URGANCH DAVLAT TIBBIYOT INSTITUTI
JANUBIY OROLBO‘YI TIBBIYOT JURNALI
2 - TOM, 4 - SON. 2026
14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

UDC: 616.366-089:616.34:576.8

MORPHOLOGICAL AND MICROBIOLOGICAL CHANGES IN THE INTESTINAL TRACT FOLLOWING EXPERIMENTAL CHOLECYSTECTOMY

Nurullayeva Sharofat Maxmudjanovna
Teaching asissistant, Alfraganus University Tashkent, Uzbekistan
ORCID: 0009-0001-0127-8667
E-mail: Sarofat711@gmail.com

Tastanova Gulchekhra Eshtayevna
Doctor of Medical Sciences, Associate Professor in Samarkand State Medical University
ORCID:0000-0003-3521-0107
E-mail: xamrakulova82@mail.ru

Xaydarov Artur Mixaylovich
Doctor of Medical Sciences (DSc), Professor, Head of the Department of Dentistry-1.
ORCID: 0009-0000-5969-2572
E-mail: Dr.khaydarovartur@mail.ru

Abstract

Gallstone disease (GLD) is a disease of the hepatobiliary system, characterized by the formation of changes in the internal bile ducts of the liver, the common bile duct, and the gallbladder. Gallstone disease, according to most statistical analyses, is more common in young and middle-aged women. According to autopsy data, gallstones are found in one in six men and one in four women. Analysis of morphological and microbiological changes in the intestinal wall after cholecystectomy.

Key words*: sensitivity to antibiotics, conditionally pathogenic infections Experimental Cholecystectomy.*

Introduction

Gallstone disease (GLD) is a polyetiological disease that involves several factors that contribute to the formation of cholesterol deposits. For example, excessive filling of the bile with cholesterol by the liver, deposition of cholesterol monohydrate in the form of crystals, and impaired gallbladder function. Also of great importance are factors such as obesity, diet, gender and estrogen levels, intestinal resection, and treatment with clofibrate.

The development of Cholelithiasis is caused by insufficient cholesterol in the bile or a decrease in the amount of total bile acids, which leads to the insolubility of cholesterol. Due to the many causes and factors of this disease, the number of cholecystectomy operations is also increasing. The complexity of the disease and its close connection with other organs in the hepatoduodenopancreatic zone lead to the development of pathological changes in them, which requires additional therapy.

URGANCH DAVLAT TIBBIYOT INSTITUTI
JANUBIY OROLBO‘YI TIBBIYOT JURNALI
2 - TOM, 4 - SON. 2026
14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

Gallstone disease (GLD) often affects other organs of the digestive system, including the stomach and duodenum. Because these organs are so closely related anatomically and functionally, their health affects the treatment of GIT. This zone, the choledochohepatogastroduodenopancreatic zone, is associated with their overall function in the digestive process. Therefore, the functional and morphological state of the stomach and duodenum is of great importance in the diagnosis and treatment of Cholecystitis. The clinical symptoms and causes of gastrointestinal disorders after cholecystectomy have changed in recent years. In the sixties, 3 groups of diseases that occur after surgery on the hepatic tract were distinguished:

- diseases that were not completely eliminated during the first operation and arise from the underlying pathological process;
- diseases directly related to the operation performed;
- diseases associated with concomitant changes in other organs and systems [9]. In the eighth decade, the following forms of functional disorders of the biliary system after cholecystectomy were distinguished:
- biliary dyspepsia (liver failure);
- biliary dyskinesia (lack of function of the parahepatic valve) [11]. According to the classification of A.L. Khloutsal (1989), only functional disorders of the sphincter of Oddi have a causal relationship with cholecystectomy. When considering the complaints that arise in patients after cholecystectomy from the point of view of the therapist, in our opinion, it is advisable to take as a basis the definition according to the International Nomenclature of Liver Diseases, which states that one of the main symptoms of postcholecystectomy syndrome is pain in the right upper quadrant and dyspeptic disordersThere is no choledocholithiasis, hepatic duct stricture, psychosomatic causes, or hepatobiliary disease [4]. When analyzing the incomplete results of cholelithiasis surgery, as noted above, in approximately 85% of patients, hepatic subacute disease is accompanied by damage to the hepatopancreatoduodenal organs, which can lead to erosive processes after cholecystectomy and is often the cause of patient complaints [6].

