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*Microscopic Structure of the Renal Artery Wall
in the Rabbit*

Budowa mikroskopowa ściany tętnicy nerkowej u królika

An increase in the incidence of the vascular system diseases has been observed for a number of years. This poses a task for researchers to explain causes of these diseases, their course and treatment, and ways of prevention. The task requires carrying out numerous researches with trials on experimental animals, the rabbit being one of them. These should be preceded by observations of the structure of peripheral arteries walls in healthy animals in order to properly interpret results of experiments. Therefore, prior to beginning research on influence of experimental diabetes upon microscopic structure of individual peripheral arteries, the authors acknowledged that it would be advisable to observe the normal structure of one of them — the renal artery, in the rabbit which is a model experimental animal in the study of the vascular system.

MATERIAL AND METHODS

The research was carried out on 77 rabbits coming from rabbit raising at the Department of Genetics and Animal Breeding of the Academy of Agriculture in Cracow. These were the animals of both sexes, of the white New Zealand breed (NZ), the black bay breed (BB), and 2 two-way hybrids: a NZ female and a BB male (NZX) or a BB female and a NZ male (BBX) 70 and 140 days old. The animals were killed in a traditional way and

exsanguinated. The renal arteries were fixed in 10% neutral formalin and embedded in paraffin. Serial sections 5—10 μm thick were stained by the methods: hematoxylin and eosin, van Gieson's, Weigert's, Fraenkel's, and alcyan blue (3). Thickness of the renal artery wall as well as its middle coat were measured under a projective microscope MP 3, calculating the mean (\bar{x}) and standard deviation (SD).

RESULTS AND DISCUSSION

Renal arteries in rabbits have a typical three-coat structure. The inner coat is lined with monolayer endothelium resting on a thin basal coat (Fig. 1). A very distinct and strongly plicate elastic inner coat can be seen on its circumference (Fig. 2).

The middle coat of the renal artery wall is composed of several layers of myocytes arranged in a circular way (Fig. 1). Within its limits, a small number of elastic fibres of the connective tissue placed among layers of muscle cells can be seen (Fig. 2). Elastic fibres on the external circumference of the middle coat accumulate creating a continuous elastic outer coat, the arrangement of fibres in the latter being less regular than in the elastic inner coat (Fig. 3).

The outer coat — adventitia — is basically composed of fibres and the connective tissue cells. Single myocytes and vessels of vessels can also be seen (Figs. 1, 2).

One of the elements of the connective tissue in the arterial wall are glycosaminoglycans whose distribution in individual coats of the arterial wall is visible in preparations stained with alcyan blue. It was found in the material studies that accumulation of acid mucopolysaccharides was greater in the endothelium and adventitia cells than in the middle coat (Fig. 4), which is consistent with the findings of other authors (1, 4—6).

We can conclude from the above observations that the renal artery in the rabbit is an artery of the muscular type as for example the basilar artery (4), whereas the pulmonary trunk and the iliac arteries are vessels of the elastic type (5, 6). There were no significant differences found in the microscopic structure of the wall of the vessel being discussed associated with the sex, breed and age of the animals studied. The changes

acknowledged by Klassen et al. (2) as early symptoms of atheromatosis were not observed in sexually mature 140-day-old rabbits so that they can serve as experimental animals in research work on diseases of the vascular system.

The results of measurements of the thickness of the renal artery wall taking into account age, breed and sex of the animals are presented in Tab. 1.

Tab. 1. The thickness of the whole wall and the middle coat of the renal artery of the rabbit (in μm)

