16) Membrane potential and contraction in portal vein from SHRSP.

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INTRODUCTION: Changes in structure and function of venous as well as arterial smooth muscle have been studied in hypertensive rats. In portal vein from SHR, hypertrophy of muscle layer and increased force of contraction have been reported but the changes are still inconsistent. In the present study, spontaneous electrical and mechanical activities of portal veins from stroke-prone SHR(SHRSP) were studied in comparison with those from normotensive Wistar Kyoto rats(WKY).

METHODS: Portal veins were isolated from four month-old male WKY and SHRSP. Isometric contractions of longitudinal muscle were recorded in modified Tyrode's solution at 37°C. High K solution was made by equimolar replacement of NaCl with KCl. Membrane electrical activity was recorded with microelectrode. Cross-sectional area of longitudinal muscle layer of the vein was measured with HE stained preparation which was fixed at relaxed condition. Noradrenaline content of the tissue was measured by HPLC-ECD. To exclude contribution of intramural adrenergic nerve, α -receptor was blocked by prazosin.

RESULTS AND DISCUSSION: Longitudinal muscle of the portal vein exhibited spontaneous contractions at regular rhythm. Amplitude of spontaneous contraction was 80 mg and 190 mg respectively in preparation from WKY and SHRSP, being significantly higher in the preparation from SHRSP than in those from WKY. Duration of each contraction was 4 sec and 7 sec in WKY and SHRSP preparation and was significantly longer in SHRSP one. Resting membrane potential of the smooth muscle cell of the longitudinal layer was -48 mV and -49 mV in WKY and SHRSP portal vein and there was no difference between them. Action potentials appeared in group as a burst and duration of a burst was 3 sec and 8 sec respectively in preparation from WKY and SHRSP. It was significantly longer in SHRSP than WKY. Number of the action potentials in a burst was 6 and 16 in preparation from WKY and SHRSP, being and it was significantly greater in SHRSP than WKY. K contracture was introduced to obtain contraction independent of action potentials. K contracture was composed of phasic and tonic contraction; the latter has been thought to be independent of action potential. Amplitude of both phasic and tonic contraction of the K contracture was higher in SHRSP than WKY portal vein. Noradrenaline content of the tissue was higher in SHRSP than WKY portal vein and decrease of tonic tension by prazosin 10^{-6} M was greater in SHRSP than WKY portal vein. Cross-sectional area of the longitudinal muscle layer was greater in SHRSP than WKY portal vein. Tonic tension in the presence of prazosin divided by cross-sectional area, which may show contraction force per unit area independent of adrenergic mechanism was still greater in SHRSP than WKY.

Thus, longitudinal muscle of portal vein from SHRSP contracted with a greater force in spontaneous contraction. The increases both in the electrical activity and contractile property of the muscle cell may contribute to the increase in the force of the spontaneous contraction in SHRSP portal vein.