53) Cardiovascular Pathology in Spontaneously Hypertensive Rats Chronically Exposed to Combined Restraint and Electric Stimulation.

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It is well known that psychological stress might be a triggering or aggravating factor for cardiovascular diseases such as angina pectoris, myocardial infarction and cerebral apoplexy in humans. In this study, spontaneously hypertensive rats (SHRs) which were accepted to have hyperreactivity to stressful stimuli were chronically exposed to stress and were investigated in a point of view of cardiovascular pathology.

Materials and methods: Male SHRs and WKYs (average body weight 210g) were restrained in wire cages and exposed to electrical stimulation (30V alternating current of 60Hz, duration 1sec per 10sec) from their tails for 40 minutes daily for three months. Blood pressure were obtained every other week by tail-cuff method. The rats were decapitated after handling five minutes daily for last seven days of experimental period. Organ-body weight ratios of removed organs were calculated. Measurements of arterial wall thickness were made on the Elastica-Van Gieson stain sections of heart, kidney and mesentery with micrometer in the eyepiece. Relative thickness of media is represented as $R-r/R$ (R and r: diameters of the outermost and innermost of elastic lamellae each).

Results: Blood pressure in the stressed SHRs rose more than 20mmHg after 8th week above values of non-stressed SHRs and that in the stressed WKYs rose 15mmHg only at 10th week above controls. Organ-body weight ratios of brain and heart of SHRs and WKYs and those of adrenal gland of WKYs were increased in stressed groups compared with each control groups. Histologically, the heart of stressed SHRs exhibited severe myocardial fibrosis which was prominent in the inner part of the left ventricle. Since the findings of obstruction such as arteritis, thrombus etc. could not be observed in arteries of the heart, the possibility of arterial spasm was pointed out as a cause of myocardial fibrosis. Relative thickness of media was more increased in SHRs than in WKYs. That of arteries of <49u, 50-99u of kidney and of <49u of mesentery was increased compared with that of non-stressed SHRs each. But there was no difference in relative thickness of media of arteries between stressed WKYs and non-stressed WKYs.

Discussion: Stressful stimulation is considered to be one of mechanism responsible for development of hypertension and to be related to revelation of its complications. SHR has hyperreactivity in cardiovascular system to stressful stimuli, and was reported to become rapidly hypertensive and to be accentuated in development of complications by chronically repeated stress. Our chronically stressed SHRs revealed increase of medial thickness in small arteries of kidney and mesentery, which might be relevant to enhanced hypertension. Myocardial fibrosis seen only in stressed SHRs was a interesting finding in considering the relationship between psychological stress and cardiovascular disease in humans. Our preliminary experiment with the same stress disclosed alterations in amount of catechol amines in the myocardium of stressed rats.