

Comparative Morphological and Morphometric Changes in the Gallbladder Wall of Dogs and Rabbits in Conditions of Experimental Calculus and Inflammatory Cholecystitis

Boboev Askar Ibodullaevich*, Oripov Firdavs Suratovich

Samarkand State Medical University, Siab College of Public Health Named after Abu Ali Ibn Sina, Samarkand, Uzbekistan

Abstract This article presents a model of experimental calculous cholecystitis in mammals. The morphology and morphometric data of different layers of the gallbladder wall are described. The results of the study showed that the morphometric parameters of the mucous, muscular-fibrous layers in rabbits and dogs of the experimental group were significantly higher than in animals of the control group. It was found that the gallbladder in the experimental group was significantly thickened compared to the control group of animals. This is a reaction of the gallbladder wall in response to calculous cholecystitis, as a result of which inflammatory processes develop, caused by the mechanical action of stones on the gallbladder wall. The data given in the article can serve as the necessary information for doctors to make a timely diagnosis and choose the right tactics for treating patients with such pathological processes. At the same time, it helps to prevent postoperative complications and properly conduct the rehabilitation process.

Keywords Experimental animals, Hepatobiliary system, Calculous cholecystitis, Gallbladder, Morphological changes

1. Introduction

According to statistics from the World Health Organization, various pathological conditions of the hepatobiliary system occur in people aged 15 to 95 years, and gallstones occur in one in ten thousand of the world's population. This pathological process is more common in men over forty years old, but the results of research by scientists show that this disease is getting younger every year. Changes and problems that occur in the liver and gallbladder as a result of this pathology attract the attention of many researchers. Scientists studied the structure and function of the liver in experimental hepatitis in dogs [3], morphological changes in the liver in acute cholecystitis [20], obstructive jaundice, acute cholangitis, biliary sepsis and their pathogenetic relationship, principles of differential diagnosis [9], morphology of nervous structures of the common bile duct [11], age-related features of morphological changes in the membranes of the gallbladder in acute cholecystitis [19], comparative morphology of the liver and gallbladder of humans and laboratory animals [17] were studied. Some researchers studied the bacterial flora and histological structure of choledocholithiasis in patients with choledocholithiasis and cholangitis [5], the morphological structure and

correction of the liver in cholelithiasis [14], morphological changes in cholelithiasis in chronic cholecystitis [6], the formation of cholelithiasis in children, observed the frequency incidence of anomalies of the gallbladder in Gilbert's syndrome [15], differences in the conservative or surgical treatment of gallstone disease in young children [16], morphological changes in gallstones [1]. Investigators analyzed the morphological features of benign gallbladder tumors [12], the sonographic assessment of cholesterol gallstones in the general population [10], age-related anatomical features of the liver and gallbladder in adolescents and adults [22], and morphological features were determined. esophagogastroduodenal region in individuals with cholecystectomy [8,18]. Other scientists studied the specific effect of laser light on the morphology of the liver and biliary tract in cholelithiasis [23], morphological changes in the liver in calculous cholecystitis in overweight people [21], the interaction of inflammatory mediators and morphological changes in the gallbladder in destructive form of cholecystitis. Researchers [4,7] noticed that each type (form) of calculous cholecystitis has its own morphological features. Scientists have established complications in the biliary tract after cholecystectomy [13], functional and morphological changes in the liver in experimental acute obstructive cholestasis [2,18]. The results of the study of experimental studies conducted in the clinic and on mammals show that diseases of the biliary system have not been studied enough, and this, in turn, remains an urgent

* Corresponding author:

asqarboboyev4@gmail.com (Boboev Askar Ibodullaevich)

Received: Oct. 3, 2023; Accepted: Oct. 17, 2023; Published: Oct. 20, 2023

Published online at <http://journal.sapub.org/ajmms>

problem for practical and theoretical medicine. These data show how common the pathology of the liver, gallbladder and biliary tract is among the population, and it remains one of the unresolved urgent problems of medicine. Various internal and external factors can cause morphological changes in the morph functional structure of the gallbladder. The scientific research that we set ourselves is aimed at studying the little-studied aspects of this problem.

