Circulatory Effects of the Prostaglandin E_1 on Spontaneously Hypertensive Rats and Normotensive Wistar Rats

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Prostaglandin E_1 (PGE_1) has been recently spotlighted as a circulatory drug, especially as antihypertensive drug. But its circulatory effect and mechanism of action have not been made clear yet. This time, we used spontaneously hypertensive rats (SHR) and normotensive Wistar rats (WR), and studied circulatory effects of PGE_1 , by observing their hemodynamics.

Materials and Methods:

SHR and WR, weighing 200–300 Gm (aging from 4 to 6 months), were used. Under light ether anesthesia, the rats were treated with α -chloralose and gallamine, and the breathing was maintained by artificial respiration. Both the common carotid arteries and the femoral artery were exposed, and the chest was opened. Blood pressure (BP) was measured through the catheter advanced to the central aorta from the femoral artery. Cardiac output (COP) was measured by the electromagnetic flow probe placed around the aortic arch. Left ventricular pressure (LVP) and its first derivative (LVPdp/dt) were measured through the catheter punctured directly into the left ventricular cavity. PGE_1 was given to the animals through the catheter inserted from the common carotid artery into the aortic arch. BP, COP, LVP, LVPdp/dt/IIT, heart rate, and systemic peripheral vascular resistance (PVR) were recorded simultaneously before and after the injection of PGE_1 .

Results:

In the case of the experiments on WR, injection of PGE_1 decreased systolic blood pressure (SBP) by 14.5% from the baseline, diastolic blood pressure (DBP) by 13%, LVP by 11.6%, LVPdp/dt/IIT by 8.8%, and PVR was also decreased by 26.8% from each control level. COP was increased by 10.2%.

In the case of the experiments on SHR, PGE_1 decreased SBP by 16.8%,

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DBP by 17.3%, COP by 30.3%, LVP by 7.4%, and LVPdp/dt/IIT by 7.6%. PVR was not changed significantly. Heart rate was not changed significantly, both in WR and SHR.

Conclusion:

BP, LVP, LVPdp/dt/IIT, and PVR were decreased, but COP was increased with PGE₁ in WR. The results suggest that PGE₁ acts not only on the peripheral vascular bed but also on the heart. BP, LVP, LVPdp/dt/IIT, and COP were, however, decreased in SHR, and PVR was not changed. The results in SHR indicate that PGE₁ affected both the peripheral vascular bed and the heart. Decreased COP and unchanged PVR were characteristic in SHR.