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Histological Structure of the Liver and Its Role in Complex Functions

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Abstract: *This article provides information on the histological structure of liver cells, their classification, morpho-physiological, anatomical and topographic characteristics, as well as the function of certain liver cells in the body and their interrelationships. The article begins with a description of the digestive system and the role of the liver in it, the topography and functional relationship of its location with the digestive organs. Subsequent data provide a comprehensive understanding of liver cells, their quantitative and qualitative indicators, complex physiological function, as well as liver-related diseases and their causes, as well as the first preventive measures in their treatment.*

Keywords: Liver, hepatocyte, liver plates, enzymes, central vein, portal zone, Disse cavity, cholangiocid, chemicals.

Introduction. The digestive system plays an important role in continuously meeting the body's need for energy and building (plastic) materials. Because the internal environment of the body is constantly formed due to nutrition and its digestion. Digestion is a complex physiological process that undergoes complex physical and chemical effects in the digestive tract and is broken down into small particles that are absorbed from the stomach and intestines into the blood and lymphatic vessels. The members of the digestive system perform a variety of functions. Motor, secretory, and suction functions are key to these. While the muscles of the digestive system perform the motor (movement) function, allowing food to be chewed, swallowed, moved along the digestive tract, and excreted undigested food waste, the secretory glands are the digestive juices that provide the chemical breakdown of food: It is associated with the production of lacquer, gastric juice, pancreatic juice and bile. The mucous membranes of the stomach and intestines, on the other hand, are responsible for absorbing the broken down nutrients directly into the blood and lymph.

Main part. The liver plays an important role in the secretory function of digestion. The bile secreted by the liver emulsifies fats and facilitates their breakdown. Bile fluid contains primary bile acids, bile pigments, cholesterol, as well as Na, Ca, K, HNO_3 and other substances. Primary bile acids hall and xenodesoxychol are produced by liver cells — hepatocytes, and when they enter the intestine, secondary bile acids are converted to deoxychol and lithochols under the influence of the bacterial flora in the intestine.

The liver is a reddish-brown organ located below the diaphragm in the upper right corner of the abdomen and measures 1.5 kg in adults. The surface of the liver is divided into 3 areas; can be divided into upper, lower and back surfaces. Because the upper surface was directly below the diaphragm, it was smooth, while the lower and posterior surfaces formed pits of different sizes as the head of the abdomen touched other organs. In the middle of the lower surface is the hepatic portal cavity, through which the portal vein, arteries, lymph and nerve vessels enter, the bile ducts exit the hepatic veins. The coronal longitudinal liver protruding from the diaphragm is two notches; divided into large (right) and small (left) pieces. The surface of the liver is surrounded on the outside by a capsule with a serous membrane of connective tissue under it in the peritoneum [1].

The liver performs a number of important functions:

1. Exocrine function produces an emulsion of fats in the intestine and bile, which is necessary to enhance gastrointestinal peristalsis;
2. Hemoglobin metabolism— Obsolete erythrocytes are broken down by macrophages in the liver, and the iron-storing part accumulates in liver cells and is used to form new erythrocytes. The protein is converted to bilirubin and added to the bile;
3. Detoxification of metabolic toxins, ensures the absorption of drugs;
4. Cleanses the blood of microorganisms and foreign substances (stellar macrophages);
5. Synthesizes plasma proteins — fibrinogen, albumin, prothronbin, etc .;
6. Collects blood in reserve (up to 1.5 liters);
7. Glycogen (in hepatocytes), fat-soluble vitamins — A, D, E, K are stored;
8. Participates in cholesterol metabolism;
9. During embryonic development, it acts as a blood-forming center.

The liver can be considered the central laboratory of the organism. It is estimated that more than 1,500 chemical reactions take place per minute. One-third of the circulating blood circulating in the body is in the liver. Blood flows more slowly

through the liver than other organs. In the walls of the large branches of the hepatic veins are annular muscle valves, which, when contracted, slow the outflow of blood from the liver and fill the liver with blood. The relatively slow flow of blood through the liver allows biochemical reactions to proceed more fully. All biochemical processes take place in the cytoplasm of liver tissue cells and in the intercellular spaces [4].