Material and methods

The experimental part of the research was conducted in the pharmaceutical scientific laboratory. Bacteriological and morphological analyses were conducted on rats. All selected rats were divided into 4 groups: a total of 100 rats were selected from 25 in each group. Cholecystectomy syndrome was called when the bile ducts were mechanically ligated, and morphological changes in the small intestine and microflora imbalance were noted on days 1, 7, 14, 30, 60. Microbiological examinations were conducted in the bacteriology laboratory of the Tashkent City Emergency Clinical Hospital. According to this, the walls of the small intestine and the sphincter of Oddi of the operated rats were examined separately.

Table 1.Morphometric indicators of the stomach in rats under isolated and combined administration of probiotics and antibiotics

Indicators		Experimental Groups		
	K(1)	PB (2)	AB(3)	PB+AB(4)
Mucosal thickness, micrometers (μm)	594,91±49,84	68,28±42,34	34506,42±99,88	577,73±36,15
Thickness of the covering epithelium, micrometers (μm)	68,73±8,43	76,98±14,43	51,57±10,99	117,20±18,79

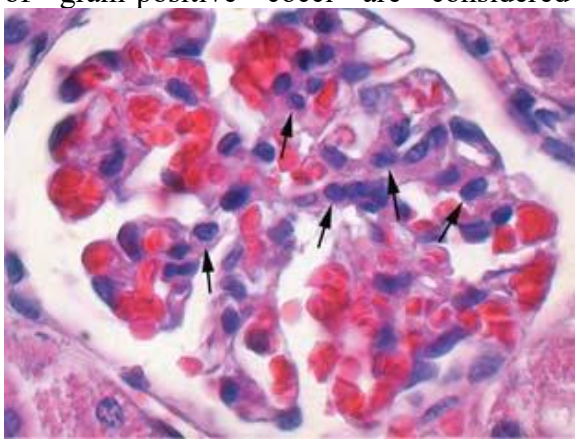
Thickness of the glandular epithelium, micrometers (μm)	525,61±71,05	531,08±40,74	454,85±47,21	460,52±5593
Percentage ratio of exocrinocytes				
Chief cells	35,58±4,60	32,65±1,76	29,79±4,34	36,11±3,15
Parietal cells	26,59±1,81	26,89±1,82	39,37±3,52	23,99±3,26
Number of epithelial cells in gastric pits	25,06±1,47	24,99±1,05	21,09±1,35	24,35±1,29
		Esophageal part of the stomach		
The thickness of the mucous layer (in micrometers)	419,28±22,40	352,29±27,48	140,70±16,20	242,87±20,48
The thickness of the stratum corneum	130,44±15,45	116,06±11,90	86,27±1823	96,267±14,08

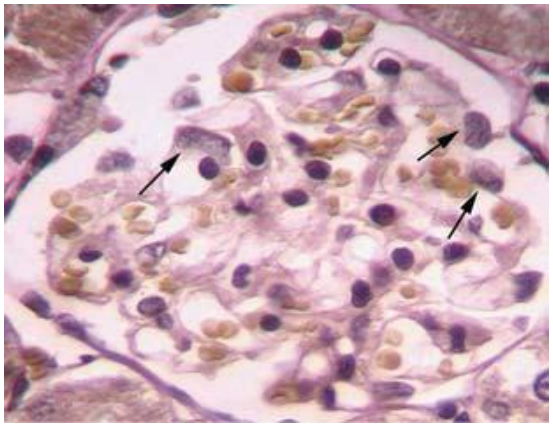
Notes: Means ± standard error of the mean; p-0.005 - significance of differences between animal groups according to the Mann-Whitney U-test.

