essential component of the increase in vascular resistance in different forms of hypertension [12]. Consequently, an increase in the viscous properties of the blood leads directly and indirectly, through potentiation of the processes leading to a decrease in the density of the microcirculatory bed, to an increase in vascular resistance in the blood in hypertension, contributing to a further rise of BP. In the early stages of hypertension, the high fibrinolysis prevents these processes.

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TUBULOSTROMAL RELATIONS IN THE NORMAL RABBIT AND HUMAN KIDNEY

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The study of species differences in tubulostromal relations in the kidneys of laboratory animals and man is of considerable interest not only to anatomists, but also to pathologists because of the increased attention being paid in recent years to tubulo-interstitial lesions of the kidneys [3, 7, 8]. The aim of this investigation was to compare extraglomerular structural elements of the renal cortex and medulla in normal rabbits and man.

EXPERIMENTAL METHOD

Altogether 10 kidneys from male rabbits weighing 2-2.5 kg and 10 kidneys removed from eight men and two women, dying accidentally at the age of between 16 and 40 years, were studied. The cause of death of the human subjects in eight cases was asphyxia, and in two it was a road accident. The rabbits were killed by air embolism. Pieces for kidney for study were fixed in buffered 10% neutral formalin solution and embedded in paraffin wax. Paraffin sections were stained with hematoxylin and eosin, with picrofuchsine by Van Gieson's method, by Heidenhain's azan method, with Congo red, and by the PAS reaction. Frozen sections were treated by the direct Coons' method (with luminescent sera against human IgA,

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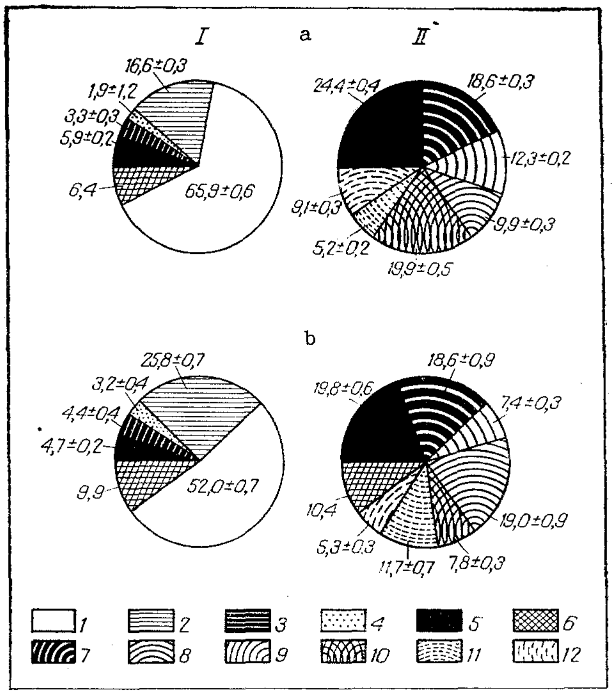

Fig. 1. Relative percentages of structural elements of the kidney. a) Rabbit, b) human, I) cortex, II) medulla. 1) Epithelium of proximal part of nephron; 2) lumen of proximal part of nephron; 3) epithelium of distal part of nephron; 4) lumen of distal part of nephron; 5) interstitial tissue; 6) glomeruli and vessels of interstitial tissue; 7) epithelium of collecting tubules; 8) lumen of collecting tubules; 9) epithelium of thick segment of loop of Henle; 10) lumen of thick segment of loop of Henle; 11) epithelium of thin segment of loop of Henle; 12) lumen of thin segment of loop of Henle.

IgG, IgM, and C3 and against rabbit γ-globulin, respectively). Morphometric investigations were conducted on paraffin sections 3 μ thick by counting points of intersection of an ocular grid (285 points) [1], coinciding with the different structural elements of the kidney tissue in the field of vision: in the cortical layer – on the epithelium of the proximal part of the nephron and its lumen, the distal part of the nephron and its lumen, the interstitial tissue, its blood vessels, and glomeruli; in the medulla – on the epithelium of the thin (descending) and thick (ascending) parts of the loop of Henle and its lumen, the epithelium of the collecting tubules and their lumen, the interstitial tissues, and their blood vessels. Data on all the above parameters except glomeruli and vessels of interstitial tissues were subjected to statistical analysis by the SEM-IPS computer (West Germany). Cells of the interstitial tissues were counted in the cortex and medulla of both rabbit and human kidneys in 100 fields of vision.

