

# **FEATURES OF COLLATERAL CIRCULATION OF THE LIVER AFTER DISCONNECTION OF LOBAR ARTERIES IN THE BACKGROUND OF MODELING A NUMBER OF PATHOLOGICAL STATES**

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**Abstract:** The article studies the features of collateral circulation of the liver after disconnection of lobar arteries in the background of modeling a number of pathological conditions. Collateral circulation of the liver after disconnection of the main trunk of the hepatic artery, as well as its lobar or intramural branches, was studied in morphological aspects against the background of an intact, practically “healthy” liver, which is not adequate to clinical conditions.

**Keywords:** dog, liver, blood flow, artery, necrosis, blood circulation, nerve plexus, hepatitis, lobar artery.

## **ОСОБЕННОСТИ КОЛЛАТЕРАЛЬНОГО КРОВООБРАЩЕНИЯ ПЕЧЕНИ ПОСЛЕ ВЫКЛЮЧЕНИЯ ДОЛЕВЫХ АРТЕРИЙ НА ФОНЕ МОДЕЛИРОВАНИЯ РЯДА ПАТОЛОГИЧЕСКИХ СОСТОЯНИЙ**

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**Резюме:** В статье изучены особенности коллатерального кровообращения печени после выключения долевых артерий на фоне моделирования ряда патологических состояний. Коллатеральное кровообращение печени после выключения основного ствола печеночной артерии, а также её долевых либо интрамуральных ветвей изучалась в морфологических аспектах на фоне

интактной практически «здоровой» печени, что не адекватно клиническим условиям.

**Ключевые слова:** собака, печень, кровоток, артерия, некроз, кровообращение, нервное сплетение, гепатит, долевая артерия.

**Introduction.** Abdominal trauma with internal organ damage significantly contributes to the overall injury profile [2]. Abdominal trauma is characterized by multiple injuries, significant blood loss, high mortality rates, and frequent postoperative complications [3]. One of the primary sources of bleeding in abdominal trauma is liver injury [1]. The volume of blood loss and the time required to achieve hemostasis from liver wounds are among the limiting factors in efforts to save the lives of patients with severe combined trauma [4,5]. Therefore, developing a rapid and reliable hemostasis method for liver injuries, determining indications for its use, and establishing a surgical algorithm are potential solutions to this critical issue.

**Study Objective.** We investigated the characteristics of collateral blood flow in the liver after ligation of lobar arteries under conditions modeling various pathological states.

**Materials and Methods.** To study collateral blood flow in the liver under pathological conditions, we ligated both lobar arteries in 10 dogs with experimentally induced hepatitis or portal hypertension. Experimental hepatitis was induced by subcutaneous administration of a carbon tetrachloride (CCl<sub>4</sub>) solution in olive oil at intervals of 48 hours, at a dose of 0.6 ml per kg of body weight.

**Results.** Before the administration of CCl<sub>4</sub>, the dogs' blood parameters were as follows: total bilirubin 0.8 mg%, direct bilirubin undetectable, indirect bilirubin 0.7 mg%, residual nitrogen 21 mg%, total serum protein 6.77%, albumin 60.89%, globulins  $\alpha$  20.0%,  $\beta$  13.42%,  $\gamma$  5.757%, albumin-globulin ratio 1.4 cm<sup>3</sup>. After 15–17 injections, total blood protein decreased to 5.25%, albumin levels dropped to 53.48%, globulins increased to 27.9%, residual nitrogen rose to 30 mg%, and the