2. Material and Methods

The gallbladder of dogs and rabbits was taken as material. Experimental animals were studied in two groups. The first group consisted of [7] dogs and [8] rabbits in the control group. The second group of animals was an experimental group of [14] dogs and [16] rabbits and was called a model of calculous cholecystitis. To do this, the animals of the experimental group were surgically opened the gallbladder under anesthesia and poured 4-6 non-sterile stones into it. Animals in the control group were surgically opened and again sutured under anesthesia. Animals of both the control and experimental groups were kept under the same vivarium conditions. Animals of both groups were euthanized under anesthesia one month after the operation. When looking for gallstones in the animals of the experimental group, stones were found in the common bile duct, and in some animals even in the intestines. Gallbladder material obtained from slaughtered animals was fixed in 12% formalin and embedded in paraffin to prepare histological sections. The resulting sections were stained with hematoxylin-eosin and the Van Gieson method. The thickness of the layers of the gallbladder wall was measured using an optical ruler, and the obtained digital data were subjected to statistical processing.

3. Results Research

The gallbladder (vesica fellea) is elongated pear-shaped. It has a base, body, funnel and neck. The length of the gallbladder is about 10 cm, and its base reaches the anterior edge of the liver. The gallbladder is one of the important

organs of the digestive system, it collects and condenses the bile produced by the liver. When food is eaten, the fluid secreted from the gallbladder enters the duodenum and activates the enzymes involved in the digestion of food, breaking down the fats contained in it. The body contains about 50-80 ml of fluid and fluid. If there are no problems with digestion, the gallbladder is also actively working. Otherwise, bile, i.e. serum, can accumulate in it, stone formation and other diseases can occur. Mucous, muscular-fibrous, adventitial (serous, covering only the lower surface) membranes are isolated on the wall of the gallbladder. The mucous membrane of the gallbladder consists of a special plate, consisting of epithelium and connective tissue, formed by multi-branched folds. The mucous membrane of the bile ducts located outside the gallbladder and liver is covered with a single-layer prismatic epithelium with a cuticular border in the apical part, and the nuclei of these cells are located in the basal part. Among the prismatic cells of the epithelium of the mucous membrane there are goblet cells, and in the region of the neck of the bladder there are mucous glands. The proper layer consists of loose fibrous irregular connective tissue rich in blood vessels. The muscular-fibrous membrane of the gallbladder consists of bundles of smooth muscles directed in different directions. In the region of the body of the gallbladder, the muscles are located longitudinally, and in the cervical part - along the circumference. Between the muscle fibers are layers of connective tissue. The gallbladder is surrounded by an adventitial membrane, consisting of loose fibrous irregular connective tissue that contains large blood vessels and nerves.

The gallbladder walls of rabbits and dogs consist of mucosal, musculoskeletal, and adventitial layers lined with a single layer of prismatic epithelium, like the human gallbladder. In dogs and rabbits of the experimental group, swelling and thickening of the gallbladder wall, foci of leukocyte infiltration can be observed. Animals of the experimental group are characterized by the presence in the walls of the gallbladder, fibrosis and foci of inflammatory infiltration, and therefore there is a significant thickening of the wall of the gallbladder compared to the animals of the control group. (Fig. 1.2).

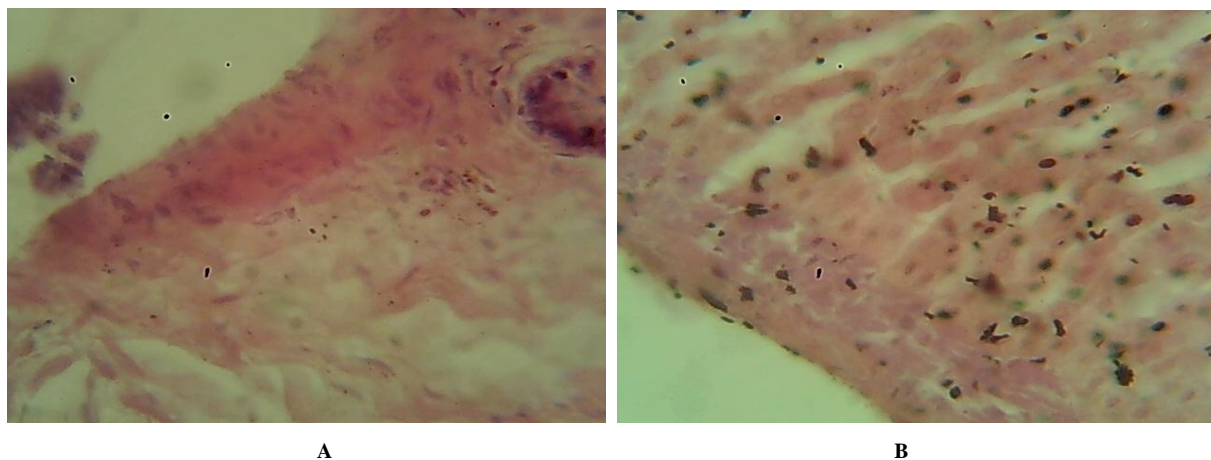


Figure 1. The structure of the gallbladder wall of control animals. A-with both; B rabbit. Hematoxylin-eosin staining. Ok. 7, vol. 40

