

## **THE VALUE OF RETROGRADE ENDOSCOPIC METHODS IN THE DIAGNOSIS AND TREATMENT OF OBSTRUCTIVE JAUNDICE CAUSED BY CHOLEDOCHOLITHIASIS**

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### **ABSTRACT**

Not all patients with choledocholithiasis can be treated endoscopically. The reason is a blockage with a stone in the major duodenal papilla, an atypical structure of the major duodenal papilla, or surgical interventions on the stomach and duodenum. However, in our scientific work, we found a solution to this problem. We used the developed classification in 510 patients for 7 years and achieved high results. It should be said that during endoscopic interventions when introducing common bile duct, it is important to determine the entry points and angles in degrees, depending on the situation. Thanks to this minimally invasive method, we have saved many patients from open surgery. The therapeutic stage of ERCP in choledocholithiasis can decompress the BD and eliminate the cause of obstructive jaundice in up to 95,0-97,0% of cases.

**Key words:** choledocholithiasis, ERCP, obstructive jaundice, major duodenal papilla, endoscopy.

### **INTRODUCTION**

**Relevance of the problem:** According to scientific forecasting, the incidence of cholelithiasis increases for every 10-15 years in the world by about 30%, which is explained by lifestyle and nutrition, hereditary factors. Also, for several years, there has been a steady increase in diseases accompanied by the development of obstructive jaundice or biliary hypertension [1, 2, 4, 5]. The urgency of this problem increases every year, which is especially important for residents of megapolises, for example, in the city of Tashkent, the incidence has increased by 2 times in the last 10 years, amounting to 30-40 per 100,000 population [11, 12].

Choledocholithiasis is a pathological condition in which calculi are detected in the common bile duct, either coming from the gallbladder or primarily formed in the bile ducts (primary choledocholithiasis) [3, 4]. Choledocholithiasis is a

complication of cholelithiasis (GSD), in 90% of cases it occurs as a result of migration of stones from the gallbladder (secondary choledocholithiasis), and in 10% of cases it is primary choledocholithiasis [1, 2, 5, 7, 10, 12, 15]. According to some authors, the prevalence of cholelithiasis on ultrasound diagnostics is 6.7% in men and 14.6% in women in the age group from 18 to 65 years (the average detection rate is 11%). The prevalence of choledocholithiasis is 6.9% (4.5% in men and 8.9% in women), and it increases with age. The presence of symptoms of cholelithiasis was found in 22% of patients from the general group [1, 2, 5, 7, 10, 11, 14, 15]. It has been shown that the risk of developing symptoms in this category of patients with a previously asymptomatic course of the disease increases by 1–4% with each passing year [2, 3]. Choledocholithiasis is more often detected in women of reproductive age, the ratio is 4:1; according to some researchers, the ratio tends to equalize with age [3, 4, 8, 10, 13]. In publications devoted to the detection of choledocholithiasis itself in patients with cholelithiasis, the data vary within 10–20% [5, 9, 11]. At the same time, in the absence of clinical manifestations of obstructive jaundice with non-dilated (according to ultrasound data) lumen of the bile ducts, the incidence of choledocholithiasis by the time of cholecystectomy does not exceed 5% [2, 3, 4, 10, 14, 15]. Choledocholithiasis can be detected before, during, and after cholecystectomy. The frequency of detection of choledocholithiasis in patients who underwent or indicated cholecystectomy varies within 3–10% [4]; according to some researchers [9], this figure reaches 14.7%. This group of patients also included those who had choledocholithiasis detected by ultrasound without typical clinical symptoms or choledocholithiasis was an accidental finding. When observing patients with the absence of any symptoms in the presence of choledocholithiasis, it was noted that in 15% of cases, characteristic symptoms developed over time [5, 6], which led to the need to perform various types of interventional interventions on an emergency or urgent basis. In a study on the detection of stones in the bile duct after cholecystectomy, residual choledocholithiasis was found in 2.8% (in 14 of 505 patients), which was an indication for various types of endoscopic, laparoscopic or open surgical interventions [10]. Currently, endoscopic retrograde cholangiopancreatography (ERCP) occupies a leading position in the diagnosis and treatment of biliary tract pathology, and especially in choledocholithiasis [1, 3, 5, 10, 11, 13, 14, 15].

Despite the increase in the frequency of diseases of the biliary system, complicated by obstructive jaundice, their diagnosis and differential diagnosis is very difficult, which may be due to the absence of pathognomonic clinical and laboratory signs of the disease and the complexity of the anatomical and physiological relationships. Despite the development of medical technologies and

equipment, today in 10-42% of patients it is impossible to timely determine the nature and cause of jaundice [2, 3, 4, 5, 9, 11, 13, 15]. The impossibility of timely decompression of the VA, or the necessary surgical operations, are a prerequisite for the development of such formidable complications as liver failure, purulent cholangitis, abscesses, and biliary sepsis. The frequency of the latter remains high, does not tend to decrease and ranges from 20% to 54% according to different authors [1, 3, 5, 10]. Establishing a correct diagnosis before surgery significantly affects the prognosis of the disease, however, emergency surgical interventions against the background of obstructive jaundice may be accompanied by high rates of complications and mortality, reaching 15-30%, 4 times higher than in cases where the obstructive jaundice can be eliminated before operations [1, 2, 3, 5, 10, 12, 15].