Table 1
CLASSIFICATION OF LIVER CELL COMPOSITION

№	The name of the liver cell	Percentage of cellular composition (%)
1	Hepatocytes	60-80
2	Cholangiocides	5-10
3	Macrophages (Kupfer cells)	10
4	Pit cells	2-5
5	Ito-cells	3

As shown in the table, the majority of liver cells are hepatocytes (60-80%). Hepatocytes are morphologically diverse, multifaceted epithelial cells with a diameter of 13 to 30 μm (average 25 μm). More than 20% of hepatocytes have two or more nuclei, granular and smooth endoplasmic reticulum in the cytoplasm, the Golgi apparatus is very well developed; the number of mitochondria is large, all of which indicate a rapid increase in metabolism and synthesis in hepatocytes [2]. In hepatocytes, there are two vascular (sinusoidal hemocapillary surface) and biliary (bile duct surface) surfaces. There are many microvilli on the surface of hepatocytes that expand the contact surface of the hepatocyte with the sinusoidal hemocapillaries. Cholangiocides are also epithelial cells that make up 5-10% of the cellular structure. They cover the grass paths from the outside and inside. In the secretion of bile, it plays an important role in the synthesis of cytokines and other mediators that affect the function of immune cells in the inflammatory focus. Cholangiocides are formed from non-specialized hepatocytes and can turn into mature hepatocytes. Stellate macrophages (Kupfer cells) make up 10% of liver cells, protecting foreign substances in the blood by phagocytosis. Pit (patch cells) make up 2-5%, belong to granular lymphocytes and have secretory granules. Capillaries surround the perisinusoidal space (to filter the blood with hepatocytes) and store fat-soluble vitamins, Ito cells (fat-accumulating cells) make up 3%, and contain A and other fat-soluble vitamins[6].

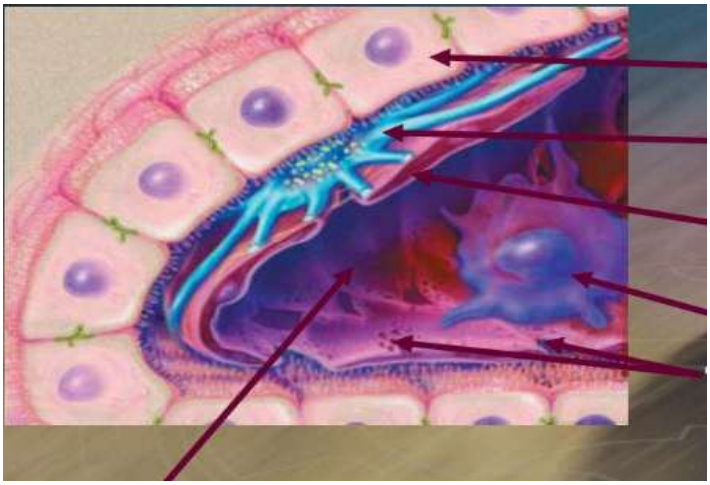

Figure 1. The structure of liver cells.

The serous membrane that surrounds the surface of the liver sinks into it and divides the liver parenchyma into many small pieces (lobes of the liver). Liver fragments are a unit of morpho-functional structure of the liver. Although fragments are not clearly visible in the human liver, we can see that in some animal (e.g. pigs) liver preparations, the fragments are in the form of a hexagonal prism. This is due to the relatively weak development of interstitial connective tissue in the human liver. There is a central vein in the middle of the segment and an interstitial portal zone at each corner. In a radial direction from the central vein to the periphery of the compartment, hepatocytes are arranged in two rows, forming liver plates. The plates prevent blood and saffron fluids from mixing with each other. The bile ducts pass between the plates and the sinusoidal hemocapillaries at both ends. Hepatocytes absorb the nutrients absorbed in the hemocapillaries, converting them into metabolic components or final unused products, adding them first to the blood and bile, and finally to the bile. The directions of motion of these fluids are perpendicular

to each other. There is no special wall of the bile ducts, bordered on both sides by hepatocytes. It should be noted that the bile capillaries are released from the part of the hepatocyte line near the central vein and directed to the periphery.

