

Expression of BKca in mesenteric artery smooth muscle cells in preeclamptic patients.

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Abstract

This study aimed to study the expression of BKca in mesenteric artery smooth muscle cells in patients with Preeclampsia (PE), and to explore the relationship between BKca electrophysiological activity and PE. Human mesenteric smooth muscle cells with good activity were obtained by acute enzyme method. The BKCa current was recorded by single channel patch clamp technique. Higher quality cells required for experiments were obtained, and the recorded channel currents were in accordance with the general properties of BKCa. Under the cell-attached patch, when the voltage was clamped at +40 mv, +50 mv, +60 mv, the opening Probability (Po) of PE group was significantly lower than that of the normal pregnancy group, and the difference was statistically significant (n=20, p<0.05). Under the inside-out patch, the Po of PE group was significantly lower than that of the normal pregnancy group, and the difference was statistically significant (n=20, p<0.05). Under the inside-out patch, when the membrane potential was +40 mv, the bath by adding different concentrations of free Ca²⁺ (10⁻⁸ M, 10⁻⁷ M, 10⁻⁶ M and 10⁻⁵ M), the sensitivity of PE group to Ca²⁺ concentration was significantly lower than that of the normal pregnancy group (n=20, p<0.05). The activity of BKCa in mesenteric artery smooth muscle cells of preeclamptic patients was weakened. Our findings suggested that the changes of BKCa channel activity in mesenteric artery smooth muscle cells were related to the occurrence of PE.

Keywords: Large conductance calcium-activated potassium channel, Human mesenteric artery, Vascular smooth muscle cells, Preeclampsia.

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Introduction

Large conductance calcium- and voltage activated potassium channels are ubiquitously expressed and regulate a diverse array of physiological processes [1-3]. Disruption of BK channel function in human and animals is associated with a wide range of pathologies ranging from hypertension, autism, asthma, cancer, diabetes, obesity and other disorders of the vascular, nervous, endocrine and other systems [4,5]. BKca is the highest expression of potassium channels on vascular smooth muscle cells. When blood pressure rises, the high intracellular calcium can cause BKca activation, hyperpolarization of cell membrane, and hypervolemia smooth muscle relaxation. On the contrary, it can cause vascular smooth muscle contraction [6,7]. BKca plays an important role in regulating the relaxation and systolic function of vascular smooth muscle.

Preeclampsia (PE) is a human pregnancy-specific multi-system disease, with hypertension, proteinuria and edema as its major characteristics [8,9]. PE can cause endothelium damage and vascular spasm can lead to serious complications, such as acute renal failure, cerebral hemorrhage [10,11]. Thus, we supposed that BKca may be involved in the vascular spasm caused by PE.

Therefore, in the present study, we aimed to investigate the activity of BKca in mesenteric artery smooth muscle cells in patients with PE and to explore the correlation between BKca activity and PE, and to provide a theoretical basis for further understanding the etiology and pathogenesis of PE.