

# Mechanoelectrical feedback regulates the arrhythmogenic activity of pulmonary veins

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摘要

## Abstract

**Background:** Atrial fibrillation is commonly associated with dilated pulmonary veins. Stretch has been shown to have mechano-electrical effects.

**Objective:** To investigate whether stretch can increase the arrhythmogenic activity of the pulmonary veins.

**Methods:** The transmembrane action potentials were recorded from rabbit pulmonary veins before and after stretch (100 and 300 mg). Gadolinium and streptomycin (stretch-activated ion channel blockers) were each perfused into the pulmonary veins under a 300-mg stretch.

**Results:** Stretch (0, 100 and 300 mg) force dependently increased the incidence of spontaneous activity (22%, 48% and 83%;  $p < 0.05$ ), mean (standard deviation (SD)) firing rates of spontaneous activity (1.7 (0.2), 2.1 (0.3) and 3 (0.2) Hz;  $p < 0.05$ ) and incidence of early post-depolarisations (9%, 26% and 61%;  $p < 0.05$ ) and delayed post-depolarisations (0%, 4% and 30%;  $p < 0.05$ ) in 23 pulmonary veins. In the seven preparations with spontaneous activity after the 300-mg stretch, gadolinium (1, 3 and 10  $\mu\text{mol/l}$ ) decreased the incidence of spontaneous activity by 43%, 29% and 14%, respectively ( $p < 0.05$ ), and decreased the firing rate from 2.9 (0.1) Hz to 0.8 (0.4), 0.3 (0.1) and 0.1 (0.1) Hz, respectively ( $p < 0.05$ ). Streptomycin (10 and 40  $\mu\text{mol/l}$ ) decreased the incidence of spontaneous activity by 71% and 29%, respectively ( $p < 0.05$ ), and decreased the firing rate from 2.9 (0.1) Hz to 1.6 (0.4) and 0.5 (0.3) Hz, respectively ( $p < 0.05$ ).

**Conclusion:** Stretch is an important factor in the electrical activity of the pulmonary vein. Stretch-induced arrhythmogenic activity of the pulmonary vein may contribute to the genesis of atrial fibrillation.