BREED	SEX	n	70 days				140 days				
			Whole wall		Middle coat		n	Whole wall		Middle coat	
			\bar{X}	SD	\bar{X}	SD		\bar{X}	SD	\bar{X}	SD
NZ	♂	5	107.4	11.9	77.8	22.4	5	171.7	8.8	126.9	10.1
	♀	5	118.9	25.7	106.0	34.1	5	186.5	20.9	170.3	29.0
	♂+♀	10	113.6	20.6	93.9	29.0	10	179.8	21.7	151.7	31.0
NZX	♂	5	135.2	3.4	81.0	7.9	5	241.6	15.5	128.0	16.9
	♀	5	123.6	36.8	83.6	43.9	5	180.8	3.1	127.5	11.6
	♂+♀	10	128.2	26.9	82.6	35.7	10	205.1	8.2	127.7	11.8
CZP	♂	5	132.4	18.1	94.6	19.4	5	205.4	13.8	144.8	23.7
	♀	5	123.2	18.1	87.7	11.3	4	206.5	10.1	134.6	9.3
	♂+♀	10	128.4	17.2	89.1	19.4	9	205.4	11.4	138.4	8.8
CZPX	♂	4	133.9	16.7	82.2	30.0	4	215.7	9.9	131.4	9.9
	♀	4	147.9	16.9	87.2	18.3	6	214.0	12.3	134.0	33.9
	♂+♀	8	140.9	16.9	83.2	22.3	10	214.9	10.1	131.1	8.8

We can conclude from the table that in 70-day-old individuals the thickest wall of the considered vessel was observed in the NZ breed representatives, a noticeably thinner wall was in the BB breed, and the thinnest in both hybrids. More significant differences in the measurements of individuals of different sexes were found only in rabbits of the NZ breed. In the remaining animals these differences were either small (BB) or minimal (BBX, NZX). The thickness of the middle coat of the renal artery in this age group was similar to the thickness of the whole wall.

At the time of the most intensive development of the rabbit between 70th and 140th day of life i.e. till reaching sexual maturity, the greatest increase in the thickness of the whole renal artery wall as well as of its middle coat occurred in representatives of the BBX breed (by over 60%) and the NZX (by approximately 60%), a little lower increase was noted in the BB breed rabbits (by approximately 45%), and the lowest in the NZ breed animals (up to 20%). As a result, renal arteries with the thickest wall were observed in grown-up animals of the BBX breed, thinner — in representatives of the BB and the NZX, and the thinnest — in the NZ breed.

In 140-day-old rabbits of the NZ and NZX breed the thickness of the renal artery wall as well as of its middle coat was markedly greater in males than in females, whereas inverse proportion was noted in representatives of the BB and BBX breeds and the differences were minimal.

In comparison with other peripheral arteries: the basilar artery, the pulmonary trunk and the common and external iliac arteries, the renal artery in grown-up rabbits is a vessel with the thickest wall and its middle coat in particular (4—6).

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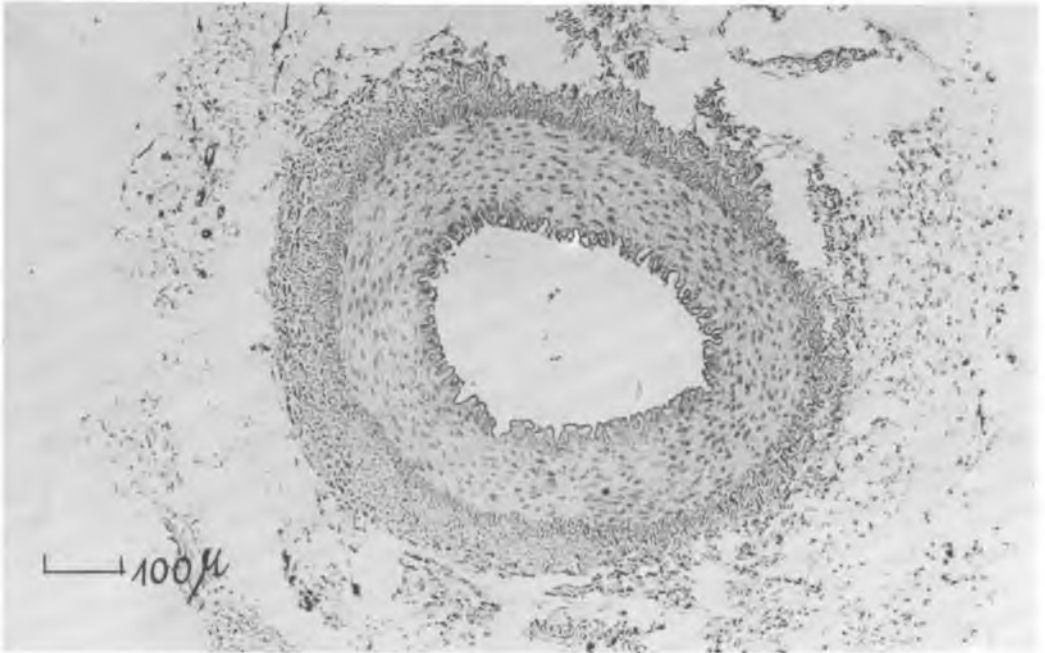


