UDC 616.367-003.7-089.832-036.8
DOI http://doi.org/10.30978/GS-2023-1-28

ISSN 2786-5584 print
ISSN 2786-5592 online

Results of laparoscopic choledocholithoextraction and choledochoscopy for difficult choledocholithiasis: a single centre experience

Y. M. Susak, M. V. Maksimenko, L. Y. Markulan, R. V. Honza, I. I. Tiuliukin, V. V. Volkovetskii

Bogomolets National Medical University, Kyiv

✉ Vitalii Volkovetskii: vitalikvolkovetsky@gmail.com

Y. M. Susak, http://orcid.org/0000-0002-5102-485X
M. V. Maksimenko, http://orcid.org/0000-0003-2507-1238
L. Y. Markulan, http://orcid.org/0000-0003-2879-5012
R. V. Honza, http://orcid.org/0009-0007-9357-3260
I. I. Tiuliukin, http://orcid.org/0000-0001-7965-2922
V. V. Volkovetskii, http://orcid.org/0000-0003-3843-9783

The management of difficult choledocholithiasis, which accounts for 10—15 % of all cases of bile duct stones, has not yet been definitively defined. One of the treatment options for difficult choledocholithiasis is laparoscopic choledocholithoextraction combined with choledochoscopy.

Objective — to evaluate the experience of a single centre in the treatment of difficult choledocholithiasis using laparoscopic choledocholithoextraction and choledochoscopy.

Materials and methods. A total of 47 patients, including 16 (34 %) men and 31 (66 %) women with difficult choledocholithiasis, were enrolled in the study and received treatment at our centre. All patients were operated on using laparoscopic choledocholithoextraction combined with choledochoscopy. Thereafter, the results of treatment were analysed for the cohort of patients. In the study, we identified the causes of difficult choledocholithiasis and evaluated the achievement of complete bile duct clearance, the surgery duration, total and postoperative bed days, complications, and mortality.

Results. All patients underwent laparoscopic choledocholithoextraction combined with choledochoscopy. The causes of difficult choledocholithiasis were as follows: characteristics of bile duct stones — 27 (57.4 %), altered anatomy of the organs of the hepatopancreatobiliary zone — 11 (23.6 %), specific location of bile duct stones — 9 (19.1 %). After laparoscopic choledocholitoextraction combined with choledochoscopy, complete bile duct clearance was achieved in 95.7 % of cases. The average duration of the operation was 130.0 ± 14.7 min. The length of hospital stay after surgery was, on average, 14.3 ± 1.7 days. 4 (8.5 %) patients had complications corresponding to classes II (2 (4.2 %)) and III (2 (4.2 %)) according to the standardized Clavien-Dindo classification (2009).

Conclusions. Laparoscopic choledocholithoextraction combined with choledochoscopy can be used as one of the technologies for the treatment of difficult choledocholithiasis.

Keywords
difficult choledocholithiasis, laparoscopic choledocholithoextraction, laparoscopic choledochoscopy.

ARTICLE • Received 2023-02-12 • Received in revised form 2023-03-02

The frequency of bile duct stones in patients with symptomatic gallstone disease varies widely and reaches 5—33 %, according to age [13, 26, 33]. In 85—90 % of cases, choledocholithiasis is successfully treated with endoscopic papillosphincterotomy (EPST) and lithoextraction, which are currently the standard treatment for this pathology [12, 26, 32—34]. However, in 10—15 % of cases, choledocholithiasis is considered endoscopically difficult, and other technologies and equipment are needed to solve this problem [12, 14, 32—34]. Laparoscopic choledocholithoextraction combined with choledochoscopy is a promising direction for the treatment of difficult choledocholithiasis [2, 4, 18, 23, 33].

Table 1. **Criteria for difficult choledocholithiasis [26]**

Category	Condition	Basis
Characteristics of bile duct stones	Large stone (> 15 mm) Multiple choledocholithiasis (> 3 stones, size > 10 mm) Atypical form of bile duct stones (barrel-shaped)	Indication for lithotripsy Impossibility of stone extraction with the Dormia basket
Location of bile duct stones	Intrahepatic ducts Bile duct stones above the stricture of the duct Mirizzi syndrome	Difficulty in reaching bile duct stones
Altered anatomy	Stenosis of the esophagus, stomach, or duodenum Condition after gastrectomy and Billroth II gastric resection Parapapillary diverticulum Vitreous edema of the duodenum	Difficulty in reaching the major duodenal papilla
Patient condition	Various terminal states Significant coagulation disorders	High risk of fatal complications

To date, there is no single consensus on the definition of difficult choledocholithiasis, and there are no standards for the treatment of this pathology [2, 7, 13, 26].

Objective — to evaluate the experience of a single centre in the treatment of difficult choledocholithiasis using laparoscopic choledocholithoextraction and choledochoscopy.

