

сов гликогена он выступает триггером запаса энергии в виде жировой ткани. Следовательно, мы предполагаем, что при развитии гиперинсулинемии, появляется большее количество инсулина, которое провоцирует, в рамках обычных процессов, накопление жировой ткани, ее отложение, но значительно в большем количестве, чем в норме.

### Выводы

1. Повышение уровня С-пептида свидетельствует о наличии патологических значений гормона уже в группе с ИзбМТ при отсутствии ожирения и о более грубых нарушениях уровня С-пептида при развитии ожирения.

2. Сочетание патологических значений С-пептида с ИзбМТ требует проведения лечебных мероприятий с целью купирования прогрессирования заболевания и возникновения ожирения.

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## MINI-INVASIVE TECHNOLOGIES AND ENDOSCOPY IN DIAGNOSTICS AND TREATMENT OF CHOLEDOCHOLITHIASIS

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МАЛОИНВАЗИВНЫЕ ТЕХНОЛОГИИ И ЭНДОСКОПИЯ В ДИАГНОСТИКЕ И ЛЕЧЕНИИ ХОЛЕДОХОЛИТИАЗА

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Проведена оценка результатов использования малоинвазивных методов при диагностике и лечении холедохолитиаза у 273 больных. Высокие показатели критериев диагностики выявлены при фиброхоледохоскопии (чувствительность — 97,3 %, специфичность — 100,0 %, точность — 98 %, эффеkтивность — 97,7 %), ультразвуковом исследовании (95,8; 78,8; 90,5; 77,1 % соответственно), компьютерной томографии (91,1; 73,4; 84; 77,2 % соответственно). Установлено, что при диаметре конкрементов 2–7 мм применение эндоскопической папиллосфинктеротомии



приводит к миграции конкрементов из желчных протоков в тонкий кишечник у 83,7 % больных. Удаление конкрементов диаметром 8–10 мм в 86,5 % случаев возможно лишь при холедохолитоэкстракции. При диаметре камней 11–15 мм механическая литотрипсия с последующей литоэкстракцией с помощью корзинки Dormia осуществима лишь в 30,0 % случаев.

**Ключевые слова:** холедохолитиаз, механическая желтуха, малоинвазивный метод, фиброхоледохоскопия.

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## MINI-INVASIVE TECHNOLOGIES AND ENDOSCOPY IN DIAGNOSTICS AND TREATMENT OF CHOLEDOCHOLITHIASIS

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**Background.** Being one of the most common pathologies of bile ducts, choledocholithiasis (CHL) is complicated by mechanical jaundice (MJ) in 21.4–46.3% of cases. Choice of optimal treatment mode and operation method is still a difficult problem.

**Purpose** of study is estimation of the results of mini-invasive methods using in diagnostics and treatment of CHL.

**Methods.** During 2007–2011 years 273 patients were treated with the diagnosis CHL aged from 24 to 92 y.o., 254 (93.0%) of them had symptoms of MJ. Abdominal ultrasound (US) was used for screening CHL, computer tomography (CT), endoscopic retrograde cholangiopancreatography (ERCP), percutaneous transhepatic fistulocholangiography, intraoperative cholangiography or cholangioscopy, intraoperative or transduodenal fibrocholedochoscopy (FCHS) were used when indicated. Surgical treatment included mini-invasive interventions (endoscopic papillosphincterotomy (EPST), percutaneous transhepatic bile duct catchment, laparoscopic cholecystectomy, choledocholithoextraction (CHLE) with following external or internal bile duct catchment), and traditional operations. Surgical treatment of patients with MJ was fulfilled in one or two stages.

**Results.** High rates of diagnostic test criteria were found in FCHS (sensitivity — 97.3%, specificity — 100.0%, accuracy — 98%, effectiveness — 97.7%), US (95.8%, 78.8%, 90.5%, 77.1% respectively), CT (91.1%, 73.4%, 84%, 77.2% respectively). It is estimated that if the concrement has diameter of 2–7 mm, the use of EPST leads to its migration from biliary ducts to the intestine in 83.7% of patients; 8–10 mm — removal is possible in 86.5% of cases only by CHLE; 11–15 mm — mechanical lithotripsy with stone extraction using Dormia basket is possible only in 30% cases.

**Conclusions.** CHL diagnostics should be performed using complex of medical tests (US, CT, ERCP and FCHS). Using of mini-invasive methods such as EPST, transpapillar mechanical lithotripsy, endovideosurgery allow to treat patients with CHL radically.

