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Microcirculatory Bed of the Pancreas after Extensive Liver Resection

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Abstract: Liver resection was performed on 60 white mongrel rats where 70% of the liver was resected. Pieces were taken for anatomical and histological studies. For anatomical and histological studies For the studies, pieces were taken on days 3, 7 and 14. For the study of microvessels, the following were used: filling with Gerot mass and 2% gelatin-tussula through the aorta. Sections of 5-30 μm thickness were prepared. After liver resection, the size of pancreatic microvessels increased by more than 50%. Intralobular hemorrhages and microthrombi in the vessels were observed. Foci of hemorrhage were observed in the islets of Langerhans., the microvessels of the pancreas were mainly manifested in the form of dystrophic, atrophic and inflammatory changes in the endocrine part and necrosis of excretory cells.

Keywords: pancreas, microvessels, liver resection, lobules.

It is well known that pancreatic diseases not only lead to disability in people of active working age, but also lead to serious consequences. The most common disease of the pancreas is diabetes mellitus, its treatment and prevention is the most important task. The disease occurs in 6-9% of people [1].

In type 1 diabetes, there is complete or almost complete destruction of β- cells [6], whereas type 2 is characterized by progressive β-cell failure and a relative decrease in their mass due to increased apoptosis [7]. According to some authors, there are two main pathways for β-cell regeneration: β-cell replication and β-cell neogenesis. β- cell replication manifests itself early in life, and is suppressed with age. In addition, it has been shown that the exocrine pancreas of an adult contains stem cells, which can differentiate under specific conditions into β- cells. The authors suggest that the mass of β- cells can increase due to neogenesis or replication depending on the intensity of various stimuli or stressors [8].

It has been established that In the development of diabetes mellitus, the morphology of the parenchyma and micro vessels, as well as the functional state of the pancreas, are of great importance. [2, 4]

Material and methods. The studies were conducted in two groups on white outbred rats. Group I consisted of 20 intact rats, group II consisted of 40 animals, liver resection was performed. Heliotrin inoculation was carried out according to the methods of N.Kh. Adullaev (1986). For anatomical and histological For the studies, pieces were taken on days 3, 7 and 14. For the study of microvessels, the following were used: filling with Gerot mass and 2% gelatin-tussula through the aorta. Sections of 5-30 μm thickness were prepared. The diameter of the vessels was measured with an eyepiece micrometer MOB 15 $^{X.}$ Statistical processing was performed with the EXCEL-10.0 program.

Results and their discussion. Studies of the pancreas of animals of group I showed that the microvessels of the lobules have branches up to 6-7 orders. Lobules of the islets of Langerhans correspond to the fifth order, their bases are directed to the surface of the organ, and the legs - to the efferent ducts. 2-3-4 lobules of the first order form a lobe or segment of the gland. According to the nature of the secretory tree, from 8 to 12 segments are distinguished.

Fig. 1. Normal pancreas. 1 – capillary network. Ink and Gerota mass filling. Magnification X 180.

Acinous capillaries connecting to form postcapillary venules. Diameter of acinous capillaries is 4.8±1.0 μm, capillary density 47%. The diameter of the afferent vessel to the pancreatic islet is 16.8 ± 1.2 μm. In the injection preparations, the diameter capillary diameter was 6.7 ± 0.23 μm and such capillaries are called sinusoidal capillaries.

Microvessels of the exocrine part of the pancreas consist of classical 5 links: interlobular arterioles, intralobular (precapillary) arterioles, capillary network of acini, postcapillary (intralobular) venules, interlobular venules.

The microvessels of the acini have the shape of baskets, each acinus is surrounded separately and has anastomoses not only with its own, but also with neighboring acini. (diameter capillaries 4.8 ±0.1 μm). Venous outflow is carried out due to intralobular and interlobular venules.

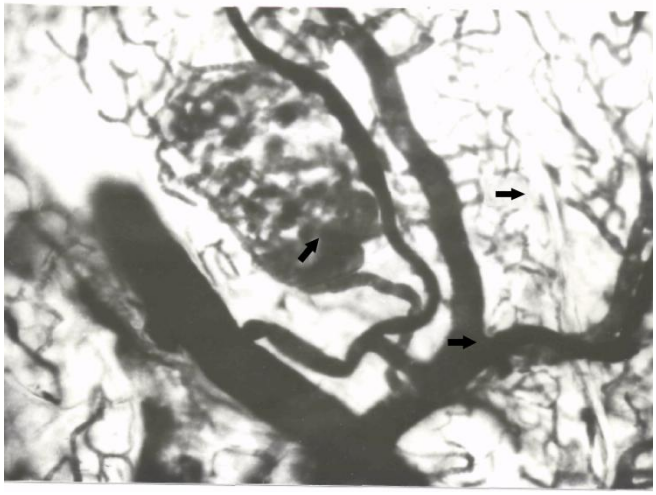

Fig. 2. Blood supply of the insular island. The arrow indicates the branches of the vessels. Filling with Gerota's mass. Magnification X 200.

