Regional vascular responses to stress and the effect of alpha-1 blocker in spontaneously hypertensive rats.

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(Purpose) We investigated to see regional hemodynamic responses to acute stress and the effects on these responses with calcium entry blocker (benidipine) and alpha1-blocker (urapidil).

(Materials and Methods) Adult female WKYs and SHRs (averaging twenty weeks old) were used in this study. These rats were anesthetized with halothane (0.5%). Pulsed Doppler probes were fixed around the left renal, superior mesenteric and common carotid arteries. Catheters were implanted into the femoral vein and artery. After several days, air-jet (10 s) and foot-shock stress (1.2 mA AC, 50 Hz, 10 s duration) were given to rats in conscious state. Calcium entry blocker or alpha1-blocker was administered to these groups of rats and the stress were given to them. The same stress was also given to other group of SHRs with renal denervation (left side).

(Results) Mean arterial pressure (MAP) and common carotid blood flow (CBF) increased in the two strains with the stress (MAP: SHR, 143 ± 6--184 ± 8 vs. WKY 90 ± 10 -- 98 ± 10 mmHg, CBF: SHR, 2.8 ± 0.1 -- 4.9 ± 0.2 vs. WKY, 3.3 ± 0.4 -- 5.5 ± 0.7 KHz, all P<0.05). Renal blood flow (RBF) and mesenteric blood flow (MBF) decreased in both strains with the stress (RBF: SHR, 9.5 ± 1.4 -- 3.1 ± 0.4 vs. WKY, 5.7 ± 0.9 -- 3.7 ± 0.7 KHz, MBF: SHR, 6.8 ± 0.5 -- 3.2 ± 0.5 vs WKY 7.3 ± 0.9 -- 4.0 ± 0.5 KHz, all P<0.05). Renal vascular resistance (RVR) tended to increase with AS, and RVR increased in both strains with FS. RVR in SHRs was higher than that in WKYs during the two stress (SHR, 22.7 ± 2.5 -- 67.3± 7.7 vs. WKY 19.9 ± 5.8 -- 46.8 ± 10.7 mmHg/KHz, all P<0.05).

% changes in MAP, RBF and MBF in SHRs were greater than those in WKYs. % changes of CBF in SHRs did not differ from that in WKYs. % changes of RVR and MVR in SHRs were greater than those in WKYs during FS and tended to be greater in case of AS.

% change of common carotid vascular resistance (CVR) in SHRs tended to be lower than that in WKYs during the two stress.

% change of common carotid vascular resistance (CVR) in SHRs was higher than that in denervated SHRs during the two stress. After the administration of benidipine in SHRs, MAP and CVR decreased, and RVR tended to decrease. Benidipine administration did not affect the % changes of MAP, RVR and CVR during the two stress. After the administration of urapidil, MAP and NVR in SHRs decreased, and RVR tended to decrease. The responses of urapidil was similar to that of benidipine in resting condition, but the % changes of MAP, RVR and MVR decreased during the two stress.

(Conclusion) SHR demonstrated exaggerated hemodynamic responses to acute stress. These exaggerated responses were greater in renal and mesenteric arteries, which were suppress with alpha1 blocker (urapidil) but not calcium entry blocker (benidipine).