Materials and methods

The study was performed at the Department of Surgery No 2 of the Communal non-profit enterprise «Kyiv City Clinical Hospital of Emergency Medical Care», specializing in the treatment of diseases of the hepatopancreatobiliary zone, which is the clinical base of the Department of Surgery with a Course in Emergency and Vascular Surgery at O. O. Bogomolets National Medical University. A total of 47 patients, including 16 (34 %) men and 31 (66 %) women with difficult choledocholithiasis, were enrolled in the study and received treatment at our centre. Thereafter, the results of treatment were analysed for the cohort of patients. The average age of patients was 60.3 ± 1.9 years (men — 57.8 ± 1.9 years; women — 62.2 ± 1.9 years). The study participants fell between the ages of 32 and 82. All patients underwent laparoscopic choledocholithoextraction combined with choledochoscopy.

Difficult choledocholithiasis was assigned based on the presence of severity factors complicating endoscopic retrieval of common bile duct stones (Table 1).

The diagnosis of difficult choledocholithiasis was established using ultrasound of the abdominal cavity, duodenoscopy, and endoscopic retrograde cholangiopancreatography. Computerized tomography with contrast and magnetic resonance cholangiopancreatography were additionally used in 2 (4.3 %) and 1 (2.1 %) patients, respectively, because ultrasound sometimes failed to provide adequate visualization of the common bile duct and biliary tree. The risks of choledocholithiasis were determined according to the criteria of the American Society of Gastrointestinal Endoscopy (Table 2) [20].

We collected and analysed the following data: demographic indicators, the achievement of complete bile duct clearance, recurrent choledocholithiasis within a year, the presence and severity of cholangitis according to the severity grading of cholangitis (Tokyo Guidelines 2013) (Table 3, 4), jaundice (serum bilirubin rises to 2 to 2.5 mg/dL) [14], the diameter of the common bile duct, number of bed days before and after surgery, and total bed days, the patients' physical status according to the ASA classification, and previous surgical interventions. Postoperative complications were

Table 2. **Predictors of choledocholithiasis [20]**

Predictors	Description
Very strong	Common bile duct stone on ultrasound Clinical manifestations of cholangitis Elevated total bilirubin level > 4 mg/dL
Strong	Dilated common bile duct on ultrasound (> 6 mm) Elevated total bilirubin level (1.8—4.0 mg/dL)
Moderate	Elevated LFTs (ALT, AST) Age > 55 years Clinical manifestations of biliary pancreatitis

Table 3. **Severity grading of cholangitis [4]**

Grading of acute cholangitis	Description
Grade I (mild)	Grade I cholangitis does not meet the criteria of grade III or grade II acute cholangitis at initial diagnosis
Grade II (moderate)	Abnormal white blood cells count ($\geq 12{,}000$ mm^3, $\leq 4{,}000$ mm^3) High fever (≥ 39 °C) Age (≥ 75 years old) Hyperbilirubinemia (total bilirubin ≥ 5 mg/dL) Hypoalbuminemia (standard deviation 0.7)
Grade III (severe)	Grade III (severe) acute cholangitis is defined as acute cholangitis that is associated with the onset of dysfunction in at least one of any of the organs/systems from Table 4

Table 4. **Dysfunction of organs/systems associated with grade III acute cholangitis**

Disfunctions	Parameters
Cardiovascular	Hypotension required dopamine ≥ 5 μg/kg per min or any dose of epinephrine
Neurological	Disturbance of consciousness
Respiratory	$PaO_2/FiO_2 \leq 300$
Renal	Oliguria, serum creatinine $\geq 2{,}0$ mg/dL
Hepatic	International normalized ratio $\geq 1{,}5$
Hematological	Platelet count $\leq 100{,}000$ mm^3

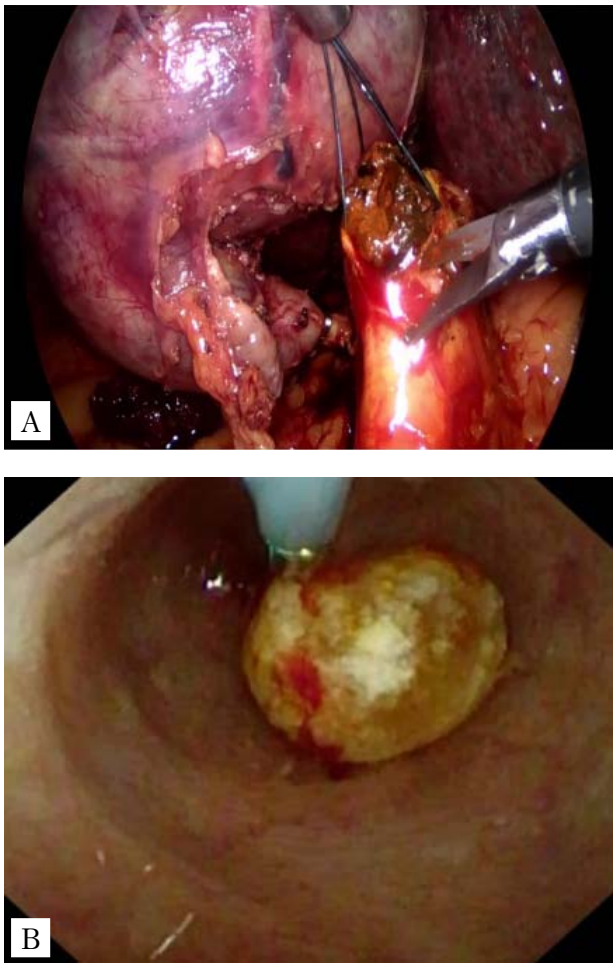

Figure 1. **Choledocholitotomy combined with choledocholithoextraction (A) and choledochoscopy guided choledocholithoextraction (B)**

determined according to the standardized Clavien-Dindo classification (2009) [9].

