of the normal male.‡ The cortical tissue of the ACTH-treated doubly operated animals seemed, in addition, to have undergone reorganization beyond that seen at the time of hypophysectomy; it resembled more closely the condition in the demedullated controls at autopsy, in which the cortical tissue had been continuing regeneration under the influence of the animal's own pituitary.

Conclusions. The stimulating action of ACTH on the adrenal cortex of hypophysectomized rats, as far as could be judged by adrenal weights and by morphology as seen in lipid stains, was the same in the absence of the medulla as in the intact adrenal.

‡ This is the typical picture of adrenal hypertrophy which has been obtained upon administration of adequate doses of ACTH to normal, hypophysectomized, gonadectomized, hypophysectomized-gonadectomized or hypophysectomized-thyroidectomized male rats.

15180 P

Hypertension Produced in Dogs by Unilateral Ligation of Periadrenal Blood Vessels and Tissue.

JOSEPH VICTOR.

From the Research Service, First (Columbia) Division, Goldwater Memorial Hospital, Department of Hospitals, and the College of Physicians and Surgeons, Columbia University, N. Y. City.

The possibility that adrenal ischemia may cause hypertension was investigated in the present experiments which are concerned with the effect of decreased adrenal blood supply upon systemic blood pressure.

Method. Mongrel dogs were employed. Systolic blood pressure was determined indirectly by a mercury manometer attached to an inflated cuff wrapped around the hind leg just above the ankle of trained unanesthetized dogs. Systolic pressure was indicated by the pressure at which pulsation of the dorsalis pedis artery was first palpable when the air in the cuff was released. The cuff was inflated 15-30 successive times to determine the range of systolic pressure. These observations were checked by direct measurements with the Hamilton manometer with readings from the femoral artery and showed agreement within 5-15 mm Hg. Animals were housed in separate cages. Blood pressures were recorded daily for a preliminary period of 3-6 weeks. Then either a sham operation in the adrenal area or one to decrease adrenal blood flow was performed on one adrenal. Thereafter blood pressures were taken daily. Urine analysis and blood NPN levels were obtained before and after operation.

Operation. The left adrenal was chosen because it was more easily exposed than the right. Blood vessels come to the left adrenal from the aorta to the hilum, from the diaphragm to the superior pole and from below to the inferior pole. Many arteries enter the adrenal from pericapsular fat and connective tissue. Because of the extreme vascularity of the tissue around the adrenal it seemed that an operation which would constrict or obstruct large numbers of vessels around the capsule would be most favorable for diminishing blood supply. Two ligatures of No. 13 white surgical silk braid were tied about vascular fat and connective tissue adjacent to the adrenal. One was placed around the hilar artery and vein and the other around grossly visible arteries and veins at either the superior or inferior pole. The area involved in the ligature was about 1.0 x 0.5 cm. The procedure just described was used on 5 dogs. In a sixth, No. 391, an artery to the inferior pole and the hilar vein were stripped of fat and connective tissue and ligated with No. 11 surgical silk. To rule out non-specific effects of these procedures, sham operations were performed in 3 dogs, 2 of which had subsequent operations for producing adrenal ischemia. A ligature of

TABLE I.
Hypertension Produced in Dogs by Unilateral Ligation of Periadrenal Tissue and Blood Vessels.

Dog No.	Systolic blood pressure, mm.Hg. Before ligation	After sham operation	After ligation	Months after ligation	Blood pressure, mm.Hg. Systolic/diastolic	NPN
361	100-150		180-261	6	261/119	34
384	125-190		190-262	7	248/102	32
385	130-190		195-267	7	267/112	30
386	110-200	130-210	190-253	4	253/130	29
387	120-140	110-150				
390	110-170	130-170	210-280	4	241/131	36
391	130-190		176-255	2	255/108	33

the same material described above was placed through the peritoneum over the surface of the adrenal. Care was taken not to include any grossly visible blood vessels.

Results. Dogs, 4 female and 1 male, subjected to unilateral ligation of periadrenal blood vessels and tissue developed within 1-3 days elevation of blood pressure which has persisted to the present, 2-7 months later. Another male dog, No. 391, had hypertension after ligation of one artery running to the lower pole of the gland and of the hilar vein. Both systolic and diastolic pressure were elevated in all cases, the latter being over 100 mm Hg. and the former going as high as 280 mm. Hg. (Table I).

