1970 #5

SUPRA-RENAL SEGMENTAL BODIES IN THE SPINY DOGFISH, Squalus acanthias

Peter Deetjen, Helena Dlouha, J. C. Brennan, and J. W. Boylan, State University of New York at Buffalo, N. Y.

From each segmental artery of the dorsal aorta in the area of the kidney, one renal artery arises which enters the kidney substance near its dorso-median border.

At the point of bifurcation of these arteries immediately below the surface of the kidney, we find invariably a distinct anatomical structure. This is a discrete, oval-shaped mass of tis-

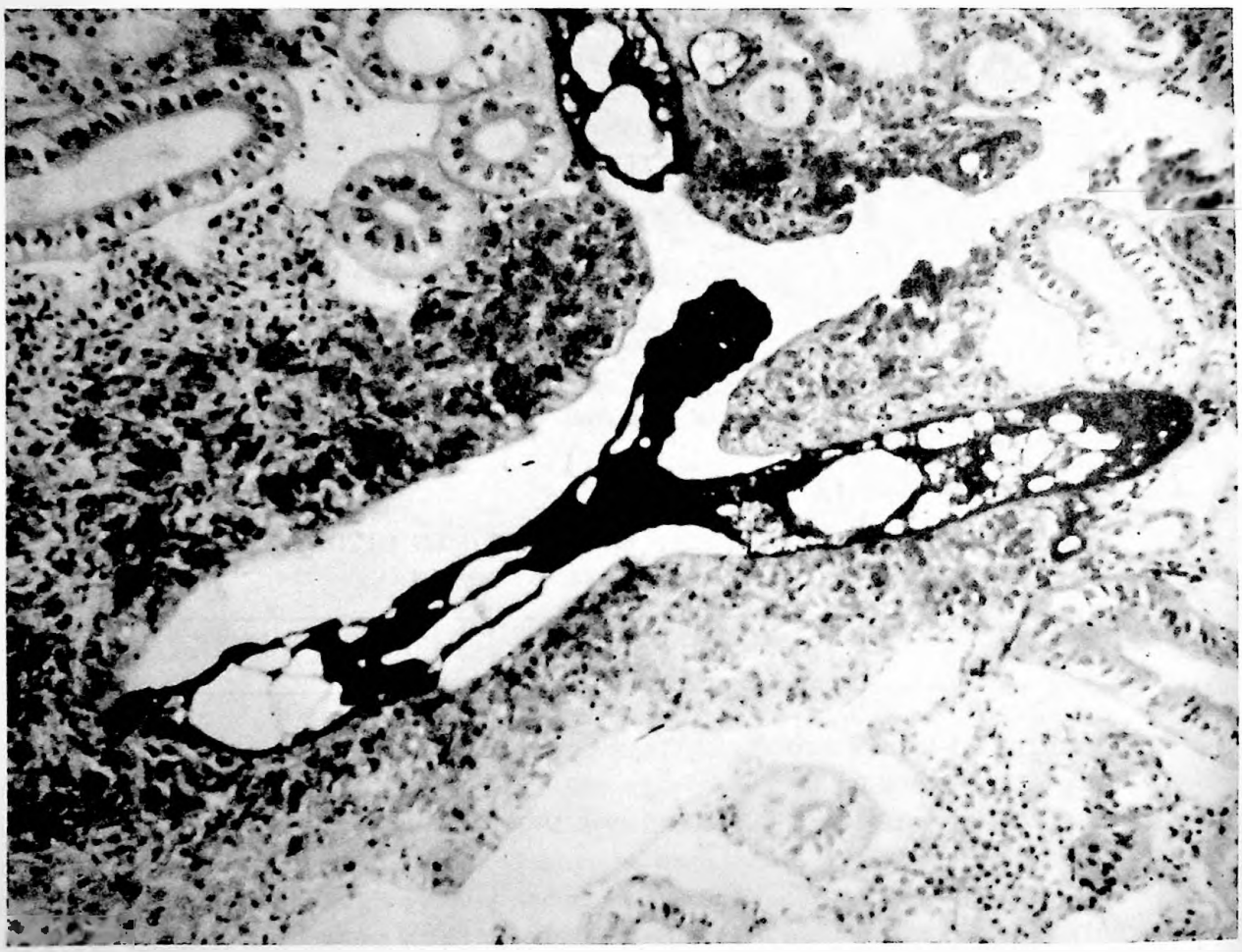

Figure 1. A segmental body arranged around trifurcation of renal artery. Note replacement of the usual medial layers of a blood vessel of this size by the segmental body cells. H and E. X130.

