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Piezo ion channel and hypertension in vascular smooth muscle cellsSang Woong Park^a, Kyung Chul Shin^bEulji University^a, Republic of KoreaKonkuk University School of Medicine^b, Republic of Korea

Piezo ion channels are mechanically-activated ion channels, which play important roles in biological processes such as pain, innocuous tactile somatosensation, hearing, and blood vessel development. They are known to express in dorsal root ganglion, bladder, Merkel cells in the skin, and blood vessels. Despite their critical roles in the normal development of blood vessels, the functions of piezo ion channels in the blood vessel function are still unclear. It is suggested that piezo ion channels may take parts in the pathophysiology of the hypertensive blood vessels. In this study, we hypothesized that up-regulation of piezo may contribute to the altered functions of hypertensive arteries.

Perforated whole cell patch-clamp, cell-attached patch-clamp, isometric contraction experiment, and western blot techniques were used in the study. The deoxycorticosterone acetate (DOCA)-salt hypertension rat model was used as a hypertension animal model.

We found that the protein expression of piezo ion channels are increased in the DOCA-salt hypertensive rat arteries. Hypotonic-induced stretch increased the cation influx in the hypertensive arterial smooth muscle cells (SMCs). It has been well known that the 5-hydroxytryptamine (5-HT)-induced cationic current is increased in the DOCA-salt hypertensive rats. We further found that under hypotonic-stretch condition, the 5-HT-induced current was even larger in the DOCA-salt hypertensive arteries. Moreover, single channel recordings with cell-attached technique clearly showed that application of pressure through the patch pipette activated the cationic single channel currents preferentially in the DOCA-salt hypertensive rat arterial SMCs; the pressure-activated cationic currents in the sham-operated control rat arterial SMCs were minimal.

Taken together, it is suggested that the increased expression of piezo ion channels in the hypertensive arteries may contribute to the increased Na⁺ influx, depolarized membrane potential, and increased vascular contractility in the hypertensive arteries. The piezo channels are suggested to be a potential candidate for treating altered function of hypertensive arteries

Biography

Sang Woong Park currently working as an assistant professor at the Department of Emergency medical services at Eulji University in south Korea. He is studying the physiological function of blood vessels. In particular, He is interested in hypertension, and he is studying oxidation stress and mechanical stimuli on blood vessel. Recently, He is studying the effects of Piezo ion channel on blood vessels and the correlation between piezo ion channel and hypertension.

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