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## WAYS OF SOLVING THE PROBLEM OF CHOLEDOCHOLITHIASIS IN PATIENTS WITH PATHOLOGY OF PARAPAPILLARY ZONE AND COMMON BILE DUCT

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The paper presents an analysis of the results of endoscopic treatment of choledocholithiasis in clinically severe cases. A retrospective and prospective analysis of the treatment of 161 patients with choledocholithiasis was conducted. Endoscopic papillosphincterotomy, mechanical lithotripsy, nasobiliary drainage and transpapillary stenting were performed to restore the bile passage and rehabilitate the extrahepatic bile ducts. Then we carry out a comparison of the efficiency of endoscopic lithoextraction in two groups of patients. The 1-st group – patients with large calculi of the common bile duct and normal anatomy of the parapapillary zone and choledochus, the 2-nd group – patients with choledocholithiasis and complicated anatomy – diverticula of the parapapillary zone, stenosis or strictures of the extrahepatic bile ducts. Endoscopic papillosphincterotomy was performed in 151 patients. In 44 patients with diverticula of the large duodenal papilla, stones were removed by standard lithoextractors, in other 107 cases – mechanical lithotripter was used. Stones were successfully removed in 98 patients. Lithotripsy was unsuccessful in 7 patients of 1-st group and in 2 patients of 2-nd group, and the reliability of lithotripsy did not differ in both groups. Endoscopic manipulations were equally effective in both groups.

**Key words:** choledocholithiasis, mechanical jaundice, endoscopic papillosphincterotomy, mechanical lithotripsy.

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## ШЛЯХИ ВИРІШЕННЯ ПРОБЛЕМИ ХОЛЕДОХОЛІТАЗУ У ПАЦІЄНТІВ ІЗ ПАТОЛОГІЄЮ ПАРАПАПІЛЯРНОЇ ЗОНИ ТА ЗАГАЛЬНОЇ ЖОВЧНОЇ ПРОТОКИ

В роботі представлений аналіз результатів ендоскопічного лікування холедохолітазу в клінічно важких випадках. Проведено ретроспективний та проспективний аналіз лікування 161 пацієнта із холедохолітазом. Для відновлення пасажу жовчі і санації позапечінкових жовчних шляхів виконували ендоскопічну папілосфінктеротомію, механічну літотрипсію, назобілярне дренивання і транспапілярне стентування. Проведено порівняння ефективності ендоскопічної літоекстракції у двох групах пацієнтів. 1-ша група – пацієнти із великими конкрементами загальної жовчної протоки та нормальної анатомією парапапілярної зони та холедоха, 2-га група – пацієнти із холедохолітазом та дивертикулами парапапілярної зони, стенозами чи стриктурами позапечінкових жовчних шляхів. Ендоскопічна папілосфінктеротомія виконувалась 151 пацієнту. У 44 пацієнтів із дивертикулами ділянки великого дуоденального сосочка камені були видалені стандартними літоекстракторами, в інших 107 випадках застосовувався механічний літотриптор. Камені були успішно видалені у 98 пацієнтів. Літотрипсія була безуспішною у 7-ми пацієнтів 1-ї групи та у 2-х пацієнтів 2-ї групи, при цьому достовірність літотрипсії не відрізнялась в обох групах. Ендоскопічні маніпуляції були ефективні однаково в обох групах.

**Ключові слова:** холедохолітаз, механічна жовтяниця, ендоскопічна папілосфінктеротомія, механічна літотрипсія.

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Despite the significant progress in the treatment of cholelithiasis, choledocholithiasis still remains one of the most important problems in biliary surgery, with the tendency to increase its frequency 10–35 % [1, 2]. Primary and recurrent calculi of the biliary tract are one of the main complications that occurs after cholecystectomy, choledocholithotomy, and they are the main reason for repeated surgical interventions on the extrahepatic biliary tract [3]. The results of operations performed on this category of patients, which are carried out in majority in an emergency, do not always have the desired positive effect, therefore we continue the search for the most optimal, effective, safe and minimally traumatic way to solve this problem [4, 5].