**Key words:** choledocholithiasis, obstructive jaundice, mini-invasive method, fibrocholedochoscopy.

### Introduction

Choledocholithiasis (CHL) is one of the most common pathologies of bile ducts [1; 6]. CHL prolongation causes bile ducts and big duodenal papilla (BDP) strictures with following mechanical jaundice (MJ) and multiple organ insufficiency (MOI) [5; 7]. CHL is complicated by MJ in 21.4–46.3% of cases, and in 22.9% of cases it is complicated by combination of MJ and purulent cholangitis [2; 5]. MJ leads to significant homeostasis imbalance: from hypocoagulation, hepatargia, liver insufficiency to MOI [5]. During last ten years significant improvement in diagnostics and surgical treatment of CHL by introducing in practice mini-invasive innovative technologies was shown [3; 6]. Despite this CHL treatment has stable morbidity rate and choice of optimal treatment tactics and operation method is still a difficult problem.

**The purpose** of this work was to estimate the results of mini-invasive methods using in diagnostics and treatment of CHL.

### Materials and Methods

In surgery clinic N 2 of Dnipropetrovsk Medical Academy on the base of unit of the Surgical Gastroenterology, Endoscopic Surgery and Transplantation in Regional State Hospital named after I. I. Mechnikov during 2007–2011 years 273 patients were treated with the diagnosis CHL aged from 24 to 92 y.o., middle age was (61.7±3.9) y.o. 254 (93.0%) of these patients had symptoms of MJ; 234 (85.7%) cases were CHL with gallbladder stones, 7 (2.6%) cases — combination of CHL with acalculus cholecystitis, 32 (11.7%) cases — recurrent or residual CHL.

Abdominal ultrasound (US) was used for screening of CHL, computer tomography (CT), endoscopic retrograde cholangio-

pancreatography (ERCP), percutaneous transhepatic fistulocholangiography (TFCG), intraoperative cholangiography or cholangioscopy (ICHG), intraoperative or transduodenal fibrocholedochoscopy (FCHS) were used when indicated. "Olympus" fibrocholangioscope was used in the last method. Well-known formulas were used to calculate diagnostic methods values [4].

Surgical treatment included not only mini-invasive interventions, but also traditional operations. The former were presented by endoscopic papillosphincterotomy (EPST), percutaneous transhepatic bile duct catchment (TTBDC), laparoscopic cholecystectomy (LCE), choledocholithoextraction (CHLE) with following external or internal bile duct catchment. External bile duct catchment was provided by Kholsted-Pikovskiy, Kholsted, Kerte, Vishnevskiy, Kehr. Internal bile duct catchment was pro-



vided by choledochoduodenostomy (CHDS). Choledochojejunostomy was provided less frequently.

The length of incision during EPST was 10 mm. It was made by using of needle-type and Saggittarius-type papillotomes with following CHLE. This procedure was performed two or three times if intraductal stones size was more than 10 mm in diameter. Stones from bile ducts were extracted by Dormia's basket, more often after their additional fragmentation by mechanical lytotriptor Olympus BML-4Q. Systems for bile duct catchment by Seldinger and drainage with stylets for transcutaneous cholecystostomies produced by "Kammed" (c. Kamyanets'-Podil'skiy, Ukraine) and drainage tube systems produced by "Balton" (Poland) and "Marflow" (Switzerland) were used for TTBCD. Dormia baskets or Fogarty catheters were used for stones extractions during laparoscopy.

Surgical treatment of patients with MJ was fulfilled in one or two stages. Indications for preliminary bile duct decompression were: third stage of MJ (hyperbilirubinemia > 200 mkmol/l, duration > 14 days, hypoproteine-mia, increasing in Sublimate test more than 4 times, prothrombin index decreasing, hypodynamia, inversion of sleep, more than 50% decrease in diuresis); second stage MJ (hyperbilirubinemia 100–200 mkmol/l, duration 7–14 days, increase in alanine aminotransferase and aspartate aminotransferase more than twice, stable hemodynamics, normal diuresis, symptoms of nascent encephalopathy) in elderly patients and those with comorbid conditions of life-depend-ing systems and organs in sub-or decompensated stage.

### Results and Discussion

Comparison of USI, CT, ERCP, TFCG, ICHG and FCHS significance in CHL diagnostics (Table 1) showed advantages of some of them such as FCHS by

any definition, and USI and CT had high specificity.