The diameter of the bile capillaries widens near the peripheral part of the segment, forming the Herring's canal. This duct is lined with single layers of hollangiocytes. Once the canal reaches the portal zone, it continues into the intergranular bile ducts. In turn, they join together to form larger networks and exit the liver through the portal vein. In the portal zone, there is an interstitial triad surrounded by connective tissue. The triad consists of three elements: the portal vein and artery, which enters the compartment, and the capillaries of the bile ducts, which exit. The portal veins and arteries extend within the segment between the hepatic plates and continue in the form of sinusoidal hemocapillaries. In the sinusoids, arterial and venous blood mix.

The structure of the sinusoidal capillaries shows one of the signs of the liver's ability to adapt to complex tasks. The sinusoidal wall consists of a ring-shaped basal membrane surrounded by endothelial and reticular fibers. Between the sinusoidal and hepatic plates is the Disse cavity (perisinusoidal cavity).

The incompleteness of the wall allows blood plasma to pass into a narrow space. In this space, hepatocytes communicate with the plasma by means of numerous microvilli on the surface, and metabolism takes place between them; plasma substances are absorbed into the cytoplasm of hepatocytes; secretory products of hepatocytes are released into the plasma. It also recognizes old erythrocytes in the blood through the receptors of stellar macrophages (Kupfer cells) adjacent to endothelial cells in the wall of the sinusoidal capillaries, phagocytoses, binds to iron ferratin protein in the erythrocytes and accumulates in the cells to form new erythrocytes. is spent. Ito cells located in the perisinusoidal space accumulate A and other fat-soluble vitamins and form myofibrils when the liver is injured, as well as produce cytokines that activate Kupfer cells [3].

Blood from the portal vein and artery passes through the sinusoid and flows into the central vein. When the central vein emerges from the septum, it joins together to form the septal vein, which is larger, and exits the liver through the portal vein and drains into the inferior vena cava.

Failure to lead a healthy lifestyle, poor diet, drinking large amounts of carbonated beverages, taking long-term medications, regular alcohol consumption, smoking, drug use Acute inflammation of the liver ish leads to cirrhosis of the liver. Cirrhosis of the liver is caused by the destruction of hepatocytes, the main causes of which are viral hepatitis (types B, C, D), long-term alcohol consumption; Moderate causes of the disease include disorders of the immune system (mostly autoimmune diseases), various diseases of the biliary tract, such as gallstones, sclerosing cholangitis, portal hypertension, circulatory disorders in the limbs, and venous blood stasis; Examples of rare causes are hereditary diseases (glycogen accumulation anomalies, Wilson-Konovalov disease, chemicals that have toxic effects on the body, such as industrial poisons, heavy metal salts, aflatoxins, long-term use of hepatotoxic drugs [5].

The danger of liver disease is that they develop slowly and almost without symptoms, and only when they reach a very high level do the patient begin to experience adverse conditions. This can be explained by the fact that the liver tissue consists mainly of epithelial cells with good dividing capacity, and as the disease progresses, the epithelial tissue is gradually replaced by connective tissue. That is, when the liver begins to be damaged, the damaged cells are replaced by new ones, but as a result of this process, the Ito cells around the damaged hepatocytes become myofibrillar fibers and begin to form fibrosis and attach to the epithelial cells. the cells increase in size. Fibrosis, on the other hand, gradually progresses to cirrhosis. This causes the liver's biochemical reactions to stop.

Conclusion. It is important to pay attention to the composition of the daily diet to prevent liver disease. It is recommended to eat less fried fatty foods. Excess fat builds up in the liver, squeezing the small capillaries. This complicates blood circulation and leads to metabolic disorders. Products rich in vitamins and minerals, greens, vegetables, fruits should be the main part of the diet, as well as the daily consumption of water should not be less than 1.5-2 liters. Ethanol in alcohol gradually neutralizes various chemicals in various drugs as it enters the liver and is neutralized. Given that liver disease develops slowly and with almost no symptoms, it is advisable for everyone to see a doctor from time to time. Because early detection and prevention of the development of the disease is the most effective method of treatment of the disease compared to any drugs and surgical procedures.

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