sublimate test became positive at 1.2 cm<sup>3</sup>. In this context, in two dogs, the lobar arteries supplying the left lateral and medial lobes were ligated. Postmortem roentgenangiograms revealed clear avascular zones in the affected lobes. To improve collateral blood flow in the liver under hepatitis conditions, we simultaneously ligated two lobar arteries and removed the periadventitial nerve plexus along the entire length of the hepatic artery trunk, as well as performed extirpation of the right semilunar ganglion of the celiac plexus. These combined arterial and neural interventions were performed in three dogs after 15–17 CCl<sub>4</sub> injections. However, no significant positive effect of denervation on collateral blood flow development was observed. For instance, preoperative biochemical parameters in one dog with hepatitis were as follows: protein fractions – albumin 31.46%, globulins 24.573%,  $\beta$  2.870%,  $\gamma$  24.574%, total bilirubin 0.6 mg%, residual nitrogen 36 mg%, sublimate test 1.4 cm<sup>3</sup>, cholesterol 220 mg%. Similar blood changes indicative of hepatitis were observed in two other dogs. In these conditions, ligation of two lobar arteries combined with removal of the hepatic nerve plexus (as in the previous group) led to extensive necrosis of the left medial and lateral liver lobes in three dogs. The data indicate limited possibilities for developing collateral blood flow in the liver after ligation of two lobar arteries under conditions of pronounced experimental hepatitis, as well as minimal impact of hepatic nerve plexus removal on collateral blood flow development. In other experiments, a model of subhepatic portal blood flow obstruction was created in four dogs by stenosing the portal vein. Portal pressure was measured via phlebotonometry in one of the mesenteric veins before and after stenosis. In one dog, pre-stenosis pressure was 56 mm H<sub>2</sub>O, increasing to 120 mm H<sub>2</sub>O after 50% stenosis of the portal vein lumen. A repeat laparotomy after 7 days showed a pressure reduction to 100 mm H<sub>2</sub>O. The dog died 4 days later. At autopsy, macroscopic examination revealed delicate adhesions between the greater omentum and the ventral abdominal wall, the diaphragmatic surface of the liver and the diaphragm, the liver and the duodenum, and between intestinal loops. The

liver was congested, with the two ischemic lobes appearing flabby and exhibiting grayish areas with necrotic decay. Roentgenangiograms showed avascular zones in these lobes, while adjacent lobes displayed well-injected intraorgan arterial branches. In other dogs, the plasticity of liver vessels was studied after ligation of two lobar arteries supplying the left medial and lateral lobes under conditions of complete subhepatic portal blood flow obstruction. In one dog, the first stage involved 50% stenosis of the portal vein trunk. The dog died after 3 days. Autopsy revealed extensive necrotic areas in the ischemic liver lobes, confirmed by roentgenangiograms and histological preparations. Notably, spontaneous adhesions formed between the greater omentum and the ventral abdominal wall and liver, as well as between the liver and diaphragm, resulting in spontaneous omentohepato-diaphragmopexy. However, this did not prevent the development of necrosis. Roentgenangiograms showed only solitary and very small vessels in these adhesions.

**Conclusion.** Summarizing the results and comparing our experiments, it should be noted that collateral blood flow in the liver, sufficient in an intact, nearly “healthy” liver after ligation of two adjacent arteries, was inadequate in all described cases. This should be considered when addressing the still-debated issues regarding the appropriateness of ligating hepatic artery branches and manipulating extreme hepatic nerve plexuses in the treatment of various liver pathologies.

#### **REFERENCES| ЧОККИ | IQTIBOSLAR:**

1. Abdullaeva, D. R., Ismati, A. O., & Mamataliev, A. R. (2023). Features of the histological structure of extrahepatic bile ducts in rats. *Golden brain*, 1(10), 485-492 (in Russ).
2. Mamataliev, A., & Oripov, F. (2021). Histological structure of the intramural nervous apparatus of the common bile duct and gallbladder in a rabbit, in norm and after gallbladder removal. *Journal of Biomedicine and Practice*, 1(3/2), 117-125(in Russ).

3. Mamataliev, A. R., Tukhtanazarova, Sh. I., Zokhidova, S. Kh., Omonov, A. T., & Rakhmonov, Sh. Sh. Anatomical and topographic structure and active contraction of the walls of the portal vein of laboratory animals. Academic research in modern science, (2024). 3(30), 163-168(in Russ).
4. Satybaldiyeva, G., Minzhanova, G., Zubova, O., Toshbekov, B., Rasulovich, M. A., Sapaev, B., ... & Khudaynazarovna, T. I. Behavioral adaptations of Arctic fox, *Vulpes lagopus* in response to climate change. Caspian Journal of Environmental Sciences, (2024); 22(5): 1011-1019.
5. Mamataliev, A. R. (2024). Nervous apparatus of extrahepatic bile ducts in rabbit after experimental cholecystectomy. International journal of recently scientific researcher's theory, 2(4), 161-165(in Russ).