Patients underwent laboratory tests (complete blood count, blood biochemistry, urinalysis, analysis of arterial blood gases and electrolytes) and instrumental tests (ECG, X-ray of the chest and abdominal cavity, ultrasound examination of the abdominal cavity and retroperitoneum, EFGDS).

Methodology of laparoscopic choledocholithoextraction and choledochoscopy

Laparoscopic choledochoscopy was performed using Olympus CHF-V choledochofibroscopes (Japan) with a diameter of 5 mm.

The surgical procedure was conducted under general anesthesia. A standard 4-port technique used for laparoscopic cholecystectomy was administered, and a separate port was placed in the projection of the common bile duct for subsequent choledochoscopy. The central part of the common bile duct was isolated, and the cystic artery was ligated. A clip was applied to the proximal part of d. cysticus. The gallbladder was left and used for traction during manipulations on the common bile duct. An incision of 15 to 40 mm was made in the central part of the common bile duct, depending on the situation, after which choledocholithoextraction was performed using the Dormia basket (Fig. 1A).

The bile ducts were washed with a 0.9 % sodium chloride solution heated to 37 °C, which helped wash out small stones from the common bile duct. With the help of choledochoscopy, all reachable segments of the bile ducts were visualized, including the ampulla of Vater (the major duodenal papilla). When calculi were detected, choledocholithoextraction was performed using the Dormia

baskets through the working channel of the choledochofibroscope (Fig. 1B).

After choledocholitoextraction, choledochoscopy was performed for direct visualization of the biliary tract through an incision (Fig. 2). Thereafter, the incision into the bile duct was closed with knotted sutures (absorbable monofilament 4/0). Drainage of the bile ducts was required in cases of incomplete removal of bile duct stones or purulent cholangitis. In the presence of a gallbladder, a cholecystectomy was carried out.

Descriptive statistics are used in the research. The data are presented as the arithmetic mean ± standard error of the arithmetic mean (M ± m). A comparison of the mean values of two variables was performed using the Mann-Whitney U-test. Calculations were performed using the IBM SPSS Statistics 22.0 program.

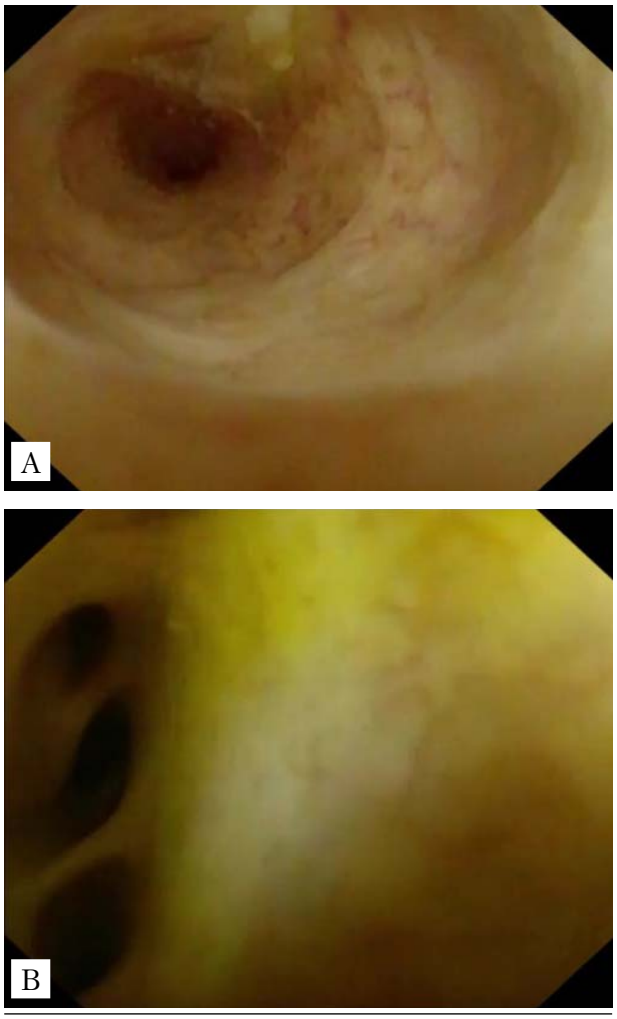

Figure 2. **Choledochoscopy: A — distal part of the bile duct after choledocholithoextraction; B — intrahepatic bile ducts after choledocholithoextraction**

Results and discussion

6 (12.8 %) patients were hospitalized within the first 24 hours, whereas 41 (87.2 %) patients were admitted after 24 hours from the time of pain onset.

The main indicators allowing classify choledocholithiasis as complex were as follows: characteristics of bile stones — 27 (57.4 %); altered anatomy of the organs of the hepatopancreatobiliary zone — 11 (23.6 %); location of the stones in the bile ducts — 9 (19.1 %) (Table 5).