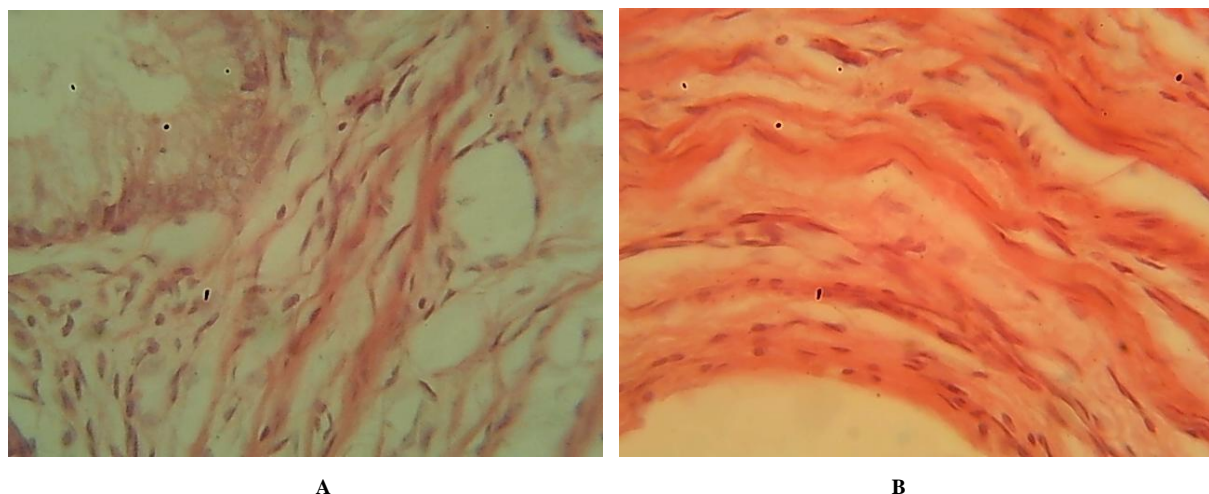


Figure 2. The structure of the gallbladder wall of animals of the experimental group. A-with both; B rabbit. Hematoxylin-eosin staining. Ok. 7, vol. 40