Under normal conditions, the microflora of the gastrointestinal tract is a balanced, open microecological system that includes, on the one hand, the physiological and immunobiological characteristics of the host organism, and, on the other hand, the species and quantitative composition of the microbial association and the diversity of their biochemical activity [7,13]. Each section of the gastrointestinal tract is populated by specific species of bacteria characteristic of it; fluctuations in their composition are usually small, and the ability of a healthy organism to self-regulate ensures rapid restoration of relative constancy [11, 12, 14, 10]. The colon has the most diverse microflora. The colon's unique habitat for microorganisms is that it is excretory rather than secretory, lacking lysozyme and with less lymphoid tissue. At the same time, it has favorable pH, temperature, and an abundance of nutrients. More than 260 bacterial species have been identified in the colon, with a total biomass of approximately 1.5 kg. One gram of feces contains up to 30-40 billion microorganisms [13,8]. The microflora of the large intestine can be divided into 4 groups: 1) Strict anaerobes that do not form spores: gram-positive bacteria of the genus Bacterobacter and gram-negative bacteria of the family Bacteroides, they account for 96-99% of all microorganisms in the large intestine. 2) Facultative anaerobes, represented mainly by B. coli and gram-positive enterococci and lactic acid rods of the genus Lactobacillus, they account for 1-4% of all microorganisms. 3) A group of so-called residual microorganisms, which account for 0.01 - 0.001% of all microorganisms in the large intestine. This group includes: Staphyllococcus, Proteus, Candida, Clostridius, Pseudomonas. 4) A group of various representatives of Enterobacteriaccae, which are detected temporarily or permanently and can cause intestinal infections: Enterobacter, Salmonella, Shigella [2,3,1,]. In the small intestine, the number of microorganisms is small and should normally not exceed 104 microbial bodies per gram of contentsThe literature provides various data on the quantitative and qualitative composition of the small intestinal microflora. This is probably due to the peculiarities of obtaining the material for research and the methods of cultivation [16,15]. Most studies have confirmed that the upper and middle sections of the small intestine contain only small populations of predominantly

URGANCH DAVLAT TIBBIYOT INSTITUTI
JANUBIY OROLBO‘YI TIBBIYOT JURNALI
2 - TOM, 4 - SON. 2026
14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

gram-positive facultative aerobes resistant to the action of acid: streptococci, staphylococci, enterococci, lactobacilli in combination with a small number of anaerobes, yeasts and fungi [8, 7, 8, 16,12]. Microbial counts are moderate and increase briefly after meals, but return to baseline levels within a few hours. A definitive answer to the question of whether the small intestine, and especially the jejunum, is sterile or colonized by microbes has not been obtained. Some studies use the term "sterile" when enterobacteria are not cultured from the small intestinal contents, and a small number of gram-positive cocci are considered transient flora and are disregarded [12,13,14].





Pic. 1. In the glomeruli of the intestines of intact animals, podocytes are small and located under the capillary endothelium (marked by arrows). Stained with hematoxylin and eosin. Enlargement ×1600

Pic.2. In the glomeruli of intestinal experimental animals, against the background of sclerotic changes, the number of podocytes is reduced; they are large in size with large nuclei (marked with arrows). Van Gieson staining. Increased ×1600

Results

The following 64 strains of microorganisms were identified when examined by bacteriological methods: *E.coli* (3/6,8%), *Klebsiella spp* (13/3,5%), *Enterobacter spp* (2/7,7%), *Citrobacter spp* (2/0,67%), *Pseudamonas aeruginosa* (1/1,1%), *Candida spp* (19/30,7%), *Staphilococcus aureus* (5/17,6%), *Staphilococcus epidermides* (9/4,34%), *Staphilococcus haemalyticus (*1/3,12%), *Streptococcus spp* (1/7,8%), *Streptococcus viridians* (3/7,7%), *B-haemalitic streptococcus* (1/8,5%). In addition, Proteus spp (1/0.33%) and Streptococcus pyogenes (2/0.33%) were also found among the isolated strains. The largest proportion of isolated microorganisms was fungi (Candida albicans, Candida spp 19/30.65%). The largest proportion of isolated microorganisms was fungi (Candida albicans, Candida spp 19/30.65%).

Table 2. Number of strains of microorganisms isolated from rats

№	Pathohenic microorganisms	Number of microbes	Rats (45)
1	*E.coli*	4	3(6,8)
2	*Klebsiella spp*	13	13(3,5)
3	*Enterobacter spp*	2	2(7,7)
4	*Citrobacter spp*	2	2(0,64)
5	*Proteus spp*	1	1(0,3)
6	*Ps. aeruginosa*	1	1(1,1)
7	*Staphilococcus aureus*	5	5(17,6)
8	*Staphilococcus epidermides*	9	9(4,35)
9	*Staphilococcus haemalyticus*	1	1(3,07)
10	*Streptococcus spp*	1	1(7,82)

URGANCH DAVLAT TIBBIYOT INSTITUTI
JANUBIY OROLBO‘YI TIBBIYOT JURNALI
2 - TOM, 4 - SON. 2026
14.00.00 - TIBBIYOT FANLARI ISSN: 3093-8740