In 14 (29.8 %) patients, concomitant pathology of the stomach and duodenum was detected, in particular, parapapillary diverticulum — in 8 (17 %), gastric ulcer — in 2 (4.3 %), duodenal ulcer — in 1 (2.1 %), and papillitis — in 3 (6.4 %). 14 (29.8 %) patients had acute pancreatitis of various degrees of severity, and 35 (63.8 %) had cholangitis.

A total of 6 (12.8 %) patients underwent operations on the organs of the upper abdominal cavity in the past. The preoperative physical status of patients was assessed according to the ASA PS classification (the American Society of Anesthesiologists Physical Status Classification System) and graded as ASA I in 6 (12.6 %), ASA II in 27 (57.4 %), and ASA III in 14 (30.0 %).

In 40 (85.1 %) patients with jaundice, the level of total bilirubin ranged from 32.3 to 253.4 μmol/L (from 1.9 to 14.8 mg/dL), with an average of 89.6 ± 9.2 μmol/L (5.2 ± 0.54 mg/dL).

The bile duct stones were found in the terminal part of the bile ducts in 23 (48.9 %) cases and in the distal part in 14 (29.8 %) cases (Table 6).

Table 5. **Cases of complex choledocholithiasis (n = 47)**

Indicator of complex choledocholithiasis	Number of cases
Characteristic of bile stones	27 (57.4 %)
Large stone (> 15 mm)	10 (21.2 %)
Multiple choledocholithiasis (> 3 stones, size > 10 mm)	16 (34.0 %)
Atypical form of bile duct stones (barrel-shaped)	1 (2.1 %)
Altered anatomy of the organs of the hepatopancreatobiliary zone	11 (23.6 %)
Condition after Billroth II gastric resection	4 (8.5 %)
Parapapillary diverticulum	7 (14.8 %)
Location of the stones	9 (19.1 %)
Intrahepatic ducts	5 (10.6 %)
Mirizzi syndrome	4 (8.5 %)

Table 6. **Location of bile duct stones in the bile duct (n=47)**

Location (a segment of the bile duct)	Number of cases
Terminal	23 (48.9 %)
Distal	14 (29.8 %)
Central	4 (8.5 %)
Proximal	4 (8.5 %)
Intrahepatic	2 (4.2 %)

Table 7. **Results of laparoscopic choledocholithoextraction and choledochoscopy for difficult choledocholithiasis**

Parameter	Value
Surgery duration, min	130.0 ± 14.7 (85—180)
Diameter of the common bile duct, mm	12.4 ± 0.7 (7—24)
Size of extracted bile duct stones, mm	6.7 ± 0.5 (3—25)
Number of extracted bile duct stones	4.4 ± 0.5 (1—24)
External drainage of the common bile duct	5 (10.6 %)
Grade II complications*	2 (4.2 %)
Grade III complications*	2 (4.2 %)
Conversions	1 (2.1 %)
Number of bed-days before surgery	7.2 ± 2.8 (1—35)
Number of bed-days after surgery	14.3 ± 1.7 (7—22)
Total number of bed-days	21.0 ± 1.9 (7—62)

Note. Quantitative data are presented as mean and average deviation and range (M ± m (min—max)), categorial data are presented as a number of cases and percentage.
* Complications according to the standardized Clavien-Dindo classification [9].

On average, during laparoscopic choledocholithoextraction combined with choledochoscopy, 4.4 ± 0.5 bile duct stones (from 1 to 24) were removed, while according to ultrasound, the average number of stones was 1.7 ± 0.2 (from 1 to 4). Additionally, the diameter of the common bile duct (intraoperatively) ranged from 7 to 24 mm, with an average of 12.4 ± 0.7 mm, which corresponded to ultrasound data in 86 % of cases.

The average values of the maximum size of bile duct stones according to ultrasound data were smaller than the actual values: 6.7 ± 0.5 mm (3—25 mm) versus 8.9 ± 0.7 mm (4—25 mm), ($p < 0.05$).

External drainage of the common bile duct was performed in 5 (10.6 %) patients due to incomplete removal of bile duct stones in 2 (4.3 %) and the presence of purulent cholangitis and biliary microcholedocholithiasis in 3 (6.2 %).

The operative intervention lasted an average of 130.0 ± 14.7 min (85—180 min).

Complete bile duct clearance was achieved in 95.7 % of cases.

A total of 4 (8.5 %) patients had grade II (2 (4.2 %)) and III (2 (4.2 %)) complications according to the standardized Clavien-Dindo classification (2009) and leakage of bile through the wound drainage collector (2 (4.2 %)).

After laparoscopic cholelithoextraction combined with choledochoscopy, 2 (4.3 %) patients needed endoscopic papillosphincterotomy (EPST), lithoextraction, and endobiliary stenting due to unsuccessful retrieval of difficult bile duct stones.

Conversion was performed in 1 (2.1 %) case due to suspicion of neoplasia of the common bile duct.

The average bed-day before surgery was 7.2 ± 2.8 days (from 1 day to 35 days), the postoperative bed-day was 14.3 ± 1.7 days, and the total bed-day was 21 ± 1.9 days. Summarized data on treatment results are given in Table 7.

Discussion

Endoscopic and laparoscopic methods are used in the treatment of patients with difficult choledocholithiasis [1, 12, 21, 23, 26, 33, 34].

