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Vascular Changes in Renal Ischemia Cell Mitosis in the Media of Arteries.

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Pathological studies of the kidneys of chronically hypertensive dogs with renal ischemia by Goldblatt, Lynch, Hanzal, and Summerville,[1] by Verney and Vogt,[2] and by others have in general revealed only degenerative changes chiefly of the tubules, arterioles and to a lesser extent of the glomeruli. These changes have been attributed directly to the ischemia. No changes have previously been described which might have a direct relationship to the hypertensive principle of the ischemic kidney. In order to see if such changes exist studies of the more immediate as well as the chronic effects of partially obstructing the renal arteries are being made by one of us (Goormaghtigh).

The kidneys of 12 dogs sacrificed 2 days to 18 months after compression of the renal arteries by Golblatt clamps applied at 2 consecutive lumbar operations, or by externally adjustable clamps[3] applied simultaneously have been studied. The most striking change has been observed in the media of the interlobular and glomerular arteries.

The media of these vessels is composed not only of ordinary smooth muscle cells but also of larger, more afibrillar and probably less contractile cells.[4, 5] In the kidney these cells are found all along the arterial vascular tree and accumulate in groups at the vascular poles of the glomeruli to form the "juxta glomerular apparatus" or "polkissen". Elsewhere in the body these cells are particularly abundant in the arterial vessels of the glomus carotidum and glomus aorticum[6] and in the vascular glomi of the skin. They are also found in a subendothelial position in the region of the carotid sinus.[6] Their close association with the carotid sinus and cardioaortic presso and chemo receptor regions suggests that their function may be connected

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

2 Verney, E. B., and Vogt, M., *Quart. J. Exp. Physiol.*, 1938, **28**, 253.

3 Grimson, K. S., *J. Physiol.*, 1939, **95**, 45p.

4 Goormaghtigh, N., *J. Physiol.*, 1937, **90**, 1263.

5 Goormaghtigh, N., and Handovsky, H., *Arch. Path.*, 1938, **26**, 1144.

6 Goormaghtigh, N., and Pannier, R., *Arch. Biol.*, 1939, **50**, in press.

with vaso-motor regulation. Masson[7] suggests that they do have a function of local vascular control.

In the media of the arteries and arterioles of the examined ischemic kidneys of hypertensive dogs these large, afibrillar and sometimes granulated or vacuolated cells have increased in number and size. In all animals the juxta glomerular apparatus is enlarged. Its cells frequently have very large nuclei and are often vacuolated. In the proximal segment of some of the intralobular arteries of some of the animals almost all of the smooth muscle cells have enlarged and become afibrillar with hypertrophied nuclei. The intensity of this type of transformation is emphasized by the presence of numerous mitotic figures. In some places these hypertrophied afibrillar cells obstructed the glomerular afferent arterioles and effect extensive atrophy of the associated glomeruli. In acutely ischemic kidneys these vascular changes are associated with varying degrees of tubular changes. In the chronically ischemic kidneys only the alteration of the afibrillar cells is consistently observed. In one animal sacrificed 18 months after application of the clamps regressive changes comparable to those observed at the vascular pole in human constricted kidneys were observed.

In general these hyperplastic cell changes stand out in contrast to the degenerative changes described by previous authors. The possibility that these cells may have a local or even general secretory or humoral activity and may therefore have a direct relationship to the hypertensive principle of the ischemic kidney must be considered.

Similar hypertrophy and hyperplasia of this type of cell has been observed in hypertensive hypervitaminose "D" dogs[5] and in the kidneys of scarlet fever patients.[8] Mitotic cell division in the media of arteries has not been reported in the literature but one of us (Goormaghtigh) has observed it in the kidneys of hypervitaminose "D" rabbits and of normal rabbits with one ureter ligated 4 days previously.

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7 Masson, Pierre, *Les Glomus Neuro-Vasculairus*, 1937, Paris, Hermann et Cie.

8 Goormaghtigh, N., *Arch. de Biol.*, 1932, **43**, 575.