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New canine model of cardio renal failure: Significance role of neurohormone

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The heart and the kidneys act in tandem to regulate blood pressure, vascular tone, diuresis, and to maintain intravascular volume homeostasis. Besides, the kidneys have a neuroendocrine function with interdependent physiological actions regulated by the renin-angiotensin-aldosterone system, sympathetic nervous system, vasopressin and aterial natriuretic peptide. To investigate this complex pathophysiological mechanisms, a canine model for congestive heart failure (CHF) compromised with renal dysfunction (RD) was used to characterize the hemodynamic and neurohumoral aspects of renal function in 21 dogs. Five dogs were used as controls. Bipolar epicardial pacemaker leads were implanted at the apex of the right ventricle in 8 dogs and the dogs were subjected to ventricular pacing at 250-270 beats/min with an external pacemaker (Nihon Kohden) for a period of 11-21 days. This rapid pacing produced CHF. RD was induced by removal of the right kidney with ligation of the small branches of the left kidney in 8 dogs. Three dogs of each of the CHF and RD groups were used to produce CHF and RD in combination; one dog died due to infection. The glomerular filtration rates of the dogs with RD, CHF, and CHF+RD were significantly lower than those of the controls, although among the dogs with RD, CHF, and CHF+RD, there were no significant differences. The levels of plasma renin activity of CHF+RD group were significantly higher than those of RD and CHF groups. The levels of vasopressin in the CHF and CHF+RD groups were significantly higher than those of the control and RD groups. The level of norepinephrine in CHF+RD groups was significantly higher than that of both in CHF and RD group. Taken together, these data suggest that in patients with CHF compromised by RD neurohumoral factors are maximally activated.

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