Both methods, including one-stage laparoscopic choledocholithoextraction combined with choledochoscopy and two-stage EPST with lithoextraction and prelaparoscopic or postlaparoscopic cholecystectomy, are effective in the treatment of difficult choledocholithiasis [12, 23, 26, 33, 34]. In modern hepatobiliary surgery, preference is given to two-stage treatment of patients (endoscopic papillosphincterotomy combined with lithoextraction) [12, 26, 32]. This is probably due to the almost 50-year experience of the use of EPST and lithoextraction. In 1974, K. Kawai et al. [18] and M. Classen et al. [8] first implemented and described this technique.

In the case of transpapillary interventions, failures and complications are possible, the frequency of which increases in the case of complex choledocholithiasis [3, 32]. There is also a growing need to use additional methods of endoscopic lithoextraction, which increases the duration and cost of the operation and, depending on the chosen lithoextraction method, is accompanied by certain complications in 3.6—9.0 % of cases [3, 32]. Failures in

endoscopic lithoextraction can occur during choledochal cannulation (parapapillary diverticulum, internal papillary diverticulum, inability to differentiate the major duodenal papilla) [3, 32] or lithoextraction [6, 34], mainly in the case of difficult choledocholithiasis.

According to the literature, the frequency of complications arising from transpapillary interventions is 5—18 %. Among them, the most common are acute pancreatitis, perforation of the duodenum, bleeding, and cholangitis [4, 14]. After EPST, complications were recorded in 9.4—11.1 % of cases [13, 20, 29].

If endoscopic lithoextraction methods are ineffective, laparoscopic or open choledocholithoextraction combined with choledochoscopy can be the method of choice [4, 13, 28]. This technique has been used since the mid-1990s, initially for diagnostic purposes and later to extract bile duct stones [19].

With the development of laparoscopic surgery and instrumentation, laparoscopic choledocholithoextraction combined with choledochoscopy is becoming a safer and more effective method in the treatment of choledocholithiasis and can be used primarily in cases of difficult choledocholithiasis as well as when transpapillary interventions are ineffective for certain reasons [2, 15, 25]. Laparoscopic choledocholithoextraction combined with choledochoscopy as a one-stage procedure does not require a delayed cholecystectomy. In combination, they reduce the need for repeated transpapillary interventions, provide direct visualization of the biliary system, and preserve the function of the ampulla of Vater, which prevents the occurrence of duodenobiliary reflux and reflux cholangitis and maintains the autonomy of the hepatopancreatobiliary zone. In some studies, the frequency of complications ranges from 7 % to 12.5 % [15, 17, 20, 28] which is consistent with our data.

In our study, bile leakage from the common bile duct sutures was the main complication. It was reported in 4.2 % of cases. This indicator was lower than those described by other authors (9.5 % [17], 4.35 % [15], and 7.2 % [28]).

After choledocholithoextraction combined with choledochoscopy, complete bile duct stone clearance was observed in 95.7 % of cases, compared to 82—100 % in other studies [11, 18, 34].

According to our data, there were no recurrences of choledocholithiasis after laparoscopic choledocholithoextraction combined with choledochoscopy during 1 year of observation, while according to other authors, they were recorded in 1.3—4.3 % of cases [7, 15, 20, 28].

In our study, no choledochal strictures or fatal consequences were reported after a year of observation. This is consistent with the data of other authors [11, 14, 34].

The average postoperative bed-day in our study was slightly longer 14.3 ± 1.7 days than reported by other authors (9.2 ± 2.5 days [15], 9.0 ± 3.6 [29], and 12.7 ± 1.8 [21]), which can be explained by different criteria for discharge of patients from the hospital.

The duration of surgical intervention as reported in the literature varies significantly: 133.2 min [15], 231.4 min [13], and 120 min [29]. These differences can be attributed to the variety of causes and severity of difficult choledocholithiasis in individual samples. In our study, the average duration of the operation was 130 ± 14.7 min (depending on the pathological changes caused by the disease, from 85 to 180 min).

The findings of our study show that the technique of laparoscopic choledocholithoextraction combined with choledochoscopy in cases of difficult choledocholithiasis is effective and safe. It allows for visualization of the extrahepatic bile ducts and controlled retrieval of all stones and is a one-stage surgical treatment that ensures the integrity of the ampulla of Vater and the absence of postoperative complications typical of transpapillary interventions. The benefits of this technique attest to the expediency of its use.

Conclusions

Laparoscopic choledocholithoextraction combined with choledochoscopy can be used as one of the technologies for the treatment of difficult choledocholithiasis. It is a one-stage surgical procedure that ensures the absence of complications typical of transpapillary interventions.

The unicentricity of our study is its limitation.

Declaration of interests

The authors declare that they have no conflicts of interest.

Authors contributions

Conception and design: Y. M. Susak, M. V. Maksimenko; acquisition of data: L. Y. Markulan, V. V. Volkovetskii; drafting the article Y. M. Susak; critical revision of the article: R. V. Honza, I. I. Tiuliukin.