Thus, the presence of high rates of recurrent, residual choledocholithiasis, the versatility of the clinical course of the disease, as well as the presence of possible fatal complications of the disease and medical manipulations, gives reason to further study this area and makes it one of the urgent problems in urgent surgery.

**Purpose of the study:** assessment and improvement of the results of diagnostic and therapeutic ERCP in obstructive jaundice caused by choledocholithiasis.

**Material and methods.** An analysis was made of the case histories of 510 patients admitted to the emergency surgical department of the multidisciplinary clinic of the Tashkent Medical Academy in 2015-2022. with a clinic of obstructive jaundice, the cause of which were extrahepatic duct calculi. The age of the patients varied from 18 to 90 years, the female sex predominated, accounting for 318 (62,4%) women, 192 (37,6%) men. The study did not include patients with choledocholithiasis without signs of obstructive jaundice. The terms of hospitalization of patients were different: up to 72 hours - 351 (68,9%), up to 10 days - 128 (25,0%), more than 10 days - 31 (6,1%) patients. Our study included patients with clinical signs of mechanical jaundice caused by choledocholithiasis, hyperbilirubinemia not exceeding 200 mmol/l. Patients with clinical signs of purulent cholangitis, severe liver failure, and mechanical jaundice caused by already verified tumors before retrograde intervention were excluded from the study.

The analysis of mechanical jaundice complications was carried out depending on the duration of the disease, as well as the level of complexity and the results of retrograde studies and the clinical course of the disease. Among our patients, during ERCP, a complicated course was established in 33 (6,5%) cases, purulent

cholangitis was diagnosed in 21 patients, and the remaining 12 patients showed signs of cholangiogenic liver abscesses and severe liver failure.

Quite often, liver failure developed in these patients, the criteria for which were an increase in liver parameters, the appearance of a thermal reaction, an intoxication syndrome, a decrease in the amount of albumin, prothrombin, in combination with signs of encephalopathy. Due to the inability to compare diagnostic criteria before and after the development of mechanical jaundice, these pathological conditions in a number of patients can be regarded as concomitant diseases. However, a significant increase in the frequency of their development with long-term jaundice is clearly seen.

Thus, the dependence of the frequency of complications on the duration of the existence of jaundice was established, which confirmed the need for a quick, reliable preoperative diagnosis.

Based on the foregoing, it is obvious that there is a need to develop an optimal diagnostic and therapeutic algorithm that can be implemented in a short time (within 12-24 hours).

Screening diagnostic methods were clinical and biochemical laboratory tests, the study of the hemostasis system, ultrasound, endoscopic examination, as well as magnetic resonance cholangiography with reconstruction of the bile production way.

Among our patients, an increase in the level of total bilirubin in the blood serum up to 100  $\mu\text{mol/l}$  was observed in 378 patients, between 100-150  $\mu\text{mol/l}$  in 115 patients, in the rest it reached up to 200  $\mu\text{mol/l}$ . An increase in the level of the indirect fraction of bilirubin was noted in about 40% of patients with jaundice lasting less than 3 days and in more than 80% of patients with jaundice lasting more than 3 days, which indicates the development of cholestasis syndrome with prolonged obstructive jaundice.

An endoscopic study was performed in 110 patients (the method has been included in the study algorithm since 2021) in order to assess the passage of bile in the duodenum, the possibility of performing retrograde manipulation, examining the major duodenal papilla, the presence or absence of a parafacial diverticulum or ulcerative cicatricial stenosis, as well as determining the type of transferred reconstructive operations on the gastrointestinal tract. Among them, no visible passage of bile was detected in 88 patients, parafatheral diverticulum - in 15 (OBD located at the entrance to the diverticulum - 9, inside the diverticulum - 6 cases), tumor of the major duodenal papilla - 2 patients, gastric or duodenal ulcer in 7 patients, patency was not among them in 2, as well as the state of resection of the stomach according to Billroth I - 2 cases, Billroth II - 3 patients.

For differential diagnosis of mechanical jaundice, non-invasive methods of ultrasound, MRI cholangiopancreatography (MRCP), MSCT were used, ERCP and percutaneous transhepatic cholangiography (PTCG) were used from invasive methods. Ultrasound was performed as a screening method for all admitted patients. MRCP, which has the added benefit of 3D visualization of all bile ducts and the Wirsung duct, was performed once in 425 patients, among them 75 patients were re-examined. MSCT was performed in 89 patients, in those who had doubtful signs of acute pancreatitis, which allowed us to determine the timing of therapeutic retrograde interventions.