In recent decades, the main method of treatment of choledocholithiasis is endoscopic papillosphincterotomy (EPST) [5, 6]. The effectiveness of this method of treatment in standard situations is quite well studied and is 82–95 % [7]. However, in certain situations, the instrumental removal of calculi from the common bile duct (CBC) after EPST causes significant technical difficulties, or is impossible at all. The reasons for such situations may be large calculi, the size of which is larger than the diameter of the dissected large duodenal papilla, the location of the stone above the stricture of the duodenal papilla, diverticula of the area of the large papilla of the duodenum, which limit the possibility of adequate EPST. In case of stenosis of the distal part of the common bile duct, the removal of even small calculi can cause significant difficulties, and the performance of EPST in patients with diverticula of the large duodenal

papilla region has a high risk of complications. According to various authors, the frequency of such situations ranges from 5 to 15 % [7, 8, 9]. In such situations, a large number of specialists refuse endoscopic interventions of the common bile duct and lithoextraction, preferring laparoscopic or open surgical interventions [9, 10].

**The purpose** of the study was to improve the quality of endoscopic transpapillary treatment of patients with choledocholithiasis in clinically severe cases.

**Materials and methods.** We performed a retrospective and prospective analysis of the results of treatment of 161 patients who were treated at the CE “2-nd City Clinical Hospital” and the Kharkiv Regional Clinical Hospital between 2016 and 2022, who underwent endoscopic treatment of severe cases of choledocholithiasis, was conducted. The age of the patients varied from 25 to 87 years. The vast majority were women – 121, men – 40. Out of 161 patients with stones of the common bile duct, 77 (47.8 %) patients underwent surgery on the biliary tract before endoscopic transpapillary interventions (Fig. 1). Of these, 12 patients were operated urgently from 1 to 3 days after hospitalization, and 65 – later, in the term from 1 month to 5 years.

In 69 (42.9 %) cases, choledocholithiasis was complicated by mechanical jaundice, and its duration in 18 (11.2 %) patients did not exceed 1 week, and in 51 (31.7 %) patients, the jaundice period lasted more than 7 days. Signs of purulent cholangitis were observed in 32 (19.9 %) patients, which greatly complicated the severity of the underlying disease and increased the risk of endoscopic manipulations and surgical interventions.

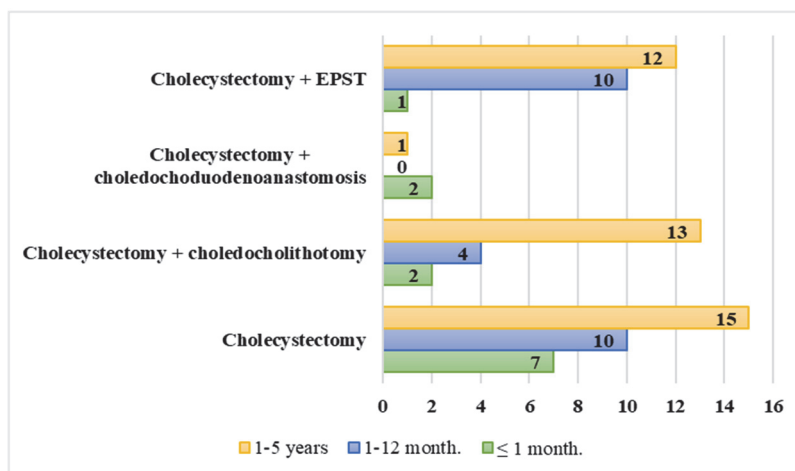


Fig. 1. Characteristics of surgical interventions carried out in the anamnesis

the, large duodenal papilla was located on the edge of the diverticulum in 68 (42.2 %) cases, in 8 (4.9 %) patients was detected stenosis of the distal part of the bile duct, and in 9 (5.6 %) patients – cicatricial stricture of common bile duct.

**Results of the study and their discussion.** Retrograde cholangiography was performed in 155 (96.3 %) patients, 6 (3.7 %) patients with parapapillary diverticula were failed to cannulate the large duodenal papilla. Endoscopic transpapillary surgical interventions in such conditions are considered quite risky and technically difficult to perform, which in turn leads to the specialist's refusal to perform this manipulation. The complexity of the manipulations on the large duodenal papilla depends on the location of the papilla in relation to the diverticulum, and the success of the manipulation, in the vast majority, depends on the experience of the endoscopist.