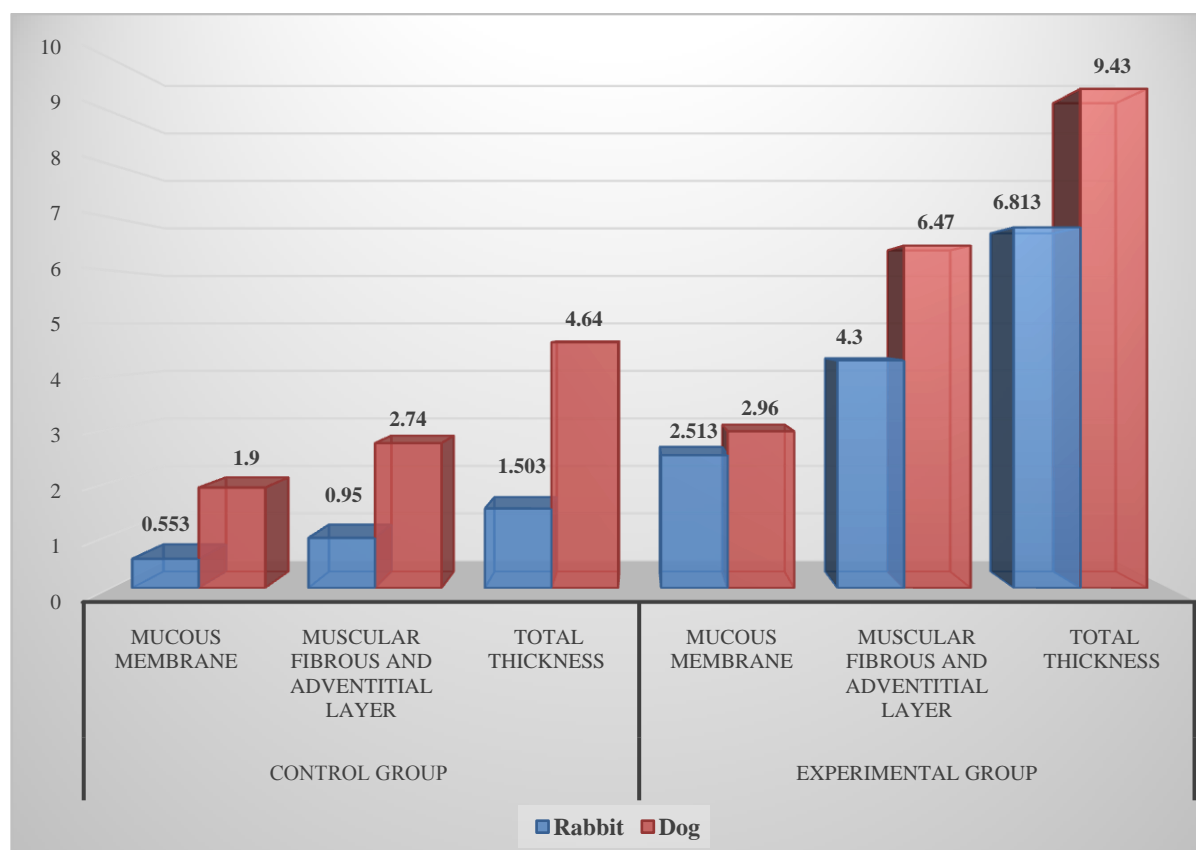


Figure 3. Comparative morphometric parameters of the gallbladder wall of mammals in the control and experimental groups

When studying the wall thickness separately in the section of the layers of the gallbladder of dogs and rabbits, the thickness of the mucous membrane in the control group of dogs was 1.9 ± 0.02 (relative value), and in rabbits 0.553 ± 0.03 . These data in the experimental group of dogs was 2.96 ± 0.04 , and in experimental rabbits 2.513 ± 0.04 (arb. units). When jointly measuring the thickness of the muscular-fibrous and adventitial layers, these indicators were 2.74 ± 0.03 in dogs of the control group, and 0.95 ± 0.02 in rabbits, respectively, and in dogs of the experimental group 6.47 ± 0.07 and in rabbits 4.3 ± 0.06 ,

respectively. The total thickness of the gallbladder wall in dogs of the control group was 4.64 ± 0.05 , in rabbits 1.503 ± 0.07 . This indicator in the experimental group of animals was 9.43 ± 0.06 (in dogs) and 6.813 ± 0.08 (in rabbits) (Fig. 3).

As can be seen from these data, the morphometric parameters of the mucosa and muscular fibrous membranes in dogs of the experimental group are twice as thick as in animals of the control group, and in rabbits of the experimental group, these parameters are 4-5 times greater than in rabbits of the control group.