Pancreatic islets contain more capillaries. relative to the acini, mostly arterioles. The capillaries of the islets continue into the peri - insular acinar capillaries and form dense insulin- acinose humoral connections. The diameter of pancreatic capillaries is 6.7 ±0.2 μm.

In group II, on day 3, significant changes in the islets were detected. There are no clear boundaries of the islets of Langerhans, which is associated with hydropic dystrophy of A cells. 50% βof the cells in the center of the islet are subject to total necrosis.

In animals of group II On the 14th day of the experiment, a 1.5-fold increase in the diameter of microvessels was revealed. The diameter of the afferent arterioles of the islets increased from 39.2±2.7 μm to 58.5±2.7 μm, intralobular arterioles from 30.6±1.88 μm to 55.6 ±2.0 μm. In 50% of the islets of Langerhans focal hemorrhages were detected. The rest of βthe cells Paranecrosis and necrobiosis were observed. In the remaining cells of the nucleus, karyorrhexis and karyopyknosis were revealed.

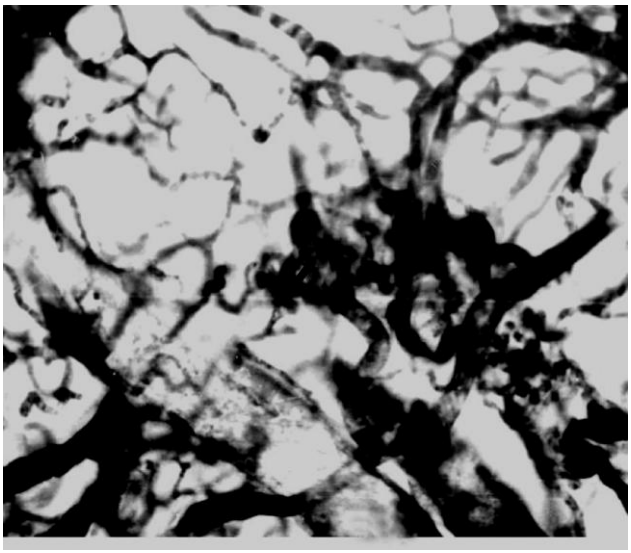

Fig. 3. Day 3 of the experiment. Acini of the pancreas. Gerot's mass. Uv. X 200.

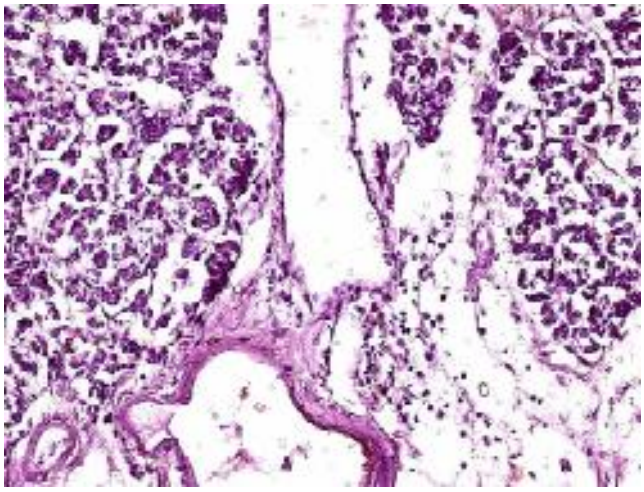

Fig. 4. Day 3 of the experiment. Edema and diffuse inflammatory infiltration. Hematoxylin-Eosin. Magnification X 300.

In arteriole x, capillary x and partially venule x acute blood filling, swelling of endothelial cells were detected and sludge syndrome.

Around the islets and inside some of the islets, diapedetic hemorrhages and perivesical swellings of the connective tissue are found. The degree and depth of dystrophy in the acinar part were focal.

After the introduction of heliotrin, after some time from the state of “shock” a regenerative changes appear in the organ. A-cells acquire normal structure and size. Islets of Langerhans are revealed more clearly.

Dystrophy gradually disappears in the cells and only total necrosis is found in the islets. The size of the islets is significantly reduced (more than 2 times) due to the decrease in the number of βcells.