References

1. Насташенко ІЛ. Транспапілярні втручання з приводу гострого панкреатиту. Клінічна хірургія. 2015;(8):32-4. http://nbuv.gov.ua/UJRN/KlKh_2015_8_10.
2. Alexakis N, Connor S. Meta-analysis of one- vs. two-stage laparoscopic/endoscopic management of common bile duct stones. HPB (Oxford). 2012 Apr;14(4):254-9. doi: 10.1111/j.1477-2574.2012.00439.x. Epub 2012 Feb 3. PMID: 22404264; PMCID: PMC3371212.
3. Angsuwatcharakon P, Rerknimitr R. Cracking Difficult Biliary Stones. Clin Endosc. 2021 Sep;54(5):660-668. doi: 10.5946/ce.2020.256-IDEN. Epub 2021 Mar 16. PMID: 33721976; PMCID: PMC8505192.

4. Atstupens K, Plaudis H, Saukane H, Rudzats A. The role of choledochoscopy in transductal laparoscopic common bile duct exploration. General Surgery. 2021;1:10-7. https://doi.org/10.30978/GS-2021-1-10.
5. Banks PA, Bollen TL, Dervenis C, Gooszen HG, Johnson CD, Sarr MG, Tsiotos GG, Vege SS; Acute Pancreatitis Classification Working Group. Classification of acute pancreatitis-2012: revision of the Atlanta classification and definitions by international consensus. Gut. 2013 Jan;62(1):102-11. doi: 10.1136/gutjnl-2012-302779. Epub 2012 Oct 25. PMID: 23100216.
6. Brewer Gutierrez OI, Bekkali NL H., Raijman I, Sturgess R, Sejpal DV, Aridi HD, Sherman S, Shah RJ, Kwon RS, Buxbaum JL, Zulli C, Wassef W, AdLer DG, Kushnir V, Wang AY, Krishnan K, Kaul V, Tzimas D, DiMaio CJ, Ho S, Petersen B, Moon JH, Elmunzer BJ, Webster GJ. M., Chen YI, Dwyer LK, Inamdar S, Patrick VB, Attwell A, Hosmer A, Ko C, Maurano A, Sarkar A, Taylor LJ, Gregory MH, Strand DS, Raza A, Kothari S, Harris JP, Kumta NA, Manvar A, Topazian MD, Lee YN, Spiceland CM, Trindade AJ, Bukhari MA, Sanaei O, Ngamruengphong S, Khashab MA. Efficacy and Safety of Digital Single-Operator Cholangioscopy for Difficult Biliary Stones. Clin Gastroenterol Hepatol. 2018 Jun;16(6):918-926.e1. doi: 10.1016/j.cgh.2017.10.017. Epub 2017 Oct 24. PMID: 29074446.
7. Cai H, Sun D, Sun Y, Bai J, Zhao H, Miao Y. Primary closure following laparoscopic common bile duct exploration combined with intraoperative cholangiography and choledochoscopy. World J Surg. 2012 Jan;36(1):164-70. doi: 10.1007/s00268-011-1346-6. PMID: 22086256.
8. Classen M, Demling L. Endoskopische Sphinkterotomie der Papilla Vateri und Steinextraktion aus dem Ductus choledochus [Endoscopic sphincterotomy of the papilla of vater and extraction of stones from the choledochal duct (author's transl)]. Dtsch Med Wochenschr. 1974 Mar 15;99 (11):496-7. German. doi: 10.1055/s-0028-1107790. PMID: 4835515.
9. Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, de Santibañes E, Pekolj J, Slankamenac K, Bassi C, Graf R, Vonlanthen R, Padbury R, Cameron JL, Makuuchi M. The Clavien-Dindo classification of surgical complications: five-year experience. Ann Surg. 2009 Aug;250(2):187-96. doi: 10.1097/SLA.0b013e3181b13ca2. PMID: 19638912.
10. Costi R, Gnocchi A, Di Mario F, Sarli L. Diagnosis and management of choledocholithiasis in the golden age of imaging, endoscopy and laparoscopy. World J Gastroenterol. 2014 Oct 7;20 (37):13382-401. doi: 10.3748/wjg.v20.i37.13382. PMID: 25309071; PMCID: PMC4188892.
11. Dehesa A, Muñoz P, Morant P, Accuracy of New 2019 ASGE Criteria for the Prediction of Choledocholithiasis. Validation Study on Patients with Symptomatic Cholelithiasis. 2021 Published by Elsevier Inc.
12. Doshi B, Yasuda I, Ryozawa S, Lee GH. Current endoscopic strategies for managing large bile duct stones. Dig Endosc. 2018 Apr;30 Suppl 1:59-66. doi: 10.1111/den.13019. PMID: 29658655.
13. Gad EH, Zakaria H, Kamel Y, Alsebaey A, Zakareya T, Abbasy M, Mohamed A, Nada A, Abdelsamee MA, Housseni M. Surgical (Open and laparoscopic) management of large difficult CBD stones after different sessions of endoscopic failure: A retrospective cohort study. Ann Med Surg (Lond). 2019 May 31;43:52-63. doi: 10.1016/j.amsu.2019.05.007. PMID: 31198552; PMCID: PMC6556483.
14. Hungness ES, Soper NJ. Management of common bile duct stones. J Gastrointest Surg. 2006 Apr;10(4):612-9. doi: 10.1016/j.gassur.2005.08.015. PMID: 16627230.
15. Jinfeng Z, Yin Y, Chi Z, Junye G. Laparoscopic management after failed endoscopic stone removal in nondilated common bile duct. Int J Surg. 2016 May;29:49-52. doi: 10.1016/j.ijsu.2016.03.037. Epub 2016 Mar 19. PMID: 27000719.
16. Joseph A, Samant H. Jaundice. StatPearls Publishing;2022. PMID: 31334972.
17. Karaliotas C, Sgourakis G, Lanitis S, Kouloura S, Karkoulias K. Laparoscopic transcystic or transcholedochal choledochoscopy during common bile duct exploration for stones? Differences and similarities. Hellenic Journal of Surgery. 2015;87:394-406. https://doi.org/10.1007/s13126-015-0246-x.
18. Kawai K, Akasaka Y, Murakami K, Tada M, Koli Y. Endoscopic sphincterotomy of the ampulla of Vater. Gastrointest Endosc. 1974 May;20(4):148-51. doi: 10.1016/s0016-5107 (74)73914-1. PMID: 4825160.