11	*Streptococcus viridians*	3	3(7,7%),
12	*B-haemalitic streptococcus*	1	1(8,6)
13	*Streptococcus piogens*	2	2(0,25%)
14	*Candida spp*	19	19(30,65%).
	Total:	**64**	**64**

The following results were obtained when the level of sensitivity to antibiotics of strains of gram-negative microorganisms was studied:

Table 3. Antibiotic susceptibility level of gramnegative strains (M±m,%)

№	The name of the antibiotic	Sensitivity levels		
		Sensitive-S	Moderately sensitive-I	Resistant-R
1	Amoxicillin + clavulanate	82,7±2.1	15,0±2,0	2,4±1,9
2	Ampicillin+sulbactam	1,8±4,3	5,2±1,5	93,0±5,1
3	Cefaperazone/sulbactam	81,1±3,7	10,7±2,5	8,2±3,8
4	Amikacin	2,5±1,7	13,8±4,7	79,1±3,6
5	Doxycycline	59,6±4,1	28,4±3,1	12,0±2,8
6	Tetracycline	60,1±4,7	9,4±0,9	30,5±4,4
7	Ciprofloxacin	58,5±4,1	23,3±3,6	18,2±2,3
8	Levofloxacin	59,6±4,2	28,4±3,1	12,0±2,8
9	Moxifloxacin	58,6±4,1	26,4±3,1	10,0±2,8
10	Ofloxacin	51,6±3,2	21,4±3,1	10,0±2,8
11	Cefpodoxime	48,6±4,7	16,4±3,1	12,0±2,8
12	Cefotaxime	71,4±2.1	11,0±2,1	1,8±1,5
13	Ceftriaxone	81,7±2.1	14,0±2,0	2,8±1,9

Most of these infections showed resistance to doxycycline, amoxicillin, ampicillin+sulbactam.

The high prevalence of Gram-positive microorganisms in the nasopharynx, and the pH and temperature there create conditions for these microbes to survive and multiply.

Table 4. Antibiotic susceptibility level of grampositive strains (M±m,%)

№	The name of the antibiotic	Sensitivity levels		
		Sensitive-S	Moderately sensitive-I	Resistant-R
1	Amoxicillin	12,7±2.1	15,0±2,0	92,4±1,9
2	Ampicillin+sulbactam	1,8±4,3	5,2±1,5	93,0±5,1
3	Ciprofloxacin	58,5±4,1	23,3±3,6	18,2±2,3
4	Tetracycline	58,1±5,6	38,7±4,7	3,2±1,4
5	Cefaperazone+sulbactam	88,2±5,0	7,2±4,0	4,8±3,3
6	Cefpodoxime (Cefpodo)	55,8±1,4	35,6±5,1	8,6±5,4
7	Ceftriaxone	48,8±2,5	37,6±5,3	13,6±2,4
8	Cefdazidim	5,8±4,6	10,6±4,5	83,6±2,1
9	Azithromycin	1,6±4,3	5,3±1,5	93,1±4,1
10	Amikacin	88,6±4,6	10,7±2,4	2,7±3,9
11	Levofloxacin	80,1±3,6	11,7±2,6	8,2±3,8
12	Cefotaxime	90,5±2,4	7,1±4,5	2,4±3,1

The following results were obtained when the sensitivity characteristics of the isolated gram-positive microorganisms to antibiotics were studied. It was found that most of them are highly sensitive to fluoroquinolone group (ciprofloxacin, levofloxacin) and cefolosporin (ceftriaxone, cefaperazone/sulbactam, ceftazidime) antibiotics. Moderate sensitivity to amikacin and azithromycin drugs and multi-resistance to colgan drugs and tetracycline group antibiotics and amoxiclav drug were found. This means that resistant strains of microorganisms are emerging day by day. One of the microorganisms that live permanently in the human body are fungi. When the human immunity decreases, the titer of these microorganisms is immediately observed in this organism. The reason for this is the body's immune system.

