13) Changes in Catecholaminergic Neurons in Medulla Oblongata of Spontaneously Hypertensive rat.
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SUMMARY: We determined catecholamine (CA) content in brain of spontaneously hypertensive rat (SHR) and observed a decrease of noradrenarine (NA) content in the brain stem as previous report. Then we used Glutaraldehyde-formaldehyde fluorescence method for histochemical study. Fluorescence of ventral A1 and dorsal A2 cell bodies in medulla oblongata was decreased. NA accumulation in caudal nervous ending of nucleus tractus solitarius (NTS) was reduced in SHR of pre-hypertensive stage aged 4 weeks. There were no changes in other regions, thalamus, hypothalamus, substantia nigra, locus ceruleus and periventricular nucleus.

INTRODUCTION: CA metabolic disorder in noradrenergic nervous system of SHR is well known. However, a role of the noradrenergic nervous system in regulating blood pressure has not revealed in detail. We examined biochemical changes histochemically and loss of function in the noradrenergic nervous system of the medulla oblongata.

METHODS:
(1) Measurement of CA content in the brain: SHR and WKY aged 12 weeks were decapitated. The brains were dissected into 7 regions, frontal cortex, occipital cortex, striatum, hippocampus, pons, mesencephalon+diencephalon and medulla oblongata, according to the method of Glowinski, et. al.. After pre-treatment with almina column, CA content was measured by using HPLC.
(2) Histochemical fluorescence: SHR and WKY aged 4, 8 and 12 weeks were used. The brains were perfused by the Glutaraldehyde-formaldehyde fluorescence. The brain tissues of 20um-thick transverse sections were examined with a fluorescence microscope.

RESULTS:
(1) CA content in the brain: NA content in NTS and the brain stem, where vasomotor center located, was decreased 60% in SHR. Dopamine contents in other regions of SHR and WKY showed no significant changes.
(2) Histochemical observation: We examined brain tissues, rostal cerebral to brain stem ending, with the fluorescence microscope. SHR of pre-hypertensive stage aged 8 weeks and post-hypertensive stage aged 12 weeks were compared with WKY under the same condition. Following changes were determined in the medulla oblongata. In SHR aged 8 weeks, noradrenergic neuropile was decreased and individual cell was dispersed in A1 region. However, the number of cells did not change. In the dorsal A2 region, fluorescence of the noradrenergic neuropile was decreased and NA level in the nervous ending were reduced in the caudal region of NTS. These changes were observed also in SHR and WKY aged 12 weeks. In other regions, thalamus, hypothalamus, periventricular nucleus, locus ceruleus and striatum, there were no changes.

DISCUSSION: The reduction of NA was determined biochemically in the medulla oblongata and the pons which identified the fluorescent histochemical observation. Thus, the changes in the biochemical measurement were supported histochemically. The fluorescence was decreased in A1 and A2 regions particularly at the level of the medulla oblongata. However in A8, A9 and A10 which located at upper region, there were no changes in neurons. In the caudal region of NTS that seems to distribute depressor neurons, the fluorescence of nervous ending is decreased. It indicates the decrease of NA accumulation and proves the changes in noradrenergic nervous system in SHR not only biochemically but histochemically.