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Morphofunctional Characteristics of Liver Tissue of White Rats

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Abstract: Liver morphogenesis of white-bred rats during prenatal development has regularly changing stages of human-like organ formation. Despite the large mass of the liver in rats, the presence of many liver lobes and the absence of a gall bladder, the microscopic structure of the rat liver and the cytophysiological characteristics of human hepatocytes are not fundamentally different. Taking this into account, it is considered convenient to carry out many experimental experiments on non-white rats.

Keywords: liver, rat, morphology, function, hepatocyte.

Relevance of the study. The liver is covered from the outside with a connective tissue capsule, which penetrates the liver parenchyma and forms a lumpy and lumpy structure. Only in the area of the portal tracts is the segmental appearance distinct. As in humans, fibrosis in rats is not separated by fibrous layers. The liver is the largest gland in non-white rats. The liver is located in the upper right part of the abdomen under the diaphragm. Liver has 2 surfaces: 1-diaphragm surface 2-visceral surface Diaphragm surface is flat and smooth and consists of 2 parts, right and left parts. On the visceral surface, the traces of neighboring azos are visible. On its lower surface you can see two sagittal and one transverse depressions. The transverse hepatic portal is considered to be the gate through which the portal vein, hepatic artery and nerve fibers enter the liver and exit through the lymphatic vessels and the common hepatic duct.

In front of the right sagittal slice lies the gall bladder, and in its posterior part lies the lower lid vein. The anterior left sagittal sulcus contains the round ligament of the liver, which, it should be noted, was the umbilical vein before the birth of the rat. These thoughts were expressed by Sapin V.A. and Bilic E.N. have also shown in their work [2010].

From the macroscopic appearance on the visceral surface, it is known that the liver of a white breed rat consists of the following four parts: - middle part; - left lobe; - square piece, - tail piece.

We can observe such distribution in the works of Aller et al., [2008] Treuting, Dintzis [2012]. Therefore, the obtained results are consistent with the information presented in modern scientific sources.

The liver is covered with a serous membrane from the outside. Under it is a thin and mature fibrous membrane, covered with a connective tissue capsule (Glisson's capsule) and a visceral layer. A spring is a structural and functional unit of the liver parenchyma with a hexagonal, prismatic shape. They are formed by interstitial sinusoidal blood capillaries and hepatic ducts. The follicles are separated from each other by thin layers of connective tissue, in which the hepatic triangle or portal tracts and sublobular vessels are located.

Portal leaflets are located at the top of the polygon and often define the borders of the bulb. They include branches of the portal vein, bile ducts, interlobular arterioles and lymphatic vessels. The central vein is located in the center of the lobe.

It turned out that the liver channels built from hepatocytes are located radially, in the direction from the periphery to the center of the lobules, blood capillaries surrounded by the Disse perisinusoidal space pass between them. The components of the blood plasma fall into this space. In pathological cases caused by various external influences, the formed elements can also fall into this place. Among the ranks of hepatocytes, there are bile capillaries that do not have their own wall. They are formed by

contiguous bile surfaces of hepatocytes. In the central part of the liver tract, grassy capillaries begin, which carry bile around the lobule.

Bile from the capillaries enters the terminal bile ducts, called Hering's cholangioma. They, in turn, flow into the interlobular bile ducts covered with cholangiocytes. Similar results were also obtained from Afanasev, Yurina [2012], confirming our research.

It was found that the blood supply to the liver comes from two sources - the portal vein, which brings blood from the organs of the gastrointestinal tract, and the hepatic artery, which brings blood from the aorta. These veins in the liver are divided into small veins. Interlobular artery and interlobular vein correspond to the lobule, they divide and become perilobular vein and artery. Around the lobular vessel, the artery merges to form sinusoidal capillaries.

It follows that the liver lobe receives mixed venous-arterial blood, which flows from the periphery to the center and collects in the central vein. After that, the blood returns to the general blood stream through the collecting vessels. Thanks to this, it is ensured that all the blood of the body passes through the liver in a short time. This idea is expressed in the scientific works of other authors who have done similar work [Bykov S.N., 2002].

Hepatocytes, which provide the main activity of the liver, undergo not only structural but also functional changes as a result of external influences, including drugs entering the body, and make up 60% to 80% of all cellular elements of the liver. It was observed that they are irregular, polygonal and often have two cores. Most of the cells are polyploid and have 1-2 nucleoids in the nucleus. It is shown that the cytoplasm of hepatocytes is granular, stained not only with acidic, but also with basic dyes and contains a large number of organelles. It has been established that most of the functions of the liver are performed by hepatocytes, and their strong mechanical connection between cells is carried out due to intercellular junction complexes, and we also recognize this. It should be noted that the cells located in the central and peripheral zones of the lobule differ in size, organoid development, and enzyme activity. Since the information about hepatocytes is given in detail by many other specialists and scientists [26], we did not find it necessary to dwell on them in detail.