Conclusion

The results obtained show that mechanical ligation of the bile ducts causes several changes in the intestinal wall. In particular, proliferative and destructive processes can be observed in the villi and epithelial tissue of the small intestine. In addition, changes in the microbiota can be observed. In particular, the number of gram-positive and gram-negative bacteria changes and an imbalance occurs. Morphological and pathophysiological changes lead to the development of dysbiosis. In rats with each gallbladder removed, problems with the digestive system were observed. The second regimen used the same groups of drugs, but with the addition of antibacterial agents to decontaminate the small intestine. During the first course of antibacterial therapy, medications were prescribed empirically, and subsequently, their selection was based on the sensitivity of microorganisms present in the intestinal lumen and its mucosa. To normalize digestion, absorption, and gastrointestinal motility, the following medications were prescribed simultaneously: enzyme preparations (pancreatin, pancitrate, creon, or mezim forte); intestinal adsorbents (maalox, phospholuged, or smecta); prokinetics (domperidone), or antispasmodics (dicetel, trimebutine, and others). To normalize the microflora, probiotics (biological preparations containing normal intestinal microflora) were prescribed, as well as prebiotics (medications that promote its growth and function). All medications were administered in standard therapeutic doses and at the generally accepted times of administration.

References

1. Григорьев П.Я., Яковенко А.В. Кинжическия тастроэжерология. - М.: Мед. йнОрм. атенство, 1998. - 647 е. 48.

2. Григорьев П.Я., Коровина В.И., ЖухО¥йО(Кии В.Г., Яковенко Э. П. И др. Изменение родового состава кишечной микрофлоры й степени обсемененйостй кишечника: бактериологическая характеристика, клиническое значение, вопросы терапии. // Практикующий врач. - 1999. №16.Вып.3.-С.14-18. 49.

3. Григорьев П.Я., Яковенко Э.П. Нарушение нормального состава микрофлоры, клиническое значение и вопросы терапии. // Методическое 1юсобие. Федеральн. тастро. центр при МЗ РФ. - М., 2000. - 15 с. 50.

4. Григорьева Г.А., Кузнецова Г.Г. Дйсбйоз кишечника у больных Перенесших холецйстэктомйю и некоторые тгутй его коррекций. // В кн.: ПОстхОлецистэктомйческий синдром и сопутстаукмцие заболевания. Рязань, 1980.-С. 26-28. 51.

5. ГрязнОва Н.А., КорЧинОва И.Г. Сочетание дуоденального стаза с патологией желчных путей. // Тер. Архив. - 1979. - Т. 51. - № 12. - С. 37 41. 52.

6. Губергиц А.Я. Болезни жеЖных путей. - М: Медгиз, 1963. - 350 с. 53. Донская Л.В. О причинах постхолецистэктомическото синдрома. // Клин, медицина. - 1981. - Т. 59. - С. 46-

7. Евдокимов В.В. ЭнзимотйстОхиМйческое изучение слизистой оболочки даенадцатйперсТгнои кишки при дуоденитах. // Материалы конферкнции . Мйй. здрав. СССР. 4-е главное управление. - М. -1976. - С. 26-27.

8. Бгишян Р.Е. Дисбактериоз тонкой кишки. // Тер. архив. - 1995. - Т. 89. С. 104-110.

9. Жуков Н.А., Ахмедов В.А., ТурйлОва Н.С., Еремеева. ФуйкцйОнальная и морфологическая характеристика желудка при дуоденогастралыюм 129 рефлюксе. // Эксперементальная и клиническая гастроэнтерология. - 2002. - № 2. - С. 22-54.

10. Златкина А.Р. Сов^менные подходы к коррекций дисбйоза кишечника. // Рос. журн. гастроэнтерологии, гепатологии, колопроктологии. - 1999. - № "3.-С. 64-67.

11. Иванова С.А., Пйворак Н.А. Актуальные вопросы клинической микробиологии "в неинфекционной клинике. / Под ред. СВ. Прозоровского. - М.: Медицина, 1988. - Ч. 2. - С 139-140. 12. Иванченкова Р.А. Ф)щкциональное изменение сфинктера Оддй после холецистэктомии. //Клин, медицина. -1988.- № 10. - С 113-116.

13. Ивашкин В.И., Шептулин А.А. Синдром диареи. - М.: ГЭОТАР Медицина, 2000. - 135с

14. Ивашкин В.Т., Комаров Ф.И., Рапопорт СИ. Краткое руководство по гастроэнтерологии. М.: М-Вести, 2001. - 215 с.

15. Игнатова Н.З. Значение патологии двенадцатиперстной кишки при холецистопатии. // Тер. архив. - 1971. - Т. 43. Вып. 12. - С. 35-38.

16. Ильченко А.А., Шибаева Л.О., Чикунова Б.З., Сперанский А.А. Желчнокаменная болезнь и изменения в слизистой оболочке пищевода, желудка и двенадцатиперстной кишки. // Рос. гастроэнтерологич. Журн. 1998.-Ш.-С. 20-25.