sue closely investing the artery and its branches so that the latter emerge from it. The structure differs in color from the surrounding tissue in the post-mortem state being pink-white in contrast to the brownish gray about it. It is separated with difficulty from the arterial wall being adherent to it, whereas the surrounding tissue is easily teased apart.

It is apparent from the literature that these structures represent the so-called "segmentally arranged bodies" of the supra renals, first described by Leydig in 1852 (Beiträge zur mikros., Anat. etc der Rochen und Hai. Leip). Histological details of cell structure of these bodies has been described by Vincent (Trans. Zoo. Soc. London 14:41, 1898). Their secretory nature and close relationship with, on the one hand, sympathetic ganglion cells and, on the other, the basement membrane of the segmented artery are illustrated in the accompanying photographs, Figures 1 and 2. An additional feature, not previously commented on, is the equally intimate relationship of the peripheral cells of these bodies with the intertubular capillary system of the surrounding renal tissue.

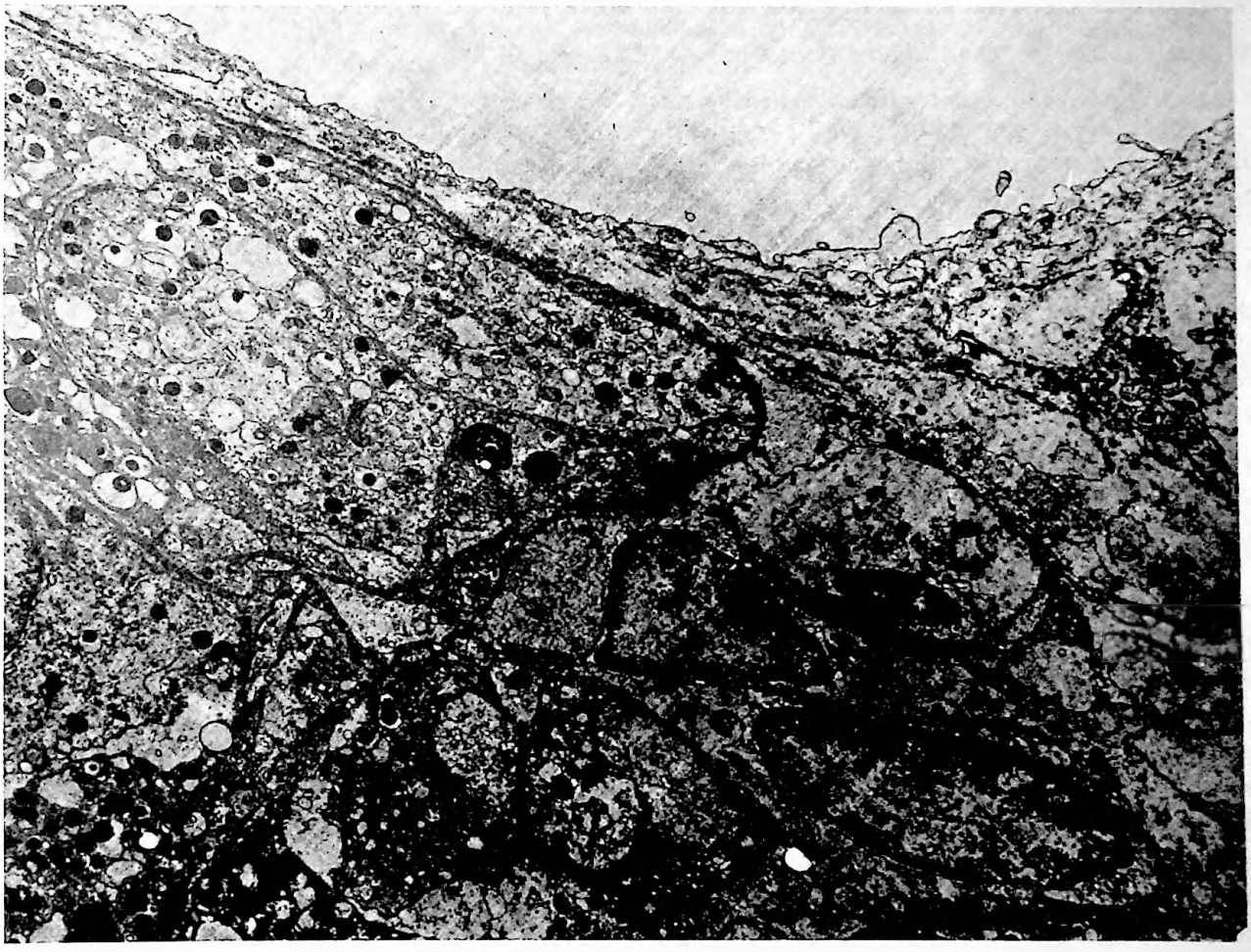

Figure 2. Electron microphotograph of segmental body; peritubular capillary lumen above.

Formalin fixation of our specimens prohibited the use of specific staining techniques to demonstrate the presence of catecholamines.

Electron microscopy, sectioned from material prepared in fresh state by Dr. William Doyle, demonstrates two distinct cell types. Secretory cells present an extraordinary number of electron dense granules. Other smaller cells have clear cytoplasm, devoid of granules,

endoplasmic reticulum or ribosomes. Figure 2.

The purpose of this report is to direct attention to these segmental bodies whose location on the renal arteries and association with peritubular capillaries raises questions of their role in the regulation of renal circulation or tubular function.

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1970 #6

CORRELATION OF FINE STRUCTURE WITH TRANSPORT CONDITIONS IN THE INTESTINE AND GILLS OF THE EEL, Anguilla rostrata AND THE DOGFISH, Squalus acanthias

William L. Doyle, The University of Chicago, Chicago, Ill.

(Specimens prepared for electron microscopy during the summer 1969 were studied during the following year and the results are summarized below. Specimens prepared during 1970 will be reported subsequently.)