19. Kelley WE Jr, Sheridan VC. Laparoscopic choledochoscopy with a small-caliber endoscope. A safe and effective technique for laparoscopic common bile duct exploration. Surg Endosc. 1995 Mar;9(3):293-6. doi: 10.1007/BF00187771. PMID: 7597601.
20. Koc B, Karahan S, Adas G, Tutal F, Guven H, Ozsoy A. Comparison of laparoscopic common bile duct exploration and endoscopic retrograde cholangiopancreatography plus laparoscopic cholecystectomy for choledocholithiasis: a prospective randomized study. Am J Surg. 2013 Oct;206(4):457-63. doi: 10.1016/j.amjsurg.2013.02.004. Epub 2013 Jul 17. PMID: 23871320.
21. Lee SJ, Choi IS, Moon JI, Choi YW, Ryu KH. Comparison of one-stage laparoscopic common bile duct exploration plus cholecystectomy and two-stage endoscopic sphincterotomy plus laparoscopic cholecystectomy for concomitant gallbladder and common bile duct stones in patients over 80 years old. J Minim Invasive Surg. 2022 Mar 15;25(1):11-17. doi: 10.7602/jmis.2022.25.1.11. PMID: 35603338; PMCID: PMC8977497.
22. Lyu Y, Cheng Y, Li T, Cheng B, Jin X. Laparoscopic common bile duct exploration plus cholecystectomy versus endoscopic retrograde cholangiopancreatography plus laparoscopic cholecystectomy for cholecystocholedocholithiasis: a meta-analysis. Surg Endosc. 2019 Oct;33 (10):3275-3286. doi: 10.1007/s00464-018-06613-w. Epub 2018 Dec 3. PMID: 30511313.
23. Manes G, Paspatis G, Aabakken L, Anderloni A, Arvanitakis M, Ah-Soune P, Barthet M, Domagk D, Dumonceau JM, Gigot JF, Hritz I, Karamanolis G, Laghi A, Mariani A, Paraskeva K, Pohl J, Ponchon T, Swahn F, Ter Steege RW. F., Tringali A, Vezakis A, Williams EJ, van Hooft JE. Endoscopic management of common bile duct stones: European Society of Gastrointestinal Endoscopy (ESGE) guideline. Endoscopy. 2019 May;51(5):472-491. doi: 10.1055/a-0862-0346. Epub 2019 Apr 3. PMID: 30943551.
24. Mattila A, Mrena A, Kellokumpu I. Cost-analysis and effectiveness of one-stage laparoscopic versus two-stage endolaparoscopic management of cholecystocholedocholithiasis: a retrospective cohort study. BMC Surgery. 2017;17:79. https://doi.org/10.1186/s12893-017-0274-2.
25. Nastashenko IL. Analysis of causes of unsatisfactory results of endoscopic transpapillary interventions. Surgery. Eastern Europe. 2018;7(2):260-4.
26. Oh CH, Dong SH. Recent advances in the management of difficult bile-duct stones: a focus on single-operator cholangioscopy-guided lithotripsy. Korean J Intern Med. 2021 Mar;36(2):235-246. doi: 10.3904/kjim.2020.425. Epub 2020 Dec 1. PMID: 32972127; PMCID: PMC7969058.
27. Qadri S, Khan M, Khan M. Use of pneumatic lithotripsy for managing difficult CBD calculi. Int J Surg. 2011;9(1):59-62. https://doi.org/10.1016/j.ijsu.2010.08.009.
28. Quaresima S, Balla A, Guerrieri M, Campagnacci R, Lezoche E, Paganini AM. A 23 year experience with laparoscopic common bile duct exploration. HPB (Oxford). 2017 Jan;19(1):29-35. doi: 10.1016/j.hpb.2016.10.011. Epub 2016 Nov 24. PMID: 27890483.
29. Tai CK, Tang CN, Ha JP, Chau CH, Siu WT, Li MK. Laparoscopic exploration of common bile duct in difficult choledocholithiasis. Surg Endosc. 2004 Jun;18(6):910-4. doi: 10.1007/s00464-003-8216-8. Epub 2004 Apr 21. PMID: 15095079.
30. Takada T, Strasberg SM, Solomkin JS, Pitt HA, Gomi H, Yoshida M, Mayumi T, Miura F, Gouma DJ, Garden OJ, Büchler MW, Kiriyama S, Yokoe M, Kimura Y, Tsuyuguchi T, Itoi T, Gabata T, Higuchi R, Okamoto K, Hata J, Murata A, Kusachi S, Windsor JA, Supe AN, Lee S, Chen XP, Yamashita Y, Hirata K, Inui K, Sumiyama Y; Tokyo Guidelines Revision Committee. TG13: Updated Tokyo Guidelines for the management of acute cholangitis and cholecystitis. J Hepatobiliary Pancreat Sci. 2013 Jan;20(1):1-7. doi: 10.1007/s00534-012-0566-y. PMID: 23307006.
31. Tarantino G, Magistri P, Ballarin R, Assirati G, Cataldo AD, Benedetto F. Surgery in biliary lithiasis: from the traditional «open» approach to laparoscopy and the «rendezvous» technique. Hepatobiliary Pancreat. Dis. Int. 2017;16:595-601. https://doi.org/10.1016/S1499-3872 (17)60031-6.
32. Trikudanathan G, Navaneethan U, Parsi MA. Endoscopic management of difficult common bile duct stones. World J Gastroenterol. 2013 Jan 14;19(2):165-73. doi: 10.3748/wjg.v19.i2.165. PMID: 23345939; PMCID: PMC3547556.
33. Troncone E, Mossa M, De Vico P, Monteleone G, Del Vecchio Blanco G. Difficult Biliary Stones: A Comprehensive Review of New and Old Lithotripsy Techniques. Medicina (Kaunas). 2022 Jan 13;58(1):120. doi: 10.3390/medicina58010120. PMID: 35056428; PMCID: PMC8779004.
34. Yasuda I, Itoi T. Recent advances in endoscopic management of difficult bile duct stones. Dig Endosc. 2013 Jul;25(4):376-85. doi: 10.1111/den.12118. Epub 2013 May 8. PMID: 23650878.
35. Zhou Y, Zha WZ, Wu XD, Fan RG, Zhang B, Xu YH, Qin CL, Jia J. Three modalities on management of choledocholithiasis: A prospective cohort study. Int J Surg. 2017 Aug;44:269-273. doi: 10.1016/j.ijsu.2017.06.032. Epub 2017 Jun 28.

