Electrophysiology and arrhythmogenic activity of single cardiomyocytes from canine superior vena cava.

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摘要

Abstract

BACKGROUND: The superior vena cava (SVC) has been proved to be a focal point in the initiation of paroxysmal atrial fibrillation. The autonomic nervous system plays an important role in the genesis of atrial fibrillation. However, the arrhythmogenic potentials of SVC and its responses to autonomic agents are not clear. The purpose of this study was to isolate single SVC cardiomyocytes and to investigate their electrophysiological characteristics, as well as the direct effects of autonomic agents. METHODS AND RESULTS: Canine SVC cardiomyocytes were isolated by perfusion with digestive enzymes. The action potentials and ionic currents were investigated in single SVC cardiomyocytes using the whole-cell clamp technique. Dissociation of the SVC yielded rod-shaped single cardiomyocytes with (n=74, 51%) or without (n=71, 49%) pacemaker activities. There were similar densities of inward Ca2+, delayed rectifier K+, transient inward, inward rectifier K+, and pacemaker currents between SVC cardiomyocytes with and without pacemaker activity. SVC cardiomyocytes with pacemaker activity have, however, greater transient outward currents than those without pacemaker activity. In SVC cardiomyocytes, acetylcholine (5.5 micromol/L) abolished the spontaneous activities, but isoproterenol (10 nmol/L), atropine (10 micromol/L), and phenylephrine (10 micromol/L) accelerated the spontaneous activity and induced the occurrences of early or delayed afterdepolarizations. CONCLUSIONS: These findings suggest that SVC cardiomyocytes have distinct action potentials and ionic current profiles that may be responsible for the arrhythmogenic activity of the SVC.