The greatest difficulties arise when the large duodenal papilla is located on the edge of the diverticulum or inside it. In this situation, the success of cannulation depends mainly on the ability to “bring” its opening into a comfortable position opposite the duodenoscope, and with increasing of endoscopist’s experience, the number of successful manipulations also increases. In some cases, it is more convenient to use a standard papillotome for cannulation of the papilla, by pulling the string of which you can change the position of the catheter, as well as move the papilla from the cavity of the diverticulum into the lumen of the intestine. In recent years, double-lumen instruments (catheters, papillotomes) have been used for cannulation of the large duodenal papilla and common bile duct, which allow simultaneous manipulation of the instrument and the string, thereby increasing the number of successful manipulations. In addition, the passage of the string into the common bile duct facilitates repeated cannulation and ensures the unimpeded introduction of other instruments (papillotomes, baskets, stents) into the lumen of the choledoch.

With the location of the large duodenal papilla in the cavity of the diverticulum, the common bile duct does not pass through the intramural part of the duodenum, but transperitoneally, which is why dissection of its opening in such patients can lead to damage to the intestinal wall.

In such a situation, EPST should be performed quite carefully and accurately by the most experienced endoscopist. One should try to translocate the large duodenal papilla from the diverticulum

In 18 (11.2 %) cases, the external drainage of the choledochus was previously performed, which made it possible to perform endoscopic transpapillary intervention in more favorable conditions. In 6 cases, cholecystostomy was urgently performed to eliminate jaundice with a preserved gallbladder. In 12 patients, external choledochal drainage was performed during surgery.

Large calculi of the extrahepatic bile ducts were observed in 77 (47.8 %) patients,

into the lumen of the intestine and only after that perform EPST. It is advisable to divide the intervention into 2–3 stages with an interval of 3–4 days, during which sufficient adhesion of the dissected tissues of the papilla will occur, which will reduce the risk of complications. Papillotomes with a short string should be used to prevent rapid uncontrolled dissection. In the case of the location of the large duodenal papilla deep in the cavity of the diverticulum, especially near its lower edge, it is advisable to refuse to perform manipulations in the form of EPST due to the high risk of perforation of the duodenum.

After contrast, 151 (97.4 %) patients underwent EPST, in 4 (2.6 %) cases, papillotomy was refused due to the high risk of perforation of the wall of the duodenum. In order to eliminate jaundice, these patients underwent transpapillary stenting with a plastic stent (3) and nasobiliary drainage (1).

After EPST, in 44 (29.2 %) patients with parapapillary diverticula, stones were removed by a standard method, that is, using a Dormia basket or a balloon extractor. It was possible to perform revision and remediation of the common bile duct because the size of the calculi did not exceed 1.2–1.3 cm, and the anatomical conditions made it possible to perform an adequate papillosphincterotomy. In addition, in several cases, the calculi had a rather soft consistency, which led to their spontaneous fragmentation during extraction with a Dormia basket. In other 107 (70.8 %) patients, lithoextraction was performed using a mechanical lithotripter.

To evaluate the effectiveness of the intervention, it was considered appropriate to consider two groups of patients. The 1-st group consisted of 77 patients with normal anatomy of the parapapillary zone who did not have narrowings of the lumen of the common bile duct. These patients had large calculi of 1.5–3.0 cm. The 2-nd group included 30 patients with parapapillary diverticula and stenosis of the distal part of the common bile duct. These patients had calculi from 1.0 to 2.1 cm and required lithotripsy due to anatomical changes. Out of 107 endoscopic interventions, 98 (91.6 %) were successful.

Lithotripsy was performed in 70 patients of the 1-st group and in 28 patients of the 2-nd group. Lithotripsy could not be performed in 7 patients with a large stone of the common bile duct and in 2 patients with stricture of the common bile duct and diverticulum (Fig. 2). The overall efficiency of lithotripsy was 91.6 %.

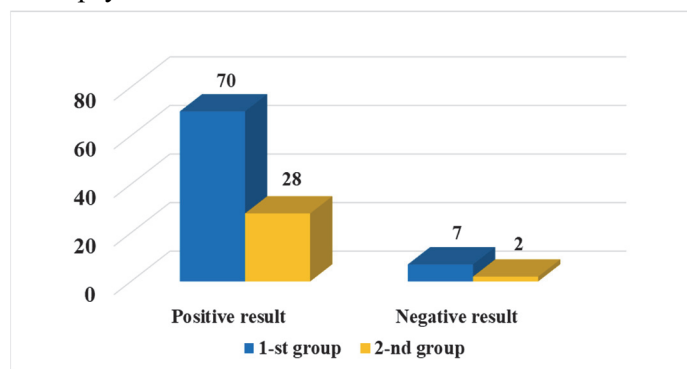


Fig. 2. Results of retrograde mechanical lithotripsy (n=107)