Результати лікування складного холедохолітіазу за допомогою лапароскопічної холедохолітоекстракції та холедохоскопії. Досвід одного центру

Я. М. Сусак, М. В. Максименко, Л. Ю. Маркулан, Р. В. Гонза, І. І. Тюлюкін, В. В. Волковецький

Національний медичний університет імені О. О. Богомольця, Київ

Менеджмент складного холедохолітіазу (СХ), частота якого становить 10—15 % серед хворих із конкрементами жовчних проток, остаточно не визначений. Одним із можливих способів лікування СХ є лапароскопічна холедохолітоекстракція з холедохоскопією.

Мета — оцінити досвід одного центру в лікуванні складного холедохолітіазу за допомогою лапароскопічної холедохолітоекстракції та холедохоскопії.

Матеріали та методи. Проаналізовано результати лікування у 2018—2022 рр. 47 пацієнтів (16 (34 %) чоловіків та 31 (66 %) жінка) із СХ. Всіх пацієнтів оперовано методом лапароскопічної холедохолітоекстракції та холедохоскопії. Оцінювали причини СХ, відсоток повного очищення жовчних проток від конкрементів, тривалість оперативного лікування, загальний та післяопераційний ліжко-день, ускладнення і летальність.

Результати. Лапароскопічна холедохолітоекстракція з холедохоскопією виконана всім хворим. Причиною СХ були: особливості конкрементів — 27 (57,4 %), змінена анатомія органів гепатопанкреатобіліарної зони — 11 (23,6 %), особливості розташування конкремента у жовчних протоках — 9 (19,1 %). Після лапароскопічної холедохолітоекстракції з холедохоскопією конкременти у жовчних шляхах були відсутні у 95,7 % випадків. Середня тривалість операції — (130,0 ± 14,7) хв. Тривалість перебування в стаціонарі після операції становила у середньому (14,3 ± 1,7) дня. У 4 (8,5 %) хворих виникли ускладнення, які відповідають II (2 (4,2 %)) та III (2 (4,2 %)) класам за P. Clavien та D. Dindo (2009).

Висновки. Лапароскопічна холедохолітоекстракція з холедохоскопією може бути застосована як одна із технологій лікування складного холедохолітіазу.

Ключові слова: складний холедохолітіаз, лапароскопічна холедохолітоекстракція, лапароскопічна холедохоскопія.

FOR CITATION

Susak YM, Maksimenko MV, Markulan LY, Honza RV, Tiuliukin II, Volkovetskii VV. Results of laparoscopic choledocholithoextraction and choledochoscopy for difficult choledocholithiasis: a single centre experience. General Surgery (Ukraine). 2023:1;28-35. http://doi.org/10.30978/GS-2023-1-28.