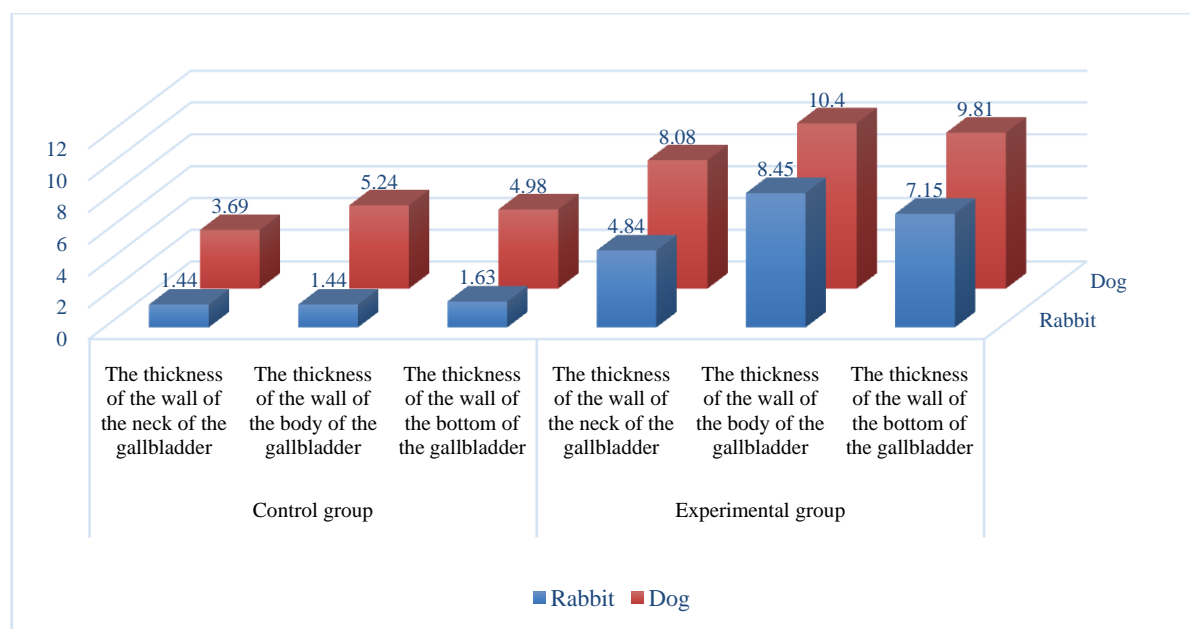


Figure 4. Comparative morphometric parameters of different parts of the gallbladder wall in mammals

When conducting a morphometric study of the thickness of the neck, body and base of the gallbladder of dogs and rabbits, we obtained the following results. The wall thickness of the gallbladder neck in dogs of the control group was 3.69 ± 0.10 , in rabbits 1.44 ± 0.05 , in dogs of the experimental group 8.08 ± 0.27 and in rabbits of the experimental group 4.84 ± 0.12 respectively. In the area of the body of the gallbladder in dogs of the control group, this indicator was 5.24 ± 0.16 , in rabbits 1.44 ± 0.03 , and in dogs of the experimental group 10.40 ± 0.17 and 8.45 ± 0.25 in rabbits, respectively. The thickness of the bottom of the gallbladder in dogs of the control group was 4.98 ± 0.10 and 1.63 ± 0.03 in rabbits, and in dogs of the experimental group 9.81 ± 0.15 and in rabbits 7.15 ± 0.14 (units) (Fig. 4).

The above results show that in animals of the experimental group, compared with the control group, the neck of the gallbladder in dogs was twice as thick, and in rabbits - three times. The body of the gallbladder was twice as thick in dogs of the experimental group compared to the control group, and in rabbits this figure was six times greater. It was shown that in the area of the bottom the thickness of the bottom of the gallbladder in dogs of the experimental group is twice as thick as in dogs of the control group, and in rabbits of the experimental group it is four times thicker than in the control group of rabbits.

4. Conclusions

With experimental calculous cholecystitis in experimental rabbits, the morphometric parameters of the mucous and muscular-fibrous layers, as shown by statistical data, in rabbits of the experimental group, the thickness increases by 4-6 times, and in dogs only twice. When comparing the thickness of different sections of the gallbladder separately

in rabbits of the experimental group, a thickening of 3-6 times is also noted, but in dogs it is twice as compared with the control group of animals. The results of the study showed that the morphology of the gallbladder wall changes to varying degrees in experimental cholelithiasis in rabbits and dogs, which is most likely due to the nature of the nutrition of the above animals.

REFERENCES

- [1] Akhmedov F.Kh., Zhumaeva M.M. Morphological changes in cholelithiasis // EURASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES Volume 2 Issue 12, November 2022 pp. 274-282.
- [2] Belyaev A.N., Kozlov S.A., Belyaev S.A., Kostin S.V., Derbedeneva O.A. Functional and morphological disorders of the liver in acute obstructive cholestasis and their correction (experimental study) // Annals of Surgical Hepatology, 2014, volume 19, No. 4, pp. 64-70.
- [3] Bluger A.F., Kormashova O.Ya. Some data on the structure and function of the liver in dogs with hepatitis. // Issues of infectious pathology. Riga-1962-issue. 1-C. 27-31.
- [4] Boboev A.I., Oripov F.S. Morphofunctional characteristics of the wall of the gallbladder and parenchyma of the liver in experimental obstruction of the common bile duct // Problems of biology and medicine 2022, No. 4 (137), pp. 269-272.
- [5] Borodach V.A., Shtofin S.G., Borodach A.V., Popov A.L., Oleinikova A.T., Morozov D.V., Sudovykh I.E., Ilyina V.N. Bacterial flora and histological structure of the common bile duct in patients with choledocholithiasis and cholangitis. // Annals of Surgical Hepatology, 2006, Volume 11, No. 1, S. 54-59.
- [6] Bystrov S.V., Gorkh P.I., Chiriev A.I., Alipov V.V., Ivchenko