The better results of lithotripsy in patients of the 2-nd group are explained by the fact that the size of concretions in this group was smaller, although statistically these results differ unreliable ( $p=0.33$ ), nevertheless, the study allows us to draw an important conclusion. Since in the vast majority of observations in patients with parapapillary diverticula and choledochal stenosis, lithotripsy is necessary to extract small fragments of stones, and the efficiency of their destruction is quite high, endoscopic sanitation of common bile duct in this

category of patients is not only not contraindicated, but can also become the method of choice for the treatment of data groups of patients.

In most cases, it was necessary to carry out 2–3 manipulations for adequate sanitation of the common bile duct. In order to prevent the obstruction of the common bile duct by fragments of stones, during staged endoscopic surgical interventions, staged nasobiliary drainage was used in 23 patients and transpapillary stenting in 11 patients, which made it possible to quickly eliminate jaundice and cholangitis. In 9 (8.4 %) cases, mechanical lithotripsy was unsuccessful. Four patients were operated on after unsuccessful manipulation, five elderly patients were stented with plastic stents and discharged.

After performing endoscopic operations, complications were observed in 15 (9.8 %) patients. 4 patients had bleeding from the papillotomy wound, 4 had acute pancreatitis, another 5 had severe cholangitis, and 2 had wedging of the lithotripter basket with an entrapped stone. In the last two observations, surgical intervention was performed, in the other observations, was performed repeated endoscopic intervention and conservative therapy. There were no fatalities.

A comparison was made of the frequency and nature of complications in 2 groups of patients: the 1-st group consisted of 77 patients with normal anatomy of the parapapillary zone, without narrowing of the common bile duct, who had large calculi; in the 2-nd group there were 74 patients with parapapillary diverticula and choledochal stenoses (Table 1).

In general, the frequency of complications was higher in patients of the first group, while patients with disturbed anatomy had fewer complications [1, 3]. However, these results are not statistically significantly different and do not mean that the risk of complications is lower in patients with diverticula. This result is explained by more careful performance of transpapillary endoscopic manipulations, while conducting EPST in several stages, which reduces the risk of bleeding, more frequent performance of stenting or nasobiliary

drainage, which allows to prevent the occurrence of cholangitis [4]. In patients with diverticula, the most frequent complication was acute pancreatitis, which is explained by technical difficulties during cannulation of the pancreatic duct, as well as coagulation damage to the mouth of the pancreatic duct during EPST.

Table 1

Characteristics of complications of endoscopic manipulations

Characteristics of complications	Number of observations, abs. (%)		p
	1st group n=77	2nd group n=74	
Bleeding	3 (3.9)	1 (1.4)	0.032
Purulent cholangitis	4 (5.2)	1 (1.4)	0.40
Wedging the basket	2 (2.6)	–	0.08
Acute pancreatitis	1 (1.3)	3 (4.1)	0.15
Total	10 (13.0)	5 (6.9)	

Thus, choledocholithoextraction was performed in 88.2 % of patients. For various reasons, calculi could not be removed in 11.8 % of patients. The analysis of the effectiveness of the sanitation of the bile duct in patients with normal anatomy of the bile ducts and parapapillary zone in comparison with the results of endoscopic treatment of patients with diverticula and stenoses showed that endoscopic resection is equally effective in both groups of patients [7, 10].

However, during the assessment of the treatment, it should be remembered that in this study of endoscopic treatment of choledocholithiasis, quite complex variants of this pathology were presented, which for most specialists would be a contraindication to the removal of concretions endoscopically [6, 12]. Nevertheless, accumulated experience has shown that endoscopic transpapillary methods allow to completely solve the problem of choledocholithiasis even in clinically difficult cases, when standard lithoextraction seems unpromising [15]. Endoscopic methods of rehabilitation of bile ducts are not only effective, but also minimally traumatic and can be used in the most complex contingent of patients in conditions of severe jaundice and cholangitis.

