Effects of Several Beta-Blockers on Hemodynamics of SHR

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We have reported about the effects of α - and β -adrenergic blockers on hemodynamics of spontaneously hypertensive rats (SHR), and summarised that β -blocker (propranolol 50 γ) depressed cardiac output, but increased blood pressure and systemic vascular resistance. The experiment has been designed to know the effects and the relationships of doses of several beta-blockers on the hemodynamics of SHR.

Materials and Methods:

SHR and WR (normotensive Wistar rats) weighing 180–230 Gm were used in this experiment. Under light ether anesthesia, α -chloralose and gallamine were added, and the aeration was maintained by the artificial respiration. The chest was opened, an electromagnetic flow probe was placed around the thoracic aorta for measuring cardiac output (COP). A catheter was inserted from the femoral artery, advanced to the central aorta for measuring of blood pressure (BP). Left ventricular pressure (LVP) was recorded through the catheter inserted into the left ventricular cavity by direct puncturing. BP, COP, LVP, LVP dp/dt, systemic peripheral vascular resistance (SVR), and heart rate were measured simultaneously, before and after the infusion of drugs. Practolol (Eraldin) as β_1 -blocker, H35/25 as β_2 -blocker, and propranolol (Inderal) were used. Each drug was administered via a catheter inserted to the jugular vein. Initial dose of 25 mg was followed by 50 γ , 100 γ , and 200 γ at about 10 min intervals.

Results:

In SHR, BP was increased with propranolol at doses of 25 γ and 50 γ , but was decreased at doses of 100 γ and 200 γ . The similar tendency was seen in WR, but the response was greater in SHR. After practolol or H 35/25 injection at doses of 100 γ and 200 γ , BP was increased but the response was greater at 100 γ than at 200 γ , in SHR. In WR, BP was increased at a dose of 50 γ , but the response was less than in SHR. It may be said that the sympathetic tone is easily accelerated in SHR. COP was decreased by propranolol at 50 γ and was increased at 100 γ and 200 γ in SHR. The effect was similar in WR. COP was decreased by practolol or H 35/25 at 100 γ and was increased at 200 γ . Although COP was increased, BP, LVP, and LVP dp/dt were decreased. Therefore it is considered that the increment of COP was caused by a diminished after load. SVR was increased by propranolol at 50 γ and was decreased at 100 γ and 200 γ in SHR.

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There was a similar tendency in WR but the response was greater in SHR. SVR was increased by practolol or H 35/25 at 50 γ and 100 γ in both SHR and WR, but was decreased at 200 γ in WR. These results indicate that the sympathetic tone is easily accelerated in SHR. Bradycardia was induced by propranolol at 50 γ , and practolol or H 35/25 at 100 γ both in SHR and WR.

Conclusion:

We have reported that there was a hypersensitivity to beta blockers in SHR and the above mentioned results seem to support our opinion. Considering that similar changes were seen with practolol and H 35/25, probably it is impossible to make a quotation from the results of SHR to human being or dog. The above results could be explained as the species specific reaction and the dose dependent responses.