ERCP was performed 595 times in 510 patients; until 2018, a duodenofibroscope with lateral optics TJF-160 VR Exera (Olimpus, Japan) was used for this manipulation, since 2018. Fujifilm Video Duodenoscope (ED-580XT Duodenoscope) is used.

We used the classification of ERCP and EPST according to the degree of complexity according to Schultz (Schutz 2000), performed with obstructive jaundice (Table 1.).

Table 1.

Results of endoscopic retrograde interventions depending on the degree of complexity of manipulations (Schultz, 2000)

Group	Type of operation	Quantity	Operation duration	Complication	Die	Difficulty level
A	EPST with lithoextraction	476 (94,2%)	17 – 42 min	41 (8,6%)	6 (1,3%)	I,II,III
B	Balloon dilatation with lithoextraction	18 (3,6%)	20-45 min	4 (22,2%)	-	II
C	EPST, lithotripsy	51 (10,0%)	35-65 min	3 (5,9%)	-	I,II
D	Stenting of the common bile duct	4 (0,8%)	25-41 min	-	-	I
E	EPST with chitinectomy	9 (1,8%)	35-45 min	2 (22,2%)	1 (11,1%)	II
F	Repeat ERCP	84 (16,5%)	till 60 min			II
	<b>Total</b>	<b>505</b>		<b>50 (9,9%)</b>	<b>7 (1,4%)</b>	

Level 1 - (biliary EPST, removal of small-sized biliary stones, installation of stents and nasobiliary drains); this group included 409 patients

Level 2 - (removal of large biliary stones, interventions for proximal malignant tumors and benign strictures, diagnostic procedures on the minor duodenal papilla, as well as in patients who underwent Billroth II gastric resection); 98 patients - (large and multiple stones - 44, duodenal diverticulum-28, chitin membranes -9, extended stenosis - 12, Billroth I - 2, lost drainage -2, fixed plastic stent -1).

Level 3 - papillosphincteromanometry, oral cholangioscopy and pancreaticoscopy, therapeutic interventions in patients who underwent resection of the stomach according to Billroth II, as well as endoscopic interventions on the pancreatic ducts and intrahepatic ducts - included 3 patients with multiple virsungocholedocholithiasis and 2 patients after Billroth II.

### **Results and discussion:**

To establish the diagnosis of mechanical jaundice caused by obstruction of stone, we evaluated the following criteria:

1) Clinical - nausea, vomiting, redness of urine, acholic feces, epigastric pain, jaundice

2) Ultrasound data - expansion of the common bile duct (8 mm or more), or the presence of a calculus in the terminal part of the common bile duct, signs of acute pancreatitis (then resorted to MSCT)

3) hyperbilirubinemia, increased levels of liver enzymes

4) MRCP - expansion of the extra- and intrahepatic ducts, as well as the expansion of the pancreatic duct and the presence of calculi in them

Ultrasound with sufficient accuracy made it possible to visualize the expansion of the bile ducts, which, in combination with hyperbilirubinemia, confirmed the mechanical nature of jaundice. In terms of the detection of calculi and volumetric formations, ultrasound is somewhat inferior to other radiation methods, in our case, about 60% of patients on ultrasound revealed the cause and level of obstructive jaundice block. This was enough to choose the method of minimally invasive decompression of the bile ducts (BD). For visualization of strictures, small calculi and tumors of the biliary tract, which were the main causes of mechanical jaundice, the determination of their localization and extent was recognized as uninformative. Thus, ultrasound, given its availability and ease of use, can be recommended as a screening method that allows you to accurately determine the mechanical nature of jaundice and make an accurate diagnosis before surgery in about 50% of cases.

ERCP attempts were made 599 times in 510 patients, contrasting of the common bile duct was successful in 505 patients, the diagnostic significance was 99%. The reasons for the impossibility of cannulation of the terminal CBD were:

the presence of severe deforming stenosis (2 cases), the location of the major duodenal papilla inside the parafatherally diverticulum (2 cases) and the atypical location of the BDS due to severe cicatricial-ulcerative deformity of the duodenum (1 patient). In such cases, PTCG with PTCS was subsequently performed. Repeated retrograde studies were performed a day later in cases where the cannulation of the OBD was unsuccessful at the first ERCP (12 cases), the presence of multiple and large stones in the common bile duct, as well as when replacing plastic stents.