Fig. 1. A transverse section of the renal artery of the 140-day-old rabbit. H+E

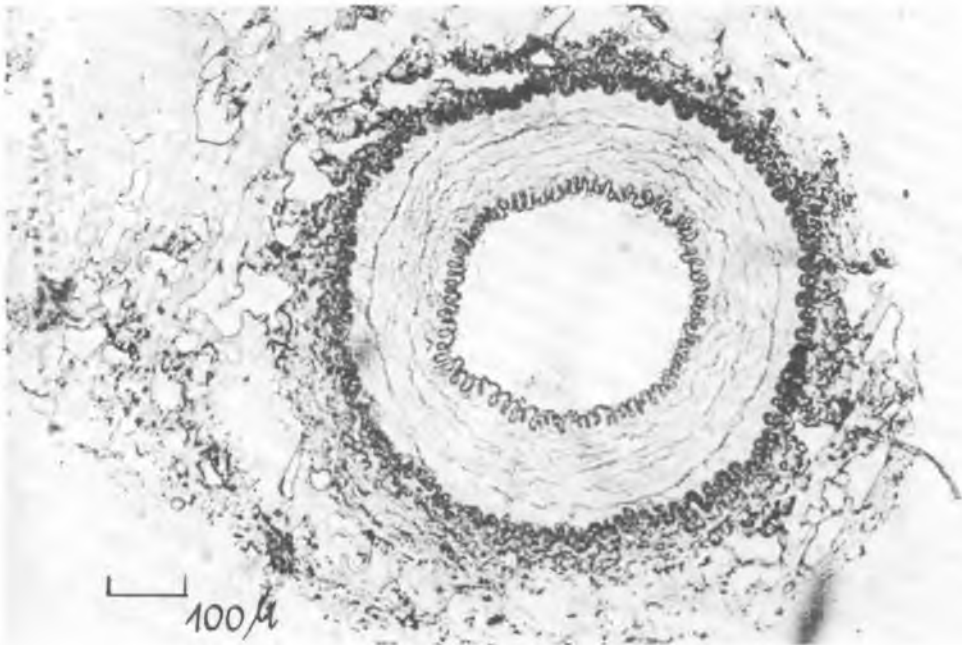


Fig. 2. A transverse section of the renal artery of the 140-day-old rabbit. Weigert's stain

