Vascular Complications in Long-term Breedings of either Spontaneously Hypertensive Rats or Wistar Kyoto Rats, with Relation to Hypertension and Aging.

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Patients with sustained hypertension tends to be complicated with cardiovascular events. Therefore, this study is aimed to clarify the relationship between hypertension and vascular or tissue lesions using spontaneously hypertensive rats (SHR) as hypertensive rats and Wistar Kyoto rats (WKY) as normotensive rats.

Methods: 1) Total 1617 rats aged until 37 months were recruited, which had been bred under 22°C with constant humidity in the animal research center, consisting of 285 male stroke-prone SHR(SHRSP), 322 female SHRSP, 247 male stroke-resistant SHR(SHRSR), 268 female SHR, 213 male WKY and 282 female WKY. Systolic blood pressure was measured by tail-cuff method. These rats were always autopsied when they died or were killed, and the presence of bead-like lesions in mesenteric artery was investigated microscopically. Under anesthesia with urethan solution several tissues were removed for preparing microscopic specimens and rarely electron microscopic specimens. 2) Microscopic specimens were stained with Azan in mesenteric artery, testis, kidney and myocardium.

Results: Systolic blood pressure was the following: SHRSP>SHRSR>WKY. Bead-like lesions of mesenteric artery were found in 16% of male SHRSP aged 8 to 9 months, in 6% of female ones, then in 78% of male SHRSP aged 12 to 13 months, in 64% of female, then in 18% of male SHR aged 24 to 25 months and in 9% of female SHR aged 28 to 29 months, while those did not appear even in WKY aged 30 to 33 months. Electron microscopically subintimal fibrin deposits and the migration of smooth muscle cells were found in mesenteric artery and testis small artery. Microscopically, fibrous changes in myocardium of both-sex rats were shown clearly by Azan stain: this change occurred earliest in 8.7% of SHRSP aged 9 to 12 months, then in 55.6% of SHRSP aged 13 to 16 months, in 10% of SHRSR aged 13 to 16 months, thereafter in 3% of SHRSP aged 17 to 20 months, indicating the acceleration of fibrous changes by both hypertension and aging. Severe lesions of renal small artery were found in 11% of SHRSP aged 5 to 8 months, then in 77.8% of SHRSP aged 13 to 16 months, in 8.3% of SHRSR aged 17 to 20 months, while those were not observed in WKY. Almost complete glomerular damages were found in 17.4% of SHRSP aged 9 to 12 months and in 100% of SHRSP aged 16 months, while those did not occur in SHRSR and WKY. In this latter investigation periarteritis nodosa of mesenteric artery and testis small artery occurred exclusively in SHRSP.

Conclusion: Fibrous changes of myocardium were accelerated by hypertension, but slightly by aging. However, severe vascular lesions in this study were caused by hypertension.