### Conclusions

1. Endoscopic transpapillary lithoextraction in patients with diverticula of the parapapillary zone, stenoses and strictures of the pancreatic duct is the method of choice for solving the problem of choledocholithiasis.
2. In clinically severe cases of cannulation of the large papilla of the duodenum, endoscopic papillosphincterotomy should be performed in 3–4 stages.
3. Endoscopic methods of lithoextraction and biliary decompression should be preferred for patients with a history of cholecystectomy for the gastrointestinal tract and repeated cases of choledocholithiasis.

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## FEATURES OF STRUCTURAL AND FUNCTIONAL DISORDERS OF BONE TISSUE IN CHRONIC HEART FAILURE

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The purpose of the study was to assess the effect of loop diuretic therapy on the structural and functional condition of bone tissue and phosphorus-calcium metabolism in patients with chronic heart failure and moderately reduced ejection fraction. 109 patients between the ages of 65 and 74 were examined, 86 of them had chronic heart failure, and 23 were practically healthy. The 1<sup>st</sup> group received basic therapy; the 2<sup>nd</sup> group – basic therapy and loop diuretics. The examination includes the following: the collection of anamneses, anthropometric measurements, laboratory (determination of natriuretic hormone (B-type), N-terminal polypeptide, C-terminal telopeptide, osteocalcin, osteoprotegerin, 25-hydroxyvitamin D, parathormone, phosphorus) and instrumental (heart ultrasound examination, ultrasound densitometry) investigations. In patients with chronic heart failure, a violation of the processes of bone remodeling with a predominance of bone resorption against the background of slowed bone tissue formation was revealed. In patients with chronic heart failure, structural and functional changes in bone tissue were revealed, which are manifested by an imbalance of bone remodeling processes with a predominance of bone resorption and slowed bone formation, vitamin D deficiency, and significantly low indices of bone mineral density. Moreover, significantly pronounced changes were revealed in the group of patients who were on basic chronic heart failure therapy and loop diuretics comparing with the same indices in patients with chronic heart disease who received only basic therapy.

**Key words:** chronic heart failure, mineral density of bone tissue, markers of bone remodeling, vitamin D.

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## ОСОБЛИВОСТІ СТРУКТУРНО-ФУНКЦІОНАЛЬНИХ ПОРУШЕНЬ КІСТКОВОЇ ТКАНИНИ ПРИ ХРОНІЧНІЙ СЕРЦЕВІЙ НЕДОСТАТНОСТІ

Метою роботи було оцінити вплив терапії петлевими діуретиками на структурно-функціональний стан кісткової тканини та фосфорно-кальцієвий обмін у пацієнтів із хронічною серцевою недостатністю та помірно зниженою фракцією викиду. Обстежено 109 пацієнтів віком від 65 до 74 років, із них 86 (основна група) мали хронічну серцеву недостатність та помірно знижену фракцію викиду, 23 – практично здорові. Пацієнти 1-ї групи отримували базову терапію хронічної серцевої недостатності; 2-ї групи – базову терапію хронічної серцевої недостатності та петлеві діуретики. Обстеження включало збір анамнезу, антропометричні вимірювання, лабораторні (визначення натрійуретичного гормону (В-типу) N-кінцевого поліпептиду, С-термінального телопептиду, остеокальцину, остеопротегерину, 25-гідроксिवітаміну D, паратгормону, фосфору) та інструментальні (ультразвукове дослідження серця, ультразвукова денситометрія) дослідження. Отримані результати показали, що у пацієнтів з хронічною серцевою недостатністю виявлено порушення процесів кісткового ремоделювання з переважанням кісткової резорбції і уповільненням кісткоутворення, дефіцитом вітаміну D та редукцією показників щільності кісткової тканини. Достовірно ( $p < 0,05$ ) виражені зміни виявлені у групі хворих, які перебували на базовій терапії хронічної серцевої недостатності та петлевих діуретиків у порівнянні з групою хворих, які приймали лише базову терапію хронічної серцевої недостатності.

**Ключові слова:** хронічна серцева недостатність, мінеральна щільність кісткової тканини, маркери кісткового ремоделювання, вітамін D

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The modern medicine has to increase the life expectancy of the population and at the same time contributed to the spread of age-related diseases, which are a global burden for the health care system [6]. In the most countries the prevalence of chronic heart failure (CHF) among the adult population in general 1.5–5.5% [8]. Spreading of CHF has a tendency to progressive growth and includes 10 % people over 70