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Reduction of Arterial Hypertension by Subcutaneous Implantation of Kidney Tissue.*

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We have obtained evidence that the kidney plays an important rôle not only in the production of the hypertension but also in its elimination.[1] To elucidate further the nature of this relationship, we have investigated the effect of subcutaneous implantation of kidney tissue in normotensive and hypertensive dogs.

Blood pressures of trained unanesthetized dogs were taken using the Hamilton manometer,[2] according to a technique previously described by us.[3] After adequate training, the diastolic pressure of most of our dogs became constant at 75 or 80 mm Hg and these were classed as normotensive. Hypertension was induced in 8 dogs by partial occlusion of the main renal arteries, using the Goldblatt technique.[4]

After a preliminary period of observation during which the arterial pressure was relatively constant, 10 to 15 g of kidney tissue obtained from normotensive dogs was implanted under local anesthesia in the subcutaneous tissue of normotensive and hypertensive dogs. On the third day thereafter the necrotic mass of partially autolyzed kidney was expelled from the wound or was removed. Usually 10 or 20 cc of a sero-purulent fluid escaped from the wound at this time. After removal of the necrotic kidney tissue, the animal improved rapidly.

In the 8 dogs with hypertension of renal origin persisting 47, 91, 100, 140, 182, 200, 400 and 29 days respectively, implantation of kidney tissue resulted in a fall in blood pressure beginning on the second day, reaching a low on the third day and returning to the hypertensive level in the fourth to fiftieth days. The blood pressure returned to the hypertensive levels in 1, 50, 20, 4, 5, 7, 3 and 40 days

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2 Hamilton, W. F., Brewer, J., and Brotman, I., *Am. J. Physiol.*, 1934, **107**, 427.

3 Katz, L. N., Friedman, M., Rodbard, S., and Weinstein, W., *Am. Heart J.*, 1939, **17**, 334.

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

respectively. The average duration of the fall was 16 days. In the latter 2 dogs, re-implantation of kidney tissue 35 and 330 days after the return of hypertension resulted in a second fall in blood pressure with a return to hypertensive levels persisting for 4 and 36 days respectively after re-implantation. The maximum drop in diastolic pressure amounted to 25 to 50 mm Hg in the 10 experiments and was sustained for the periods indicated. The non-protein nitrogen of the blood remained at normal levels during and subsequent to the depression in arterial pressure.

In 6 normotensive dogs the implantation of kidney tissue had no effect on the blood pressure. The blood pressure remained at the normotensive levels for the duration of the experimental period up to 38 days. Renal ischemia was then produced in 3 of these dogs, 24, 38 and 7 days respectively after the implantation was performed. In all 3 a definite persistent rise in arterial pressure was observed to follow this operation.

In 3 dogs with renal hypertension the production of an infusorial earth abscess had no significant effect on the blood pressure. This abscess was produced by injecting 1 gm of infusorial earth in 10 cc of saline subcutaneously. The large abscess which resulted was opened on the third to fourth day, at which time 25 to 50 cc of pus escaped. The animals improved rapidly following the opening of the abscess.

Our results suggest that during destruction of transplanted kidney tissue, a drop occurs in the blood pressure to normotensive levels in dogs with renal hypertension. No fall in blood pressure occurred following production of an infusorial earth abscess. This is in line with the report[5] that extensive cellulitis does not lower the pressure of renal hypertensive dogs. Since no fall in blood pressure occurred after implantation into normotensive dogs, the effect seems to be confined to the hypertensive animals. It may persist for long periods beyond the time of removal of the kidney tissue. These facts indicate that the process is not a simple depressor action from absorbed depressor substances but more likely is in the nature of an antagonist to the renal hypertension mechanism. These results are in accord with independent and somewhat different experiments recently reported.[6,7] A striking difference exists in the two types of ex-

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[6] Harrison, T. R., Grollman, A., and Williams, J. R., *Am. J. Physiol.*, 1940, **128**, 716.

[7] Page, I. H., oral presentation at the American Physiological Society meeting in New Orleans, 1940.

periments in that no blood NPN elevation occurred in our experiments.

Implantation of liver, skeletal muscle, cardiac muscle, spleen, and boiled kidney had only a transient depressor effect upon the blood pressure of hypertensive dogs.

Experiments are under way to determine the nature of this renal principle and to discover whether or not similar effects can be obtained with other tissues.

Summary. Our results suggest that transplanted kidney tissue undergoing degeneration exerts an antagonistic action upon the renal hypertension mechanism.

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Effect of Serum Proteins on the Polarographic Curve.*

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The first attempt to apply the polarographic method to cancer diagnosis was reported by Brdicka.[1] Since then various others have used this technique as a test for the detection of changes in cancer sera.[2-4] A difference has been demonstrated between normal and cancer blood by these workers, but it appears that this difference is chiefly a statistical one. Our own results fully confirm this difficulty. In a survey of 150 cases, individuals were divided into 3 general groups: normal, non-cancerous diseases and cancer.[5] The values obtained were expressed as the height of the polarographic curve. There was considerable overlapping in all groups, making it impossible to distinguish any individual case as being representative of normal, cancerous or non-cancerous.

During the course of these studies, serum proteins were determined in some of the specimens which also were examined polarographically. There appeared to be a general parallelism between the amount of the serum protein and the height of the polarographic

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2 Bergh, F., Henriques, Q. M., and Wolffbrandt, C. G., *Nature*, 1938, **142**, 212.

3 Wedemeyer, H. E., and Daur, T., *Z. f. Krebs.*, 1939, **49**, 10.

4 Walker, A. C., and Reimann, S. P., *Am. J. Ca.*, 1939, **37**, 585.

5 Rusch, H. P., Klatt, T., Meloche, V. W., and Dirksen, A. J., in press.