Institute of Experimental Morphology and Anthropology

Acta morphologica et anthropologica, 10
Sofia•2005

General Peculiarities of the Structure of the Sinusoidal Capillaries of the Adrenal Gland

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The adrenal gland was electron microscopically investigated. In the cortical part of the gland both arterial and venular areas of the sinusoid capillaries were identified while in the medullar part there were typical sinusoid capillaries and venous sinusoids as well as arterial capillaries. These data correspond to the concepts about the construction of the terminal vascular bed in the adrenal gland. The sinusoid capillaries in the adrenal gland possess as basic peculiarities common for its two parts the following: a fenestrated endothelium, an continuous basal membrane and optional (occasional) extraendothelial cellular and fibrillar elements. The differences between both parts of the gland concern the presence of microvilli and processes of the parenchymal cells in the pericapillary space and in the wall of the sinusoid capillaries, the extent of endothelial fenestratedness, and the activity of micropinocytosis.

Key words: sinusoid capillaries, adrenal cortex, adrenal medulla.

Terminal blood vessels in both parts of the adrenal gland designed as sinusoid capillaries or sinusoids represent the object of our investigations. We identify as sinusoid capillaries the vessels with a fenestrated endothelium, that as a rule, is surrounded by a basal membrane. To them belong some vessels of different shape and size of the lumen. It is rounded when it contains erythrocytes but irregular in their absence because of deformation induced by the surrounding parenchymal cells.

In the wall of the sinusoid capillaries some permanent components such as endothelium and basal membrane and provisory extraendothelial cellular and fibrillary elements can be distinguished.

Every endothelial cell could be, conditionally, divided into two zones: a nucleus containing and a peripheral zone. The latter is relatively thin and presents with non-fenestrated and fenestrated areas showing definite differences between the cortex and the medulla. In the cortical part the thickness of the non-fenestrated areas varies between 200 and 800 nm while that of the fenestrated ones — between 40 and 120 nm. They occupy the larger part of the cellular surface and contain numerous fenestrae closed by a membrane or by pores without any membrane. In the medullar part the non-fenestrated areas of the endothelium are strongly attenuated reaching up to 20 nm. Among the attenuated parts thickenings being sometimes of large size can be observed. The fenestrated areas of the endothelium in the medulla are considerably

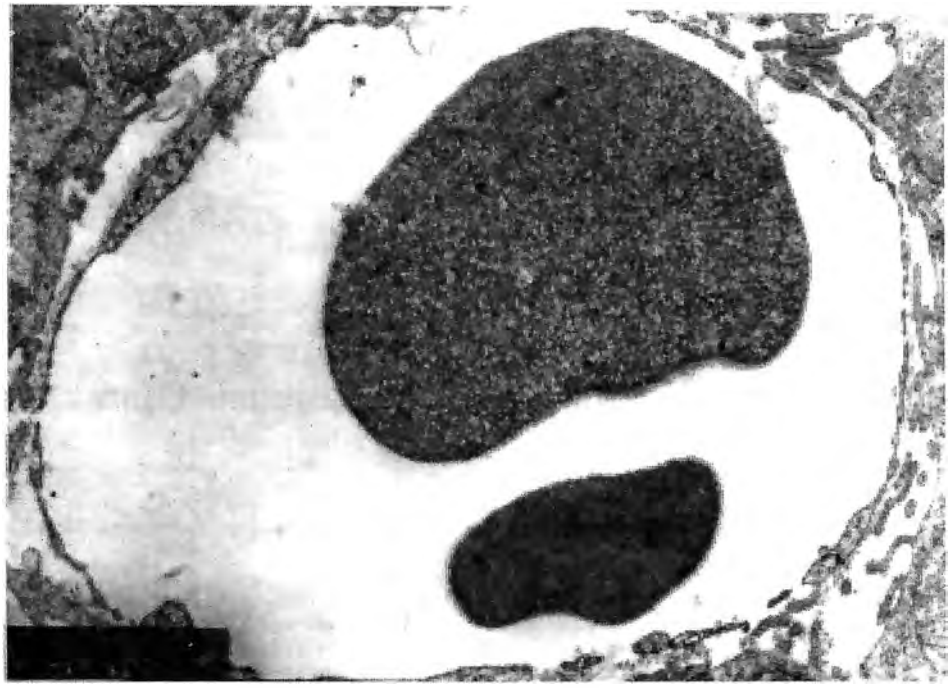

Fig. 1. Adrenal cortex. Sinusoidal capillary. Electron microscope magnification (× 16 000)

