Urinary Excretion of Atrial Natriuretic Peptide during Saline Infusion and Supraventricular Tachycardia

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Dear Sir,

We have been studying the changes in plasma levels of atrial natriuretic peptide (ANP) and its physiological effects during supraventricular tachycardia (STV) [1, 2]. The main stimulus for ANP release was confirmed to be an atrial distension and/or an increase of atrial pressure [3]. Although Marumo et al. [4] demonstrated the presence of ANP in urine, there have been few studies about the changes in urinary excretion of ANP during stimulation of ANP release. The aim of this study was to compare plasma levels and urinary excretion of ANP during saline infusion and SVT.

saline

infusion (1500ml)

saline infusion(1500mli

SVT

SVT

-100

Subjects and Methods

Subjects consisted of 3 essential hypertensive patients and 3 patients with SVT. In hypertensive patients, 1,500 ml of saline was infused during 1 h. Blood samples for determination of plasma ANP levels were taken every hour, from 1 h before to 2 h after saline infusion. Urine was collected over a 1-hour period during the study. In the other study, SVT was induced by programmed cardiac stimulation through an esophageal lead and terminated 1 h after by rapid atrial pacing. Blood samples were taken from 30 min before the induction to 1 h after the

termination of SVT. Urine was collected at the same time period as blood samples. Plasma and urine ANP was extracted using C8-octyl cartridges (Amersham) and measured by radioimmunoassay. The recovery rate of this extraction method was $71 \pm 7\%$ ($n = 5$) when 50 pg of authentic α -ANP was applied to the cartridge.

Fig. 1. a Changes in plasma ANP levels and urinary ANP excretion during infusion of 1,500 ml of saline for 1 h. b Changes in plasma ANP levels and urinary ANP excretion during SVT.

Results and Discussion

The plasma ANP levels increased during saline infusion in every hypertensive patient. The urinary ANP excretion showed the same time course as the plasma ANP levels (fig. 1a). In patients with SVT, however, urinary ANP excretion tended to decrease during SVT, despite a rise of plasma ANP levels (fig. 1b). There was a significant correlation between plasma ANP levels and urinary ANP excretion in the study of saline infusion (fig. 2), while such a correlation could not be observed in the study of SVT ($r = -0.189$; $p > 0.1$). Urinary ANP seems to

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Fig. 2. Relationship between plasma ANP levels and urinary ANP excretion in the study of saline infusion. There is a significant correlation between plasma ANP levels and urinary ANP excretion ($r = 0.679$, $p < 0.02$).

originate from glomerular filtration of circulating ANP. The increase of urinary ANP excretion during saline infusion presumably results from the rise of plasma ANP levels and the increase of the glomerular filtration rate. On the other hand, urinary ANP excretion decreased during SVT, despite the rise of plasma ANP levels. ANP seems to be hydrolyzed by peptidases which exist on the brush border membrane of the proximal tubule. This thesis was confirmed by in vitro experiments which showed rapid hydrolysis of ANP by treatment with kidney microvillar membrane [5]. Tubular fluid flow will be retarded during SVT because of increased tubular reabsorption caused by the decrease of peritubular hydraulic pressure, since hypotension is associated with SVT [2]. The increased hydrolysis of ANP due to retarded tubular fluid flow will explain the decrease in urinary ANP excretion during SVT. Our findings suggest that urinary ANP excretion does not represent plasma ANP levels, because urinary ANP excretion appears to be modulated not only by glomerular filtration, but also by hydrolysis due to peptidases of the tubular brush border membrane.

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