(1) An isolated preparation was made of the spiral valve of the dogfish using arterial and luminal perfusion with saline suitably adjusted to provide maximal and minimal rates of transport across the mucosa. The particular morphology of the spiral valve permits the application of hydrostatic pressure to the mucosa without the complications of effects of distension on the morphology. The preparation is viable for more than an hour and in these experiments the effects of the experimental conditions were examined after twenty to thirty minutes of perfusion. Preliminary studies during 1970 indicate that quantitative values for transport rates under these conditions should be readily obtainable for the isolated spiral valve.

In the spiral folds there is mucosal epithelium on both sides with only a delicate muscularis mucosa and the lamina propria at the basal surface. The epithelial cells are very tall columnar cells about 5 x 100 microns showing distinct zones of polarization of components especially with respect to the endoplasmic reticulum. The apical endoplasmic reticulum is particularly responsive to differences in transport conditions and is prominent at high transport rates. Below the level of the nuclei the endoplasmic reticulum is less vesicular and more obviously cisternal in arrangement. Lateral intercellular spaces are most evident (at high transport rates) in the subnuclear regions of the cell but cell membranes are closely approximated at the basal lamina. At minimal transport rates the lateral intercellular spaces disappear. When transport is blocked by ouabain (intra arterially) the lateral space is obliterated except for peculiar, localized symmetrical distensions. Lateral space remains prominent under high intraluminal hydrostatic pressure with cell dimensions (height) remaining unaltered.

Under high rates of transport there is hydration of the apical cytoplasm and in addition an increase of volume in the apical endoplasmic reticulum. This endoplasmic compartment provides an additional membrane bounded intracellular compartment whose role in transport requires further elucidation. The diminished volume of the endoplasmic reticulum at the subnuclear level, where lateral intercellular spaces are most prominent, suggests that the water of this compartment traverses the cytoplasm for elimination to the lateral intercellular space.

(2) The transfer of eels from fresh to salt water is accompanied by increased salt and water transport in the gills and gut. In collaboration with Franklin Epstein, Ralph Janicki and