On Elastin in Aorta of SHRSP

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Elastin is a major component of the arterial wall and there seems to be a close relationship between elastin and hypertension and hypertensive arterial disease. As one of the methods of clarifying the character of these diseases in SHRSP, elastin was isolated from aortas and its amino acid composition was examined.

Materials and Methods:

Male SHRSP and Wistar-Kyoto rats as control were used mainly for this study. Some of the SHRSP were fed with a 50% white fish meal or 50% casein diet by weight from 35 days after birth.

After sacrificing these rats at various ages, the thoracic aorta was isolated from each animal and adhering tissues were separated. Five or 6 rats were used for 1 experiment. These aortas were homogenized together in a 0.25 M sucrose solution using Virtis homogenizer and nuclear fraction was obtained by centrifuging at 1,000×g for 10 min. According to Partridge's method (Biochem J 61: 11, 1955), an insoluble elastin was prepared from this fraction.

The insoluble elastin was weighed and expressed as weight per 1 Gm aorta. Five mg of elastin was hydrolyzed in 6 N HCl at 110°C for 72 hours and amino acid analysis was performed using a JOEL amino acid analyser.

Results:

1. Proportion of elastin in aorta

In male SHRSP and Wistar-Kyoto rats, a high proportion of elastin in the aorta was shown at 1 month of age, being 94.6 mg in SHRSP and 84.0 mg in Wistar-Kyoto rat. This high proportion decreased with age and became nearly constant after 4 months of age, being 46.2 mg and 41.9 mg respectively. On the other hand, there were certain differences in the proportion of elastin between SHRSP and control rats at similar ages, showing a higher proportion in the former than in the latter. In 4 or 5 months old SHRSP fed with 50% white fish meal or 50% casein diet, the proportion of elastin was higher (57.3 mg and 63.6 mg respectively) than in SHRSP fed with a stock chow diet (46.2 mg) and Wistar-Kyoto rats fed with a stock chow diet (41.9 mg). This high proportion became more remarkable at about 7 months of age for SHRSP fed with these experimental diets, being 93.4 mg in SHRSP fed with a 50% fish meal diet and 77.0 mg in SHRSP fed with a 50% casein diet.

Also in females, the proportion of elastin was high at 1 month of age (64.7 mg in SHRSP and 54.3 mg in Wistar-Kyoto rats) and decreased with age (45.9 mg in 70-day-old SHRSP and 50.0 mg in 92-day-old Wistar-Kyoto rat), although it was slightly lower than in males. Moreover, the SHRSP showed a higher proportion of elastin than did the control rats.

2. Amino acid compositions of elastins

All the elastins prepared from various aortas presented an amino acid dis-

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tributions, conforming to the generally accepted pattern of elastin, being characterized by a high content of non-polar amino acids and a low content of polar amino acids. But some differences in amino acid compositions were found between SHRSP and controls. At 1 month of age, the SHRSP showed a lower content of polar amino acids such as lysine, arginine, aspartic acid and glutamic acid and a higher content of non-polar amino acids than did the control. But after about 3 months of age, this relationship became reversed, the SHRSP showing a higher content in polar amino acid than did the control.

On the other hand, similar differences were found between younger and older rats in each strain, the former showing a lower content of polar amino acids than the latter. But no significant difference was found in hydrophobic amino acids not only between the 2 strains but also between the younger and older rats in both strains.

Summary with Discussion:
As described above, the proportion of elastin in aorta was high in young rats and decreased with age. And its amino acid composition showed that the content of polar amino acids increased with age. Moreover, the SHRSP showed a high proportion of elastin and a high content of polar amino acids in amino acid compositions after 3 months old, as compared with the Wistar-Kyoto rats. These results indicate that the aging process in the aorta of SHRSP proceeds earlier than in the Wistar-Kyoto rats, but the effects of hypertension upon the arterial wall must be considered.

On the other hand, for the SHRSP fed with white fish meal or casein diet, the proportion of elastin in aorta was higher than in the SHRSP fed with a stock chow diet. This became more remarkable with age. It should be expected that there is some relationship between these results and the inhibition of blood pressure elevation and the decrease in incidence of stroke in SHRSP fed with these experimental diets.

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