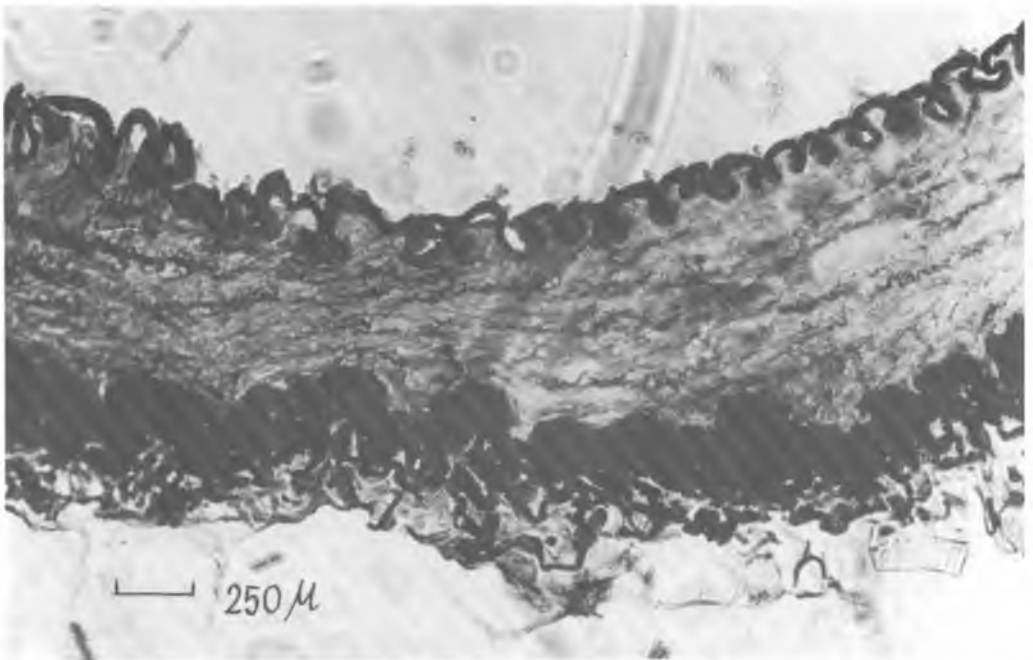


Fig. 3. A transverse section of the renal artery of the 140 days old rabbit. Weigert's stain

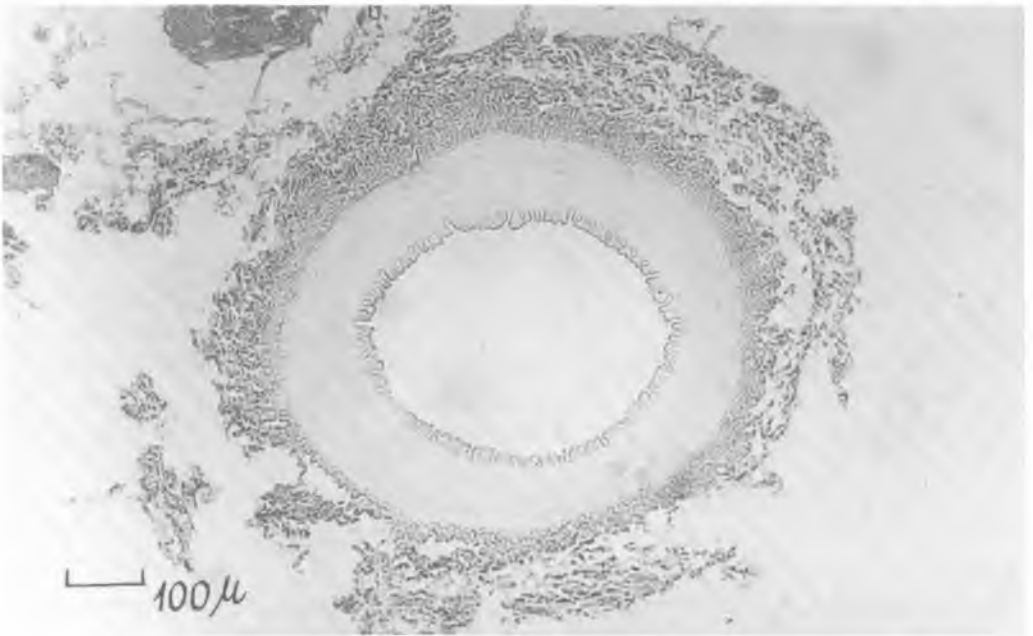


Fig. 4. A transverse section of the renal artery of the 140-day-old rabbit. Alcian blue stain

STRESZCZENIE

Budowę mikroskopową ściany tętnicy nerkowej u królika prześledzono w celu uzyskania danych o tym naczyniu przed obserwacją zmian zachodzących w jego ścianie w przebiegu cukrzycy doświadczalnej. Badania przeprowadzono na 77 królikach obu płci, rasy nowozelandzkiej białej i czarnej podpalanej oraz dwu krzyżówek obukierunkowych, w wieku 70 i 140 dni. Wykazano, że omawiane naczynie jest tętnicą typu mięśniowego o stosunkowo grubej ścianie, a zwłaszcza jej błonie środkowej. Nie stwierdzono istotnych różnic w budowie mikroskopowej ściany tętnicy nerkowej związanych z płcią, rasą i wiekiem królików. U dojrzałych płciowo zwierząt (140-dniowych) nie zaobserwowano zmian uznawanych za wczesne objawy miażdżycy, tak że mogą one być zwierzętami doświadczalnymi w badaniach chorób układu naczyniowego.

