Endothelin-1 modulates the arrhythmogenic activity of pulmonary veins.

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摘要

Abstract

Objective: Endothelin-1 has important cardiovascular effects and is activated during atrial fibrillation. Pulmonary veins (PVs) play a critical role in the pathophysiology of atrial fibrillation. The aim of this study was to evaluate whether endothelin-1 affects PV arrhythmogenic activity.

Methods: Conventional microelectrodes were used to record the action potentials (APs) and contractility in isolated rabbit PV tissue specimens before and after the administration of endothelin-1 (0.1, 1, 10 nM). The ionic currents of isolated PV cardiomyocytes were investigated before and after the administration of endothelin-1 (10 nM) through whole-cell patch clamps.

Results: In the tissue preparation, endothelin-1 (1, 10 nM) concentration dependently shortened the AP duration and decreased the PV firing rates. Endothelin-1 (10 nM) decreased the resting membrane potential. Endothelin-1 (0.1, 1, 10 nM) decreased the contractility and increased the resting diastolic tension. In single PV cardiomyocytes, endothelin-1 (10 nM) decreased the PV firing rates from 2.7 ± 1.0 Hz to 0.8 ± 0.5 Hz (n = 16). BQ-485 (100 μM, endothelin-1 type A receptor blocker) reversed and prevented the chrono-inhibitory effects of endothelin-1 (10 nM). Endothelin-1 (10 nM) reduced the L-type calcium currents, transient outward currents, delayed rectifier currents, transient inward currents, and sodium–calcium exchanger currents in the PV cardiomyocytes with and without pacemaker activity. Endothelin-1 (10 nM) increased the inward rectifier potassium current, hyperpolarization-induced pacemaker current, and the sustained outward potassium current in PV cardiomyocytes with and without pacemaker activity.

Conclusion: Endothelin-1 may have an antiarrhythmic potential through its direct electrophysiological effects on the PV cardiomyocytes and its action on multiple ionic currents.