It is noticeable that none of diagnostic methods shown in Table 1 had 100% accuracy and effectiveness. Even using of FCHS 1 (1.85%) case was followed by residual cholangiolithiasis.

Indications for EPST were found in 192 patients. In 8 (4.2%) cases it was not possible to cannulate BDP because of parafar-terial diverticula, stenosis of papilla or distal part of common bile duct. Analysis of 184 EPST results showed that effectiveness of treatment procedure directly correlated with stone size and its mechanical resistance. Thus, if stone had diameter more than 2–7 mm EPST and following conservative therapy lead to stone migration from bile ducts to intestine in 83.7% patients, CHLE was conducted in 8.5% cases, in 7.8% of patients transpapillar CHLE was impossible. Evacuation of stones with diameter about 8–10 mm was possible in 86.5% cases during CHLE only, for 13.5% patients transpapillar manipulations were not effective. If stone had diameter 11–15 mm mechanical lithotripsy with stone extraction using Dormia basket was possible only in 30.0% cases.

Complications rate after EPST was 4.9% (9 cases). In 5 cases it was followed by acute pancreatitis, which had abortive clinical course after drug treatment. Duodenal bleeding was seen in 4 cases, which started after simultaneous EPST and stone extraction. In 3 patients the bleed-

ing was stopped by complex drug treatment and endoscopic injective hemostasis. 1 patient needed urgent surgical operation. Mortality rate of EPST and endoscopic lithoextraction was 0. There was no complications later in post-operative period.

TTBDC was used in 42 patients with CHL. Left duct puncture was performed in 37 (88.1%) cases, in 5 (11.9%) cases right duct puncture was done. After TTBDC drainage worked actively in 35 (83.3%) patients. In 7 (16.7%) cases interruption of bile flow through drainage tube were caused by their dislocation (3) or by progressive liver insufficiency (4). In 1 (2.4%) case there was dribbling of bile to free abdominal cavity past drainage tubes. In such cases urgent laparoscopy, CHLE, external bile duct catchment by Kholsted, abdominal cavity sanitation and catchment were performed. In three patients who had the tube dislocated second TTBDCs was performed using catheters of bigger diameter and additional catchment of sub-hepatic space. After tube replacing bile dribbling to abdominal cavity was stopped.

In 23 patients with recurrent (19) or residual (4) CHL, and 3 patients with CHL combined with non-calculus cholecystitis, which had been treated by conservative methods, radical treatment was performed by EPST using. 3 patients who had contraindications to surgical treatment such as severe comorbid conditions and elderly age were discharged from the clinic with external bile duct drainage for out-

Table 1  
Medical Tests Characteristics in CHL Diagnostics, %

Criteria	Diagnostic tests					
	USI n=105	CT n=95	ERCP n=60	TFCG n=37	ICHG n=58	FCHS n=44
Sensitivity	95.8	91.1	96.3	89.5	91.4	97.3
Specificity	78.8	73.4	50.0	54.1	52.8	100.0
Accuracy	90.5	84.0	91.7	88.7	87.2	98.0
Effectiveness	77.1	77.2	73.2	76.4	72.1	97.7

Note: n — number of cases.



Types of Radical Surgical Interventions

Type of operation	Quantity		Morbidity		Mortality	
	n	%	n	%	n	%
Laparoscopic operations	210	86.1				
LCE	143	58.6				
LCE, CHLE, external bile duct catchment	38	15.6				
LCE, CHDS	25	10.2	1	0.4		
LCE, CHLE, suturing of common bile duct	4	1.6	1	0.4	1	0.4
Conventional (after laparotomy)	34	13.9				
Cholecystectomy, CHLE, external bile duct catchment	19	7.8	1	0.4	1	0.4
Cholecystectomy, CHDS	13	5.3	2	0.8	1	0.4
Cholecystectomy, cholechojejunostomy	2	0.8				
Total	244	100	5	2.0	3	1.2

patient treatment or inpatient treatment in other hospitals. Other patients were operated on. Types and quantity of surgical interventions are showed in Table 2.

### Conclusions

1. Choledocholithiasis diagnostics should be performed using complex of medical tests such as ultrasound investigation, computer tomography, endoscopic retrograde cholangiopancreatography and fibrocholedochoscopy.

2. Using of mini-invasive methods and technologies such as endoscopic papillosphincterotomy, transpapillar mechanical lithotripsy, endovideosurgery allow to treat patients with choledocholithiasis radically. Effectiveness of them depends on equipment support improvement and professional skills of physicians.

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