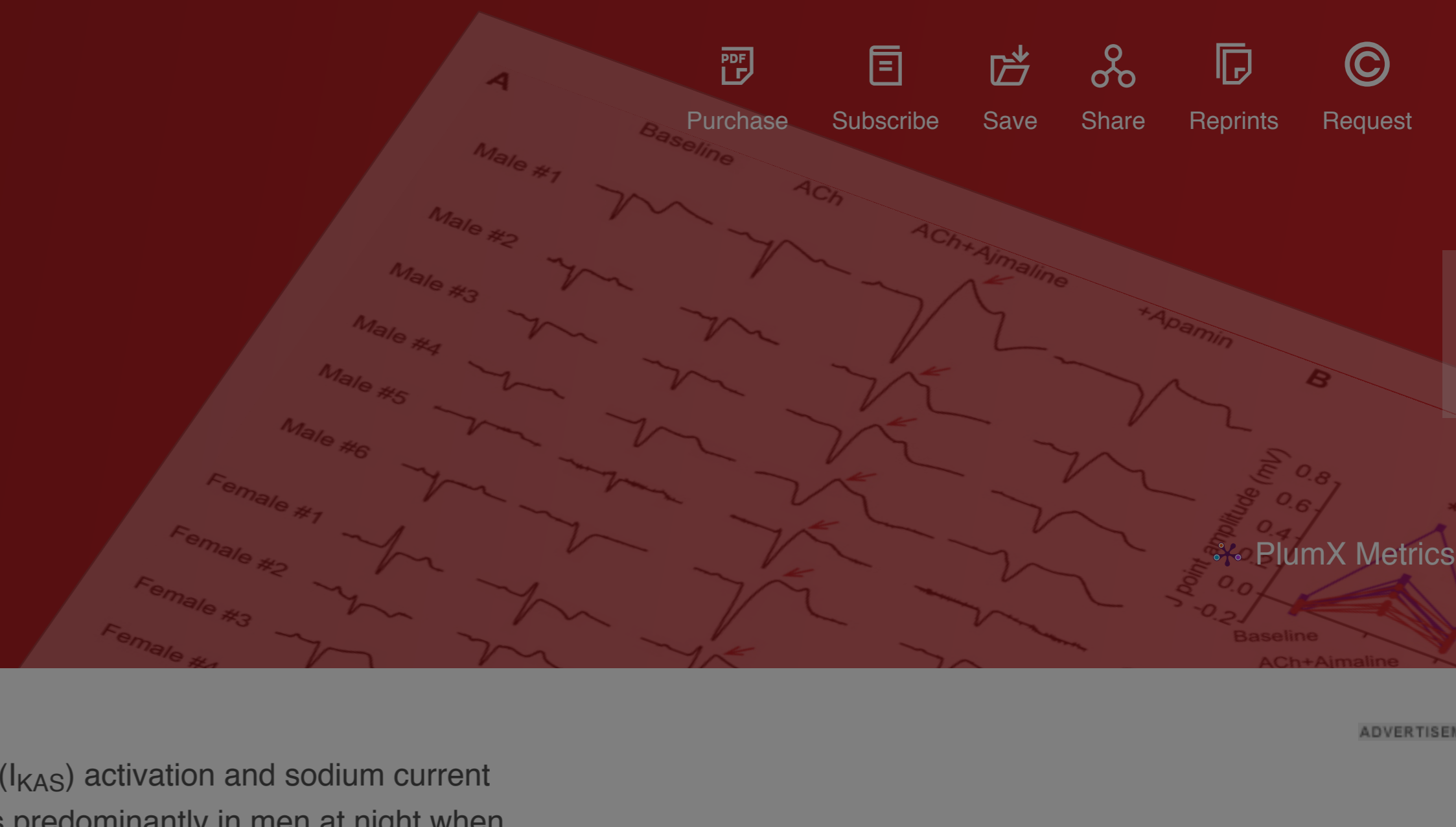


Simultaneous activation of the small conductance calcium-activated potassium current by acetylcholine and inhibition of sodium current by ajmaline cause J-wave syndrome in Langendorff-perfused rabbit ventricles

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Background

Concomitant apamin-sensitive small conductance calcium-activated potassium current (I_{KAS}) activation and sodium current inhibition induce J-wave syndrome (JWS) in rabbit hearts. Sudden death in JWS occurs predominantly in men at night when parasympathetic tone is strong.

Objective

The purpose of this study was to test the hypotheses that acetylcholine (ACh), the parasympathetic transmitter, activates I_{KAS} and causes JWS in the presence of ajmaline.

Methods

We performed optical mapping in Langendorff-perfused rabbit hearts and whole-cell voltage clamp to determine I_{KAS} in isolated ventricular cardiomyocytes.

Results

ACh (1 μ M) + ajmaline (2 μ M) induced J-point elevations in all (6 male and 6 female) hearts from 0.01±0.01 to 0.31±0.05 mV ($P<.001$), which were reduced by apamin (specific I_{KAS} inhibitor, 100 nM) to 0.14±0.02 mV ($P<.001$). More J-point elevation was noted in male than in female hearts ($P=.037$). Patch clamp studies showed that ACh significantly ($P<.001$) activated I_{KAS} in isolated male but not in female ventricular myocytes (n=8). Optical mapping studies showed that ACh induced action potential duration (APD) heterogeneity, which was more significant in right than in left ventricles. Apamin in the presence of ACh prolonged both APD at the level of 25% ($P<.001$) and APD at the level of 80% ($P<.001$) and attenuated APD heterogeneity. Ajmaline further increased APD heterogeneity induced by ACh. Ventricular arrhythmias were induced in 6 of 6 male and 1 of 6 female hearts ($P=.015$) in the presence of ACh and ajmaline, which was significantly suppressed by apamin in the former.

Conclusion

ACh activates ventricular I_{KAS} . ACh and ajmaline induce JWS and facilitate the induction of ventricular arrhythmias more in male than in female ventricles.

Keywords

[Brugada syndrome](#) • [Early repolarization syndrome](#) • [J-wave syndrome](#) • [Sex difference](#) • [Ventricular arrhythmia](#)

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