- A.O., Ivchenko O.A., Gavrilin E.V. Morphological features of the course of chronic cholecystitis in cholelithiasis // Issues of reconstructive and plastic surgery No. 4 (55) December 2015 P. 43-46.
- [7] Vervekina T.A., Magrupov B.A., Ubaidullaeva V.U. The relationship of morphological changes in the structure of the gallbladder and inflammatory mediators in destructive forms of cholecystitis // Shoshilinch tibbiyot axborotnomasi, 2015, No. 3, pp. 17-21.
- [8] Graushkina E.V., Kozlova I.V., Kvetnoy I.M. Clinical and morphological features of the esophagogastroduodenal zone in persons with no gallbladder // Medical science and education of the Urals No. 1/2009, pp. 12-17.
- [9] Datsenko B.M., Borisenko V.B. Obstructive jaundice, acute cholangitis, biliary sepsis: their pathogenetic relationship and principles of differential diagnosis // News of Surgery. Volume 21. No. 5. 2013. S. 31-39.
- [10] De S.N. Sonographic assessment of cholesterol gallstones of its subtypes and biliary ascariasis among Indian patients // Medical education today 3(7). 2019, pp. 13-17.
- [11] Dekhkanov T.D., Khamraev A.Kh., Dekhkanova N.T. Morphology of the nervous structures of the common bile duct // XX International Scientific and Practical Conference | ICNS "SCIENCE AND EDUCATION". pp. 179-182.
- [12] Ibraimova N.P. Morphological features of benign diseases of the gallbladder // Avicenna No. 83, 2021, pp. 27-29.
- [13] Katanov E.S., Anyurov S.A., Moskvichev E.V., Krasnova A.V. Biliary complications after cholecystectomy // Acta medica Eurasica. 2016. No. 1, pp. 14-22.
- [14] Kashaeva M.D. Changes in liver morphology in patients with cholelithiasis and their correction // Electronic scientific and educational bulletin "Health and education in the XXI century" No. 10, 2008 (T. 10). pp. 430-434.
- [15] Klepikova T.A., Votyakova O.I., Chekalova A.A., Shemanaeva E.V. Formation of gallstone disease in a child with Gilbert's syndrome and anomaly of the gallbladder // Bulletin of the Ivanovo Medical Academy T.19, No. 4, 2014 P. 69-71.
- [16] Lupash N.G., Shakaryan K.A., Matalaeva S.Yu., Kharitonova L.A. Gallstone disease in young children - treat conservatively or promptly // Russian Bulletin of Perinatology and Pediatrics, 2018; 63: (4) pp. 63-68.
- [17] Muzhikyan A.A., Zaikin K.O., Gushchin Ya.A., Makarova M.N., Makarov V.G., Comparative morphology of the liver and gallbladder of humans and laboratory animals // International Bulletin of Veterinary Medicine No. 4 2017. pp. 117-129.
- [18] Oripov F.S., Turdiev L.U. Adrenergic innervation of the liver of rabbits in normal conditions and during experimental cholecystectomy. // Thesis. report. congress of young medical scientists and doctors of Uzbekistan. Volume II, Andijan, 1991 pp. 397-398.
- [19] Polyansky M.B., Nazarenko D.P., Ishunina T.A. Age aspects of morphological changes in the membranes of the gallbladder in acute cholecystitis // Morphological journals. 2017. 25(3): 52-54.
- [20] Sadrididinov A.F. Morphological changes in the liver in acute cholecystitis. // Adaptive processes of the digestive organs in clinical and experimental conditions. Tashkent, 1974. S. 170-171.
- [21] Semerikova N.A., Freind G.G., Popov A.V., Palatova L.F., Ershova A.I. Features of morphological changes in the liver in people with overweight and calculous cholecystitis // Siberian Medical Journal, 2011, Volume 26, No. 4, Issue 2, P. 154-156.
- [22] Chaplygin E. B. Somatotypological patterns of anatomical variability liver And gall bubble at of people youthful And first period mature age // Abstract, Volgograd 2009.
- [23] Shamirzaev B.N. Structural and functional bases of laser effects on the morphology of the liver and biliary tract in cholelithiasis // Laser medicine Volume 13 / Issue 3, 2009, pp. 15-19.