Peripheral zone hepatocytes actively participate in the process of accumulation and detoxification of substances. Central zone cells are known to be more active in the process of excreting compounds. The cells lining the sinusoids include four different types. Endothelial cells are also known to line the sinusoids. They are characterized by the absence of a basement membrane and the presence of many fenestrae, which ensures the rapid exchange of nutrients and macromolecules with the surrounding environment.

Hepatocytes through the space of Disse absorb various molecules and particles involved in endothelial cells, as well as lipoprotein metabolism, by endocytosis.

Kupffer cells located in the liver are located in the spaces between endothelial cells or on their surface, they act as macrophages, they absorb antigens that enter the body and provide non-specific resistance. Garib F. Yu. and all. According to [2012] these cells serve as the "first echelon of defense". They have many processes that enter the space of Disse through the cytoplasm of endotheliocytes. These cells have high phagocytic activity and clean the blood from toxic particles, microorganisms and other foreign substances (antigens). They also provide the synthesis of a large number of important proteins, including a number of cytokines, hematopoietic factors, fibronectin, and erythropoietin. Their life span is 100 days.

Perisinusoidal lipocytes (Ito cells) are located in the space of Disse. In addition, there are long processes covering the sinusoids, and the organoids are poorly developed. In the cytoplasm in the process and around the nucleus, there are a large number of lipid droplets, in which vitamin A is stored. Ito cells transform into fibroblasts in response to liver injury.

Cholaniocytes form the bile duct epithelium. They have a basement membrane. There is no direct connection between blood and bile capillaries, as they are separated from each other by hepatocytes

and endothelial cells. Only in diseases associated with the death of liver cells, bile enters the blood capillaries [Afanasev, Yurina, 2012].

The boundaries of the sections are conditional lines between the portal tracts. Liver cells and hepatocytes are arranged in relatively regular rows within the lobes and form two rows of radial liver plates.

The transverse size of hepatocytes (the distance from the center of one hepatocyte nucleus to the center of the nearest nucleus of another hepatocyte nucleus) varies from 21.0 to 28.0 μm, on average - from 25.1 to 0.45 μm. They have a polygonal shape with clear boundaries. Cytoplasm is amphophilic, granular. In the perinuclear zone and on the side of the sinusoidal pole, against the background of a relatively pale cytoplasm, there is a fine-grained basophilic substance corresponding to the granular endoplasmic reticulum.

The indicators of the average cross-section of the cytoplasm of hepatocytes range from 403.0 mm2 to 731.0 mm2, the average - from 594.5 to 21.6 mm2. Hepatocyte nuclei are centrally located, contain one or two well-defined nucleoli, vary in size and shape, and are often round. Nuclei are usually located in the center of liver cells, but can be moved around them. Most of the hepatocytes are mononuclear, but there are also binuclear hepatocytes. Periportal hepatocytes are somewhat smaller, their nuclei are hyperchromic, and their cytoplasm is more basophilic.

The number of binuclear hepatocytes per 100 hepatocytes is in the range of 10-18, with an average of 0.72 compared to 14.2 hepatocytes. The cross-sectional indicators of hepatocyte nuclei of the control group of rats ranged from 102.0 mm2 to 143.0 mm2, the average - up to 119.4%, up to 2.58 mm2.

In the center of the liver lobes there are central veins, which are the primary connection of the liver veins. The diameter of the central veins is from 48.0 to 76.0 μm, the average is from 60.55 to 1.74 μm. Portal tracts are located around the lobes that contain the artery, vein, and bile duct.

The diameter of interlobular veins is from 22.0 to 36.0 μm, the average is from 30.1 to 00.870 μm.

These vessels give branches of very small diameter, which eventually pass into venules and are divided into branches of sinusoidal capillaries, which form a labyrinth-like vascular bundle of the liver lobe. Interlobular arteries give most of their branches to the blood supply of the bile ducts, participate in the formation of peribiliary bundles, the density of which increases as the diameter of the bile ducts increases.

The diameter of interlobular arteries ranges from 9.9 to 16.3 μm, with an average of 14.2 to 0.40 μm. A smaller part of the terminal arteries is involved in the formation of sinusoidal vessels (capillaries) passing into arterioles, the diameter of which is smaller than the diameter of the interlobular veins (by 2 times or more). They are located between the lobes of the liver.

Sinusoidal capillaries are directed mainly in the radial direction to the center of the lobes, they flow into the central vessels. These hemocapillaries have a cross-sectional size from 9.0 to 13.0 μm, with an average of 11 μm to 0.26 μm. One side of the hepatocyte faces the sinusoid (sinusoidal side), and the other side faces the neighboring hepatocyte, where bile capillaries are formed (bile side).

The bile ducts of the triad are covered with a single-layer cuboidal epithelium, the height of which is from 4 to 6 μm, the average is 4.77 μm, and the thickness is 0.17 μm. The size of bile ducts ranges from 16.0 to 35.0 μm, on average - from 22.5 to 1.18 μm. The parenchyma between the portal tracts and central vessels is represented by lobes consisting of two rows of liver cells.

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