The greatest number of complications after and during retrograde interventions were observed in group A - 41 (8,6%) cases. This group included patients subjected to retrograde interventions, according to the degree of complexity I, II, III. About 60% of the cases of complications account for those manipulations that were of the first degree of complexity, which is possibly associated with forced or aggressive papillotomy or multiple unsuccessful cannulations of the OBD. Among them, bleeding from the EPST zone was noted in 29 (70,7%) patients, 22 cases were stopped by endoscopic methods of hemostasis (injection of 33% ethanol solution, electrocoagulation, or mechanical methods). The remaining 7 (17,0%) patients (due to the ineffectiveness of the above methods) were subjected to open surgery to stop bleeding. Among them, 3 patients died due to acute blood loss and the development of DIC.

In 9 (22,0%) patients, acute post-manipulation pancreatitis of varying severity was noted, of which 4 patients underwent repeated operations due to the development of pancreatic necrosis with infection of the gland and the formation of retroperitoneal purulent processes. Due to the development of sepsis and multiple organ failure, a lethal outcome was noted in 2 cases.

In 2 (5,0%) patients, signs of purulent cholangitis appeared after lithoextraction, namely in those patients with multiple and large calculi. They later had to perform percutaneous-transhepatic interventions for decompression of the BD and elimination of cholangitis. One patient died 2 days after PTCS due to liver failure and sepsis (cholangiogenic liver abscesses were detected during autopsy).

This group included ERCP with EPST, in those patients after reconstructive operations of the gastrointestinal tract (Billroth I, II) - 4 cases; virsungocholedocholiasis - 3 cases. They are included in the second third category according to the degree of complexity of ERCP according to the Schultz classification. Complications after them were not observed.

For balloon dilation, patients (group B) with extended stenoses of the terminal part of the common bile duct, as well as with the presence of large stones incompatible with the size of the papillotomy opening, were subjected to balloon

dilation. This group included 18 (3,6%) patients, among them acute pancreatitis (3 cases), perforation of the posterior wall of the duodenum (1 case) prevailed among the complications, which were cured conservatively. There were no fatal outcomes.

Since 2018, after purchasing a mechanical lithotripter (group C), lithotripsy and lithoextraction were performed in patients with large stones of the common bile duct - 51 (10,0%), among them choledocholithiasis was radically eliminated - in 48 (94,1%) patients; in 1 case, the lithotripter got stuck in the CBD, which required surgery; purulent cholangitis developed in 1 case; acute pancreatitis developed in 1 case. There were no fatal outcomes.

The use of retrograde interventions in group E gave a good result, since the removal of chitin from the common bile duct eliminated obstructive jaundice, however, recurrent entry of chitin into the CBD from the cystic cavity at an early stage changed the situation. Of the 9 cases, bleeding is noted in 1 case, the patient was operated on for profuse bleeding from the EPST zone, which was stopped, but the other patient died due to the development of acute liver failure.

According to many authors [12, 13, 14, 15], MRI cholangiography in its diagnostic value corresponds to the methods of direct contrasting of the biliary tract. In most cases, this method allows you to determine the cause and nature of the MF to select the optimal method of decompression of the bile ducts. The study can clearly visualize the gallbladder, extra- and intrahepatic ducts, calculi in any location, tumors and strictures of the bile way, as well as the parenchyma of the liver and pancreas. The advantage of MRCP, along with non-invasiveness, is also the contrasting of the bile duct above and below the obstacle, as well as the assessment of the structure of the hepatopancreatoduodenal zone. In our opinion, this method is an alternative when ultrasound does not allow establishing an accurate preoperative diagnosis.

MSCT showed the highest information content in detecting and assessing the prevalence of tumor processes in the parenchymal organs of this zone (especially acute pancreatitis), but it was less sensitive in detecting calculi and intraductal pathological changes than in MRPCG and other direct methods of contrasting the biliary tract. MSCT is advisable to use as a differential diagnosis.

The analysis of the cholangiograms obtained during ERCP gives a fairly accurate idea of the changes in the bile ducts, allows to identify stones with a smallest diameter of up to 2 mm. It is more difficult to determine with a high degree of certainty the nature of an extraductal volumetric lesion, which can be assessed only by indirect signs. In order to resolve jaundice as quickly as possible, we used endoscopic retrograde manipulations, which combine high diagnostic and therapeutic value with low invasiveness. They are highly effective methods for

restoring the bile outflow in case of obstruction of the bile duct with stones, as well as allowing for the rapid elimination of the mechanical jaundice. The use of mechanical lithotripsy made it possible to increase the effectiveness of the treatment of retrograde interventions in the presence of large and multiple stones (up to 20 mm).

**Conclusions.** ERCP is a highly informative diagnostic method that allows to determine the presence of stones in the bile ducts, differentiate them from other causes of mechanical jaundice, establish the location, number, size, and degree of blockage of the ducts. In addition, the therapeutic stage of ERCP in choledocholithiasis can decompress the BD and eliminate the cause of obstructive jaundice in up to 95.0-97.0% of cases.

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