Effect of renal sympathetic nerve on adrenergically and angiotensin II-induced renal vasoconstriction in normal Wistar-Kyoto rats

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Abstract

Background. This study examined the effect of renal sympathetic innervation on adrenergically and angiotensin II (Ang II)-induced renal vasoconstriction in Wistar-Kyoto (WKY) rats.

Methods. Forty-eight WKY rats were treated with either losartan (10 mg/kg/day p.o.) or carvedilol (5 mg/kg/day p.o.) or a combination of them (10 mg/kg/day + 5 mg/kg/day p.o.) for 7 days. On day 8, the rats were anaesthetized, and renal vasoconstrictor experiments were carried out. A group of rats was subjected to acute unilateral renal denervation during the acute study. Changes in the renal vasoconstrictor responses were determined in terms of reductions in renal blood flow caused by Ang II, noradrenaline (NA), and methoxamine (ME).

Results. In normal animals, losartan decreased \( P < 0.05 \) the renal vasoconstrictor response to Ang II but not to NA or ME. Carvedilol treatment, however, blunted \( P < 0.05 \) the renal vasoconstrictor responses to Ang II and adrenergic agonists. Combination of losartan and carvedilol blunted \( P < 0.05 \) the renal vasoconstrictor response to Ang II but augmented the responses to NA and ME (all \( P < 0.05 \)). Interestingly, when denervated rats were treated with the same combination, there was a reduction \( P < 0.05 \) in the renal vasoconstrictor responses to Ang II and adrenergic agonists.

Conclusions. Data suggest that the renal sympathetic nerve contributes to adrenergic agonist-mediated renal vasoconstrictions in normal rats. The data further indicate an interactive relationship between renin-angiotensin and sympathetic nervous systems in modulating adrenergically and Ang II-induced renal vasoconstriction in WKY rats.

Key words: \( \alpha_1 \), adrenoceptors, carvedilol, losartan, renal hemodynamics, Wistar-Kyoto rats

Introduction

Angiotensin II (Ang II) has been shown to increase vascular sensitivity to noradrenaline in rats as well as in isolated vessels (1), hence suggesting that Ang II and noradrenaline exert synergistic actions on vasculature. It has also been reported that the blockade of endogenous Ang II by angiotensin II receptor type 1 (AT1) blockers could alter vascular reactivity to exogenous noradrenaline (2). One of the most important sites of physiological action of Ang II is the renal vasculature, on which it has a direct and potent vasoconstrictor action (3). It has been reported that a certain degree of renin-angiotensin system (RAS) activity is necessary to optimize the release of noradrenaline from renal