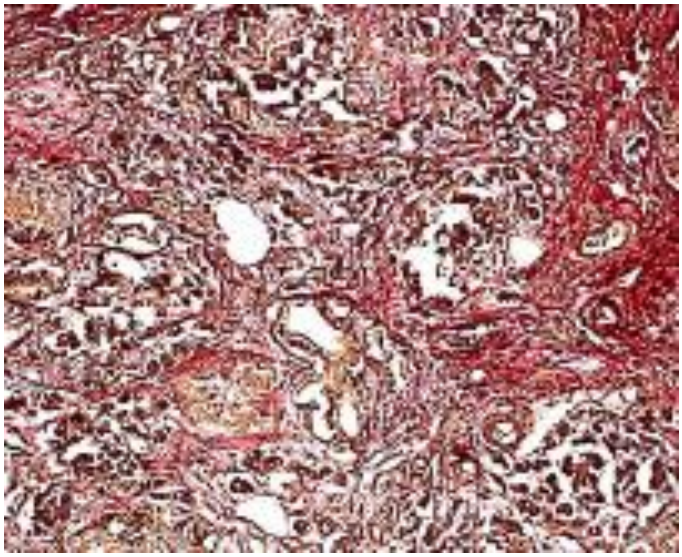

Fig. 5. Day 7 of the experiment. Focal changes and diffuse lymphoid infiltration of the pancreatic parenchyma. Hematoxylin and eosin. Magnification X 320.

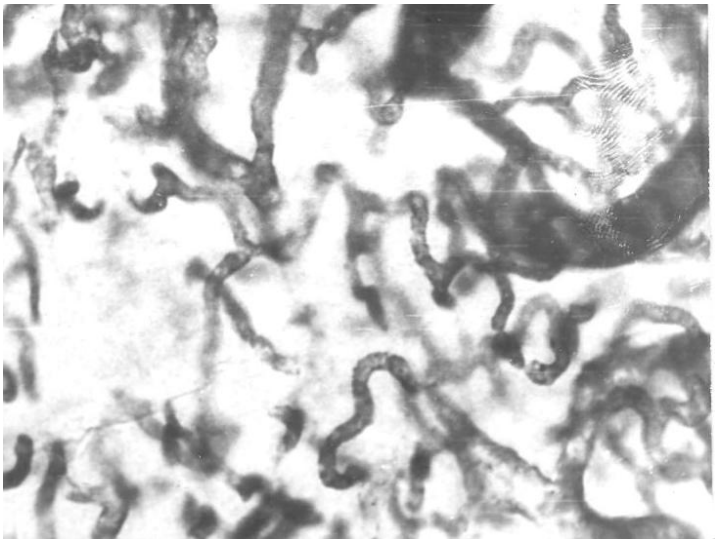

Fig. 6. 14th day after the introduction of heliotrin, uneven coloring due to the increase in the diameter of microvessels. Pouring with Gerota's mass. Uv. X 200.

In place of the disappearing β- zones of cells appear with lymphocyte infiltration and segmented neutrophils. Intensity and density of leukocyte infiltration from the prevalence and level of alternative processes. β- xuzhayralar ning necrobiosis va paranecrosis holatida bulgan joilarda infiltration fried kuchsiz rivojlangan.

In the acinar part of the pancreas, restorative processes were detected; the staining of the secretion in the lumen of the gland ducts ceased to depend on the diameter of the duct.

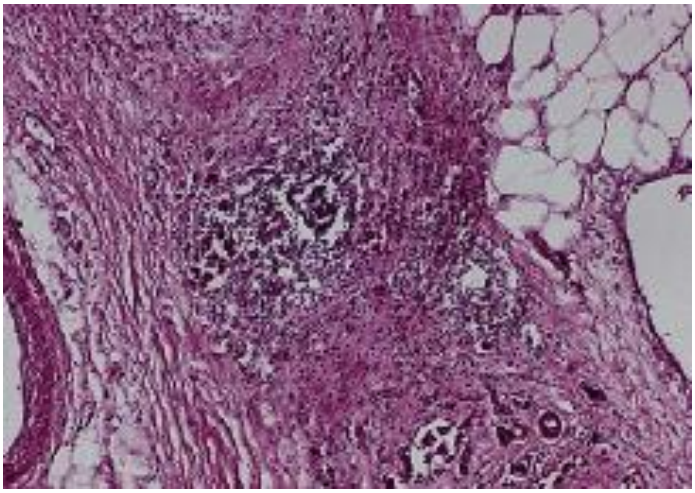

Fig. 7. Day 14 of the experiment. Appearance of inflammatory infiltration and hemorrhage foci. Hematoxylin-eosin. Magnification X 320.

On the 14th day, morphological restoration of the exocrine part was established, only in the insular part some changes were revealed. Determination of clear boundaries of the islets of Langerhans is associated with restoration A cells, no polymorphism was observed. The size of the islets is reduced by 2 times.

Conclusions

1. The microcirculatory bed of the exocrine pancreas consists of the classic 5 links: interlobular arterioles, intralobular (precapillary) arterioles, capillary network of acini, postcapillary (intralobular) venules, interlobular venules. Pancreatic islets are supplied with blood fundamentally by a different principle. The capillaries of the islets have more capillaries than in the acini. The capillaries of the islets continue into the peri - insular acinar capillaries and form dense insulin- acinose humoral connections.

2. After liver resection, the size of pancreatic microvessels increased more than 1.5 times. Intralobular hemorrhages and microthrombi in the vessels were observed. Foci of hemorrhage were observed in the islets of Langerhans.

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