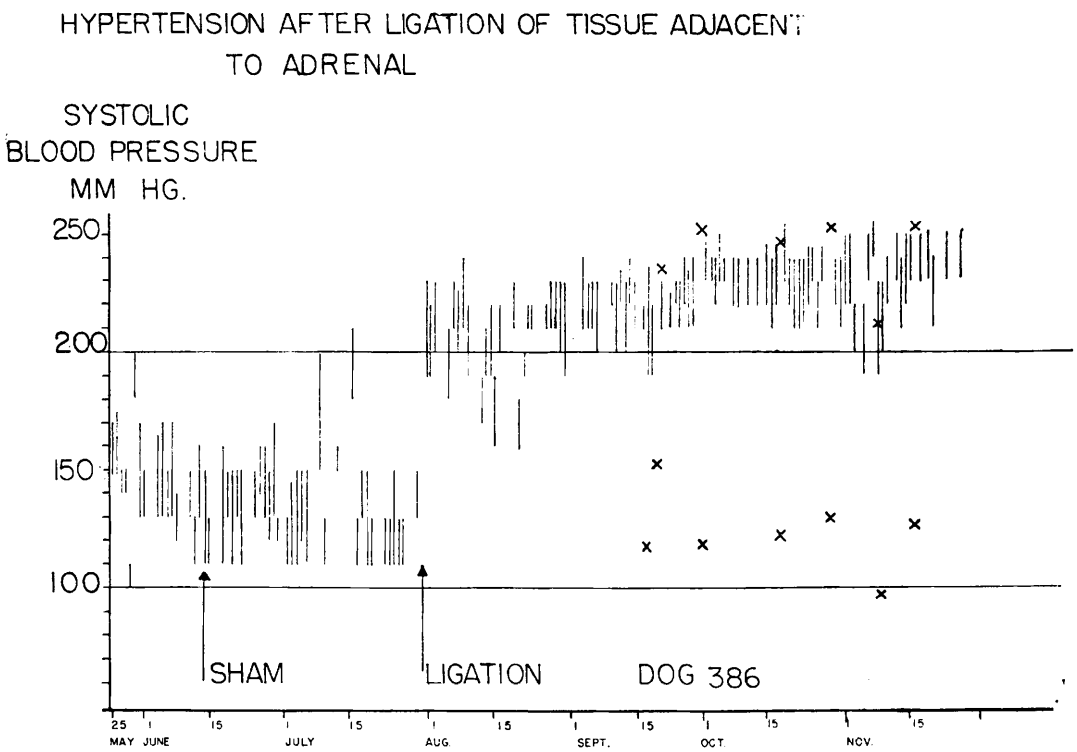

FIG. 1.

Vertical lines indicate ranges of systolic blood pressures. Upper and lower crosses (×) represent systolic and diastolic pressures respectively. Sham operation on right adrenal had no effect but ligation of left periadrenal tissues and blood vessels produced hypertension.

Sham operation produced no change in systolic blood pressure in 3 dogs which were followed for 6 weeks. Subsequent operations in which periadrenal blood vessels and tissues were ligated in dog No. 390 and No. 386, Fig. 1, caused elevation of blood pressure which has persisted until the present, 4 months later. To date, there have been no significant changes in the urine analysis or blood NPN levels of the hypertensive dogs.

Conclusion. A prompt and sustained hypertension was produced in 6 dogs by unilateral subtotal ligation of periadrenal blood vessels and tissue.

It is a pleasure to thank Miss Goldie Spierer and Mr. Dominick Triolo for their assistance in these observations.

15181

The Production of Shock in Rats by the Drum Method.*

ROLAND K. MEYER AND ELVA G. SHIPLEY.

From the Department of Zoology, University of Wisconsin, Madison, Wis.

Noble and Collip[1] described a method by which rats were subjected to graded degrees of trauma by tumbling in drums for varying periods of time. Animals subjected to this type of trauma did not develop complications of hemorrhage and infection. The undesirable factor of an anesthetic was likewise eliminated. Hemoconcentration and other pathological changes ascribed to the condition of shock did develop. These workers found that the drum method produced a better graded and controlled type of trauma than any other method they tried, and made use of it in subsequent experiments.[2,3] Zahl, Hutner, and Cooper[4] used the method and confirmed Noble and Collip's results as to the number of turns, percentage of deaths, survival time, and reproducibility. Chambers, Zweifach, and Lowenstein[5] employed the method to study circulatory reactions of rats, and Clarke and Cleghorn[6] used the drug method to study tissue potassium and phosphorus in shocked rats. In our laboratory we were interested in finding a method for producing shock which would give as nearly uniform and reproducible results as possible in animals to be used for biochemical studies. We wished to determine the chemical changes in the blood and tissues of animals in shock, and in animals which had received sublethal stimuli under conditions which could be readily controlled so that a quantitative relationship between the sublethal and lethal stimuli could be defined. As the tissues were to be analyzed for extremely labile substances they had to be frozen *in situ* with liquid air. The necessity for rapid freezing precluded the use of any animal larger than a rat. The method of Noble and Collip for production of shock was chosen because it seemed best to meet the requirements for the chemical investigations and also because it simulates battlefield conditions insofar as it has the elements of violent exercise and excitement as well as trauma.

The blood and tissue studies of rats which had been shocked by the drum method will be reported in other papers.[7,8]

This report is concerned with results ob-

* The work described in this paper was done under a contract, recommended by the Committee on Medical Research between the Office of Scientific Research and Development and the University of Wisconsin.

1 Noble, R. L., and Collip, J. B., *Quart. J. Exp. Physiol. and Cog. Med. Sci.*, 1942, **31**, 187.

2 Noble, R. L., and Collip, J. B., *ibid.*, 201.

3 Noble, R. L., *Am. J. Physiol.*, 1942, **138**, 346.

4 Zahl, P. A., Hutner, S. H., and Cooper, F. S., *J. Pharm. and Exp. Therap.*, 1943, **77**, 143.

5 Chambers, R. W., Zweifach, B. W., and Lowenstein, B. E., *Am. J. Physiol.*, 1943, **139**, 123.

6 Clarke, A. P. W., and Cleghorn, R. A., *Endocrinol.*, 1942, **31**, 597.

7 McShan, W. H., Potter, V. R., Goldman, A., Shipley, E. G., and Meyer, R. K., *Am. J. Physiol.*, 1945, **145**, 93.

8 LePage, G. A., unpublished data.