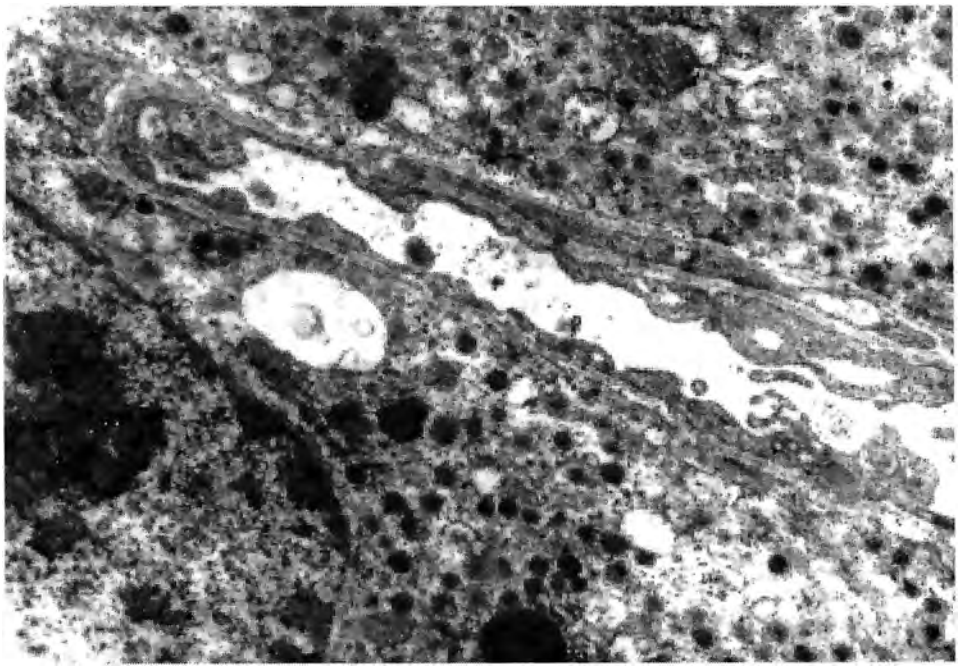

Fig. 2. Adrenal medulla. Sinusoidal capillary. Electron microscope magnification (× 8000)

smaller in size than these in the cortex (Fig. 1, 2). The fenestrae in both glandular parts are closed by one-layer membrane with a centrally located dense material.

Our data indicate the presence of a significant micropinocytotic activity in the non-fenestrated peripheral areas of the endothelial cells that is, in general, stronger in the medulla than in the cortex. The presence of forming and opening vesicles on the surface argues for a two-directional transport (Fig. 3). In relation with the transendothelial transport some peculiar formations of the fenestrated endothelial areas are of undoubted interest. The fenestrated plate bends and prominates into the lumen thus moving away from the basal membrane. Some evaginations of the glandular cells can penetrate into the formed enlargement of the subendothelial space (Fig. 4) [4].

As a rule, the wall of the sinusoid capillaries in the cortex and medulla does not possess any continuous layer of extraendothelial cellular and fibrillar elements. Single cells and fibrillar elements occur comparatively seldom and along a restricted distance only. In the pericapillary space of the cortical part one can also observe evaginations of the endothelial cells of different shape and size as well as processes and microvilli of the parenchymal cells (Fig. 1). The pericapillary space in the medullar part is distinguished by that in the cortical one mainly through the absence of processes and microvilli of the parenchymal cells. That is why the parenchymal cells are located along a significant distance in the close proximity to the sinusoid capillary as both basal membranes, i.e. the endothelial and the parenchymal, are merged into one membrane (Fig. 2).

