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Altered Expression of Renal Natriuretic Peptide and Renin-angiotensin-aldosterone System in Two-kidney, One Clip Hypertension

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Background : Recently, the classical view of the renin-angiotensin- aldosterone (RAAS) has been challenged by the discovery of truncated angiotensins and aldostrone synthase (CYP11B2). Furthermore, locally produced natriuretic peptides in the kidney may play a key role in the regulation of blood pressure and progression to hypertension. The present study was designed to investigate whether the expression of local natriuretic peptide and RAAS is alterd in the kidney in two-kidney, one clip (2K1C) hypertension.

Methods : Sprague-Dawley rats were made 2K1C hypertensive for 4 weeks. Plasma aldosterone level was measured by radioimmunoassay. The mRNA expression of various isoforms of atrial, brain, and C-type natriuretic peptide (ANP, BNP, CNP) and different subtypes of natriuretic peptide receptor-A, -B, and -C (NPR-A, NPR-B, NPR-C) was determined in the kidney cortex by real time polymerase chain reaction. The mRNA expression of renin, angiotensin converting enzyme (ACE), ACE2, CYP11B2, mineralocorticoid receptor (MR), angiotenin II type I (AT1R) and type II (AT2R) receptor was also determined.

Results : The plasma aldosterone level was significantly increased in the 2K1C hypertensive rats compared with controls. The expression of ANP, BNP and CNP was increased in the clipped kidney, but was not changed in the contralateral non-clipped kidney compared with controls. In clipped kidney, NPR-B expression was increased, while NPR-A and NPR-C was not changed. The mRNA expression of renin was increased in the clipped kidney and decreased in the contralateral kidney. The expression of renin, ACE, CYP11B2 and MR was increased in the clipped kidney, whereas that of ACE2, AT1R and AT2R was unchanged.

Conclusion : An upregulation of various components of local RAAS may contribute to the development of hypertension in 2K1C rats. Enhanced activity of natriuretic peptides in the clippped kidney may then play a compensatory role in hypertension.

Key Words : Two-kidney, One clip hypertension, Renin-angiotensin-aldosterone system, Natriuretic peptide