# NEUROGENIC COMPONENT OF TONE OF CAPACITIVE VESSELS IN REGIONAL ARTERIAL HYPOTENSION

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Experiments on rats showed that a decrease in the bulk rigidity of the capacitive vessels observed in an area of chronic regional arterial hypotension is manifested only after their denervation. In experiments on the innervated hind limb the bulk rigidity of the capacitive vessels in the region of hypotension was indistinguishable from the corresponding indices in the control rats.

KEY WORDS: veins; rigidity of walls; vascular tone; hypotension.

It was stated previously [2] that prolonged lowering of the blood pressure in the arteries of the posterior part of the body in rats leads to a progressive decrease in the bulk rigidity of the capacitive vessels of the limb. However, the bulk rigidity in these experiments was measured after denervation of the limb, so that it was impossible to evaluate the true bulk rigidity of the veins in arterial hypotension and also to assess the neurogenic component of the tone of the capacitive limb vessels in this pathological state.

It was therefore decided, in the present investigation, to compare the bulk rigidity of veins of the innervated and denervated limbs of animals with a normal arterial pressure and rats with chronic regional arterial hypotension.

## EXPERIMENTAL METHOD

The bulk rigidity of veins, designated by the index $E_{15}$ [4], is the ratio between the increase in pressure ($\Delta P$) and the increase in volume of the veins ($\Delta V$) at a venous pressure of 15 mm Hg, and it is expressed in cm water/ml/100 g body weight. A cannula was introduced into the left femoral artery in the distal direction and, using a controlled-output roller pump, the limb vessels were perfused with blood from the carotid artery. The skin and all muscles were divided by thermocautery at the boundary between the upper and middle thirds of the thigh; the femoral and sciatic nerves were dissected and, after being wrapped in cotton wool soaked in warm physiological saline, these also were divided. Periodically (every 5-10 min) the outflow of blood from the femoral vein was stopped and the curve of rise of pressure ($\Delta P$) distally to the point of occlusion was recorded by means of an electromanometer on a KSP-4 potentiometer. The output of the pump was altered stepwise from 0.5 to 1.6 ml/min and the increase in volume of the capacitive vessels ($\Delta V$) was calculated at time intervals of 0.5-1 sec.

Experiments were carried out on 18 control rats and 16 rats with chronic (90 days) regional arterial hypotension, produced by constricting the abdominal aorta below the origin of the renal arteries by means of a nichrome coil [3], causing the pressure in the femoral artery to drop by 30-45%. The experiments were carried out on animals with intact innervation of the limb (9 control and 6 experimental animals) and also 15-20 min after division of the sciatic femoral nerves (9 control and 10 experimental animals).

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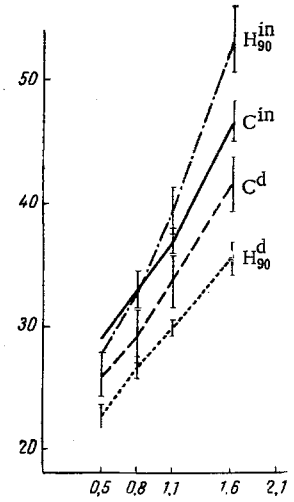


Fig. 1. Rigidity of veins in control rats with innervated ($C^{in}$) and denervated ($C^{d}$) limbs and in animals with regional hypotension lasting 90 days with innervated ($H_{90}^{in}$) and denervated ($H_{90}^{d}$) limbs. Abscissa, volume velocity of perfusion (in ml/min); ordinate, bulk rigidity ($E_{15}$ in cm water/ml/100 g body weight).

## EXPERIMENTAL RESULTS

The results given in Fig. 1 show that the bulk rigidity of the vessels depended on the rate of their filling with blood (or, correspondingly, the rate of their deformation) in both denervated [1] and innervated vessels.

It will be clear from Fig. 1 that denervation of the limb in the control rats caused a very moderate (by 10-13%) decrease in bulk rigidity of the capacitive vessels. By contrast, in the animals with chronic regional hypotension, the rigidity of the capacitive vessels of the denervated limb was 18-24% lower than the rigidity of the capacitive vessels of the limb with its innervation intact.

It is important to note that the bulk rigidity of the denervated capacitive vessels in rats with chronic regional hypotension was clearly lower than that in the control animals, whereas this index after denervation of the capacitive vessels was actually somewhat higher in rats with chronic regional hypotension than in animals with a normal blood pressure. The magnitude of the neurogenic component of the tone of the capacitive vessels was thus clearly increased during prolonged lowering of the arterial pressure. It is probably in this way that the considerable decrease in bulk rigidity of the veins observed in animals with chronic arterial hypotension is compensated.

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