10856 P

Production of a Sustained Neurogenic Hypertension of Renal Origin.

K. S. GRIMSON,* J. J. BOUCKAERT AND C. HEYMANS.

From the Department of Pharmacology, University of Ghent, Belgium.

Several methods have been devised for producing experimentally a renal ischemia hypertension. That of Goldblatt, Lynch, Hanzal and Summerville[1] is most frequently used. These methods have all involved the use of a foreign material such as a clamp and have produced blood pressure changes that are not reversible without removing the foreign material or the involved kidney.

It has therefore been difficult to apply these technics to experimental studies analysing the value of various methods of surgical treatment of hypertension in man. It has also been difficult to evaluate the possible importance of a primary nervous factor or a primary vascular disease factor in attempting to correlate experimental renal ischemia hypertension with essential hypertension in man.

A technic has been devised to determine in dogs whether an overactivity of the renal vasoconstrictor splanchnic nerves can produce hypertension. The technic consists of sympathectomizing all of the animal except the origin and the distribution of the splanchnic nerve fibers to the kidneys and adrenals. This is accomplished in 3 operations. At the first the abdominal sympathetic chains below the second lumbar ganglion are removed and the rami to that ganglion as well as the abdominal branches leaving the coeliac ganglion except those to the kidneys are divided. The first lumbar nerve is now cut distal to the origin of the sympathetic ramus. At the second and third operations the first 7 thoracic sympathetic ganglia, including the stellate, are removed and the last 5 intercostal nerves are divided near but distal to the origin of the sympathetic rami on both sides. This leaves the animal completely sympathectomized with the exception of the kidneys and the adrenals.

Five dogs were prepared in the hope that this extensive sympathectomy might produce an overactivity of the remaining portion of the sympathetic system; the innervation of the kidneys and adrenal glands. During periods of observations varying from 25 to 60 days, however, no alteration of the general blood pressure from that

* Fellow of the Belgian American Educational Foundation.

1 Goldblatt, H., Lynch, J., Hanzal, R. F., and Summerville, W. W., *J. Exp. Med.*, 1934, **59**, 347.

before and during the operative stages was noted. Therefore to intensify the activity of the splanchnic nerves, 3 dogs have been further operated according to the following technic:[2, 3] One cervical vagus-sympathetic-depressor nerve and the depressor-sympathetic nerve on the other side were cut, and the carotid sinuses were excised. This total removal of the reflex moderator nerves of the cardio-vascular centers produces, in normal dogs, an immediate and sustained increase of the sympathetic vasoconstrictor tone and arterial hypertension.[2-5] These reactions are absent in completely sympathectomized dogs.[3, 4, 6] In the 3 animals with the moderator nerves cut and with only the sympathetic innervation of the kidneys and the adrenals left the blood pressure rose gradually and reached a sustained hypertensive level in 5 to 14 days. The increases of blood pressure were respectively from around 100 to around 170 mm Hg in one, 130 to 200 in the second, and 135 to 225 in the third dog. The blood pressures remained elevated during 20 to 30 days of observation. Now, although the delayed gradual blood pressure elevation and the rates (120, 126 and 138 average respectively) of the sympathectomized hearts argue against the adrenals as a cause of the hypertension, a control was made in 2 animals by denervating the kidneys at their pedicle. This restored the blood pressure to normal where it remained during the following 90 and 40 days respectively of observation. The kidneys of 2 of the 3 hypertensive dogs were observed, one at operation and one at autopsy. They appeared somewhat smaller and darker than normal.

---

2 Heymans, C., Bouckaert, J. J., and Regniers, P., *Le sinus carotidien*, 1933, O. Doin et Cie, edit., Paris.

3 Heymans, C., and Bouckaert, J. J., *C. R. Soc. Biol.*, 1935, **120**, 82; *Summaries of Communic. XV intern. Physiol. Congr.*, 1935, p. 154; *Bull. Academ. roy., medec. belg.*, 1936, p. 42; *Acta brev. neerl.*, 1939, in press.

4 Heymans, C., *Surgery*, 1938, **4**, 487; *New Eng. Med. J.*, 1938, **218**, 147.

5 Nowak, S. J. G., and Walker, I. J., *New Eng. Med. J.*, 1939, **220**, 269.

6 Bacq, Z., Brouha, L., and Heymans, C., *Arch. intern. pharmacodynam.*, 1934, **48**, 429.