EXPERIMENTAL RESULTS

The results are given in the form of diagrams (Fig. 1), showing relative percentages of structural elements of the rabbit and human kidney. The relative volume occupied by each structural element (in %) is shown in the diagrams by an appropriate sector. The fraction corresponding to glomeruli and vessels of interstitial tissues (together) is shown on the diagrams as one sector: 9.9% in the human renal cortex, 6.4% in the rabbit cortex, 10.4% in the human medulla, and under 1% in the rabbit medulla.

No diseases of the kidneys were found by qualitative light-optical investigation in either the rabbit or the human kidney. In both rabbit and human kidneys the same structural elements were found and there was a common structural plan. However, differences do exist in quantitative relations between volumes occupied by the same structures in the different species and between volumes of different structural elements. No significant differences were found between relative volumes of the epithelium of the distal tubules and epithelium of the collecting tubules in the rabbit and man ($p > 0.05$). In both rabbit and human renal cortex about 80% of the volume was occupied by the proximal part of the nephron. In the rabbit, however, the volume of the lumen was smaller ($p < 0.05$) but the volume of the epithelium was greater ($p < 0.05$) than in man. In the medulla, although the volume of the epithelium of the collecting tubules was the same, their lumen was twice as great in the rabbit as in man. In both thick and thin parts of the loop of Henle the volume of the lumen in the rabbit was about twice that in man, but the volume of the epithelium was only half of that in man. In the rabbit, the volume of the lumen in the thick and thin parts of the loop of Henle was almost twice as great as the volume of the epithelium. In man, however, the opposite was the case. Comparison of the relative volumes of the interstitial tissues yielded the following results: in the rabbit, 1.4% greater in the cortex ($p < 0.05$) and in the medulla 4.6% greater ($p < 0.05$) than in man.

There are several opinions regarding the cellular composition of the interstitial tissue. On the basis of data obtained by several workers [5, 6, 9] and our own observations, we divided cells of the interstitial tissue into two groups: fibroblast-like (FBC) and lymphocyte-like (LCC) cells. Counting showed that the number of FBC was always the overwhelming majority (in the human cortex the number of FBC was 74.5 ± 4.9% and the number of LCC 25.5 ± 2.9%, in the medulla the number of FBC was 80.7 ± 2.3% and the number of LCC 19.3 ± 1.2%; in the rabbit the number of FBC in the cortex was 89.4 ± 2.7% and the number of LCC was 10.6 ± 1.0%; in the medulla the number of FBC was 81.1 ± 2.4% and the number of LCC was 18.9 ± 1.6%.

Differences in the relative volumes of epithelium and lumen of the parts of the nephron in the rabbit and man are probably connected with differences in both weight, conditions of life, and mode of feeding. The more arduous the conditions of life, the higher the concentrating power of the animal's kidneys. The ability of animals to live under desert conditions is connected with their development of juxtamedullary nephrons with long, thin loops of Henle [10]. The more highly they are developed, the greater the ability of the animal to retain water. In the guinea pig, the number of long loops of Henle relative to the total number of nephrons is under 5%, but in albino rats it is over 28% [2]. The increase in the volume of epithelium of the tubules in man was probably connected with his performance of more complex physiological processes than are necessary for mammals standing at the level of development of the rabbit. That the interstitial tissue participates in the concentration of urine is a well known fact, and its ability to "swell," to accumulate water, combined with differences in conditions of life can probably explain the difference which we found in the volumes of the interstitial tissue in the rabbit and man. Participation of FBC in such important processes as synthesis of the intercellular interstitial substance, concentration of urine, regulation of blood pressure, phagocytosis, and mechanical maintenance of the shape of the organ [8] evidently determine their greater quantitative preponderance in both species above LCC which, it is assumed, perform only a phagocytic function [8].

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