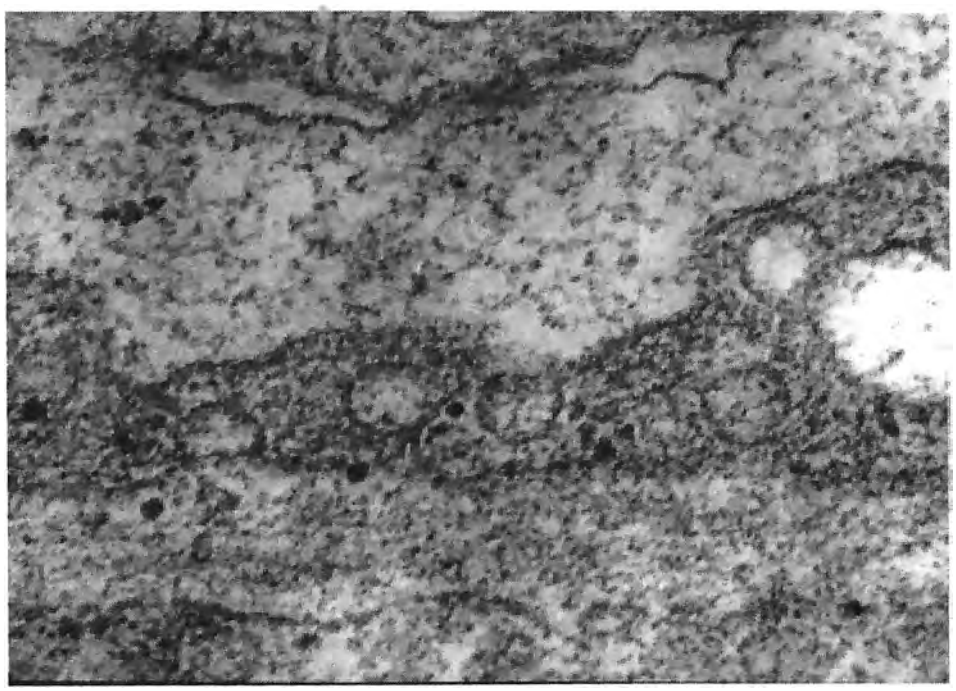

Fig. 3. Adrenal medulla. Forming and opening micropinocytic vesicles. Electron microscope magnification (× 87 500)

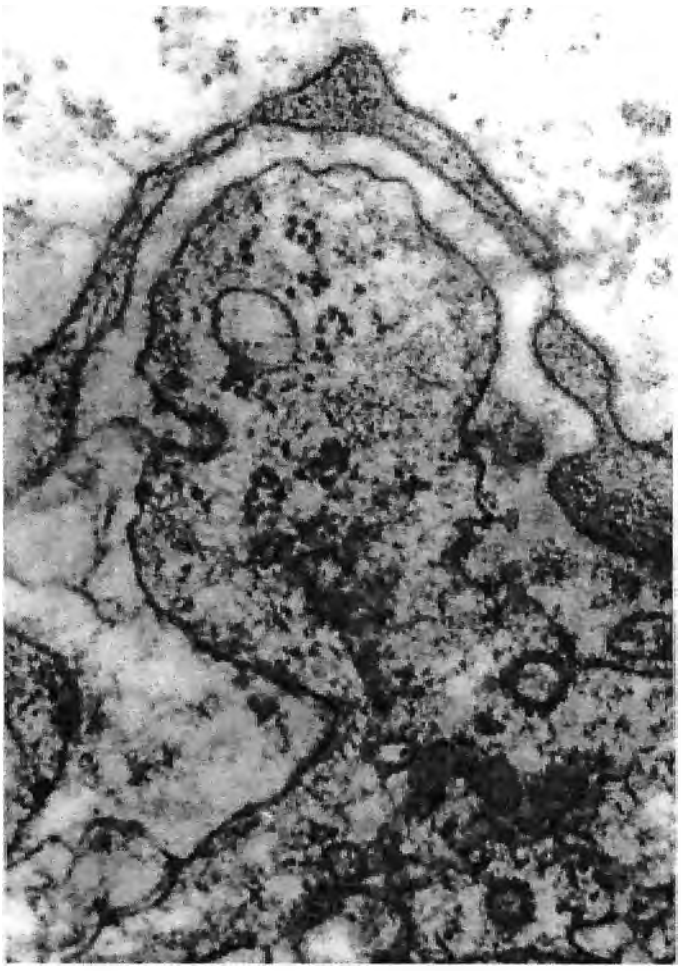

Fig. 4. Adrenal cortex. Electron microscope magnification (× 50 000)

The results from our studies disprove the general validity of certain signs incorporated into the classification characteristics of the capillaries of the endocrine organs: an continuous layer of periendothelial cells [7], permanent parenchymal basal membrane as an obligatory borderline of the pericapillary space [1, 2], size of the fenestrae [1, 3], and three-layer structure of the fenestral membrane [7]. Literature data about the presence of a fenestrated endothelim within the medulla are contradictory [5,6].

Our investigations demonstrate that the sinusoid capillaries of the adrenal cortex and medulla are of a qualitatively equal structure but they differ concerning the amount of the single ultrastructural devices designed for a transendothelial transport. They possess the whole possible set of structural mechanisms determining the capacity for an intensive transendothelial transport under stress conditions.

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