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The Increase of Calcium Current in Smooth Myocytes of Mesenteric Arteriole of Rat with Diabetes Mellitus Induced Hypertension

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The mechanisms inducing hypertension are actively investigated and are still challenging topics. Basically hypertension must be caused by the disorder of Ca^{2+} metabolism in vascular smooth muscle, such as the increase of Ca^{2+} influx, the decrease of Ca^{2+} efflux, or the change of sensitivity of contractile protein etc. The one of cause of the increase of Ca^{2+} influx may be the change of Ca^{2+} channel activity. Even though the relationships of Ca^{2+} channel activity and hypertension were studied using various hypertension models, still it is not clear how much change of Ca^{2+} channel activity in diabetes mellitus (DM) induced hypertension is occurred. We induced DM hypertension in SD rat and compared the Ca^{2+} channel activity with age-matched normotensive SD rat. For inducing DM hypertension, left kidney was removed with 200 gm rat and, after 1 month, 60 mg/kg of streptozotocin was injected into peritoneal space to induce diabetes mellitus. Usually after 4-6 weeks, hypertension was fully induced. For isolating vascular smooth muscle cells (VSMC), we used mesenteric arteriole (3rd - 4th branch of mesenteric artery) of which diameter is below 150 um. VSMCs were isolated enzymatically. Ca^{2+} current was measured using whole cell patch clamp technique. All experiments were performed at 37 °C. The cell membrane area of VSMC of DM hypertensive rat is larger than that of control VSMC (36.6±3.64 pF vs 22.4±1.29 pF, mean±S.E.) When we compared the current amplitude, the Ca^{2+} current amplitude in VSMC of DM hypertensive rat is much larger than that in VSMC of normotensive age-matched rat. After Ca^{2+} current amplitude was normalized by cell membrane area, the current amplitude in DM hypertension is increased to 249.1±15.9 % (mean±S.E.M), which means the

absolute current amplitude is about 4 times larger in DM hypertension. When we compared the steady state activation and inactivation, there were no noticeable differences. From these results, one of cause of the DM hypertension is due to the increase of Ca^{2+} current amplitude. But it need further study why the Ca^{2+} current is so large in VSMC of DM hypertension and how much Ca^{2+} influx through Ca^{2+} channel contribute to the increase of intracellular Ca^{2+} and eventually contribute to development of hypertension.

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