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THE ROLE OF RELAPAROSCOPY IN THE DIAGNOSIS AND TREATMENT OF POSTOPERATIVE BILE LEAKS

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The effectiveness of relaparoscopy in the diagnosis and treatment of patients who developed bile leakage after surgery on the gallbladder and bile ducts was studied. It was revealed that the use of minimally invasive endoscopic technologies in the early diagnosis of postoperative bile leakage of the gallbladder and biliary tract makes it possible to determine the nature of this complication, the optimal method of elimination, justify the transition to conversion, and avoid inappropriate relapses.

Keywords: bile discharge, laparoscopic cholecystectomy, postoperative complications.

Introduction. Cholecystectomy (CE) is the most common operation, and the number of cholecystectomies performed annually exceeds 500 thousand [5, 8].

One of the leading places in the structure of early postoperative complications after cholecystectomy is the outflow of bile, which should be considered as an independent problem. Bile outflow after cholecystectomy is observed in about 0.5% of cases [3, 6, 7, 14].

This indicator increases to 1-1.2% when using laparoscopic techniques to remove the gallbladder, as well as in cases of conversion, when difficulties and complications arise during surgery [1, 2, 11, 12].

After open cholecystectomy, bile leakage is observed in 5-15% of cases, after mini-access cholecystectomy, in 3.6%, after laparoscopic cholecystectomy, in 2-5% of cases [3, 4, 9, 10, 13].

About 750,000 cholecystectomies are performed each year in the United States, most of which are performed laparoscopically. Complications after cholecystectomy are not uncommon and lead to an increase in morbidity and financial burden. Some of the most common complications of laparoscopic cholecystectomy include damage to the biliary tract (0.08%-0.5%), bile leakage (0.42%-1.1%), stones in the common bile ducts (0.8%-5.7%), postcholecystectomy syndrome (10%-15%) and diarrhea after cholecystectomy (5%-12%).). [10, 14] Endoscopy plays an important role in the diagnosis and treatment of biliary complications and in many cases can provide the final treatment. There is no consensus on the best therapeutic approach to biliary complications. [10]

Ultrasound (ultrasound) - diapeutics and laparoscopy, used in surgical pathologies of the abdominal cavity, open up wide opportunities for optimizing early diagnosis and treatment tactics of postoperative bile leakage.

The aim of the study was to evaluate the effectiveness of laparoscopy in the diagnosis and treatment of bile leaks that occur after cholecystectomy and operations on extrahepatic bile ducts.

Materials and methods of research. The research work was carried out during 2010-2021 at the clinical bases of two departments of general Surgery of the Azerbaijan State Institute of Advanced Medical Training named after A.Aliyev. Based on the results of diagnosis and treatment of patients who developed bile leaks in the postoperative period, operations were performed on the gallbladder and bile ducts.

The main group included patients (n=567) who, in surgical tactics and for the treatment of complications, were given preference to the active use of endovideosurgery in the development of complications after surgical interventions in the bile ducts.

The control group included patients (n=148) who used "traditional" methods of surgical correction of complications that arose after similar surgical interventions.

The criterion for inclusion in the study is the occurrence of intra–abdominal complications in the early period after surgical interventions on the bile ducts.

The criterion for exclusion from the study is the critical severity of the patients' condition.

Complications in the early postoperative period were clinically diagnosed in 160 out of 567 patients (28.2%) in the developed main group and in 41 out of 148 patients (27.7%) in the control group. In the main group, bile leaks was detected in 88 patients after laparoscopic cholecystectomy, in 16 patients after mini-laparotomic cholecystectomy and in 56 patients after traditional cholecystectomy.

In 15 clinical cases (9.4%), when performing minimally invasive interventions with damage to the extrahepatic bile ducts is clearly impractical, relaparotomy was performed according to the indications. Laparoscopy was performed in 145 (90.6%) patients of the main group according to indications that were confirmed on the basis of bile drainage, peritoneal signs and ultrasound signs of fluid in the abdominal cavity.

The control group included 41 patients with postoperative bile leaks, but without the use of minimally invasive technologies.

To assess postoperative bile leaks, we used a modified classification by Morgensten L. (2006) [15], in which not only the daily output of bile flowing from the abdominal drainage tube, but also the volume of a limited liquid derivative in the projection of the gallbladder bed, as well as ultrasound data mainly took into account the presence of free fluid in the abdominal cavity and its localization.

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We started an instrumental examination of all patients with ultrasound in order to identify free fluid or its limited accumulation in the abdominal cavity when bile leaks from the drainage in the abdominal cavity. In addition, we also evaluated the diameter of the extrahepatic bile ducts during ultrasound as one of the important characteristics of impaired bile outflow with the main bile ducts. Percutaneous puncture was also performed under ultrasound control in 18 (11.3%) patients in order to obtain additional information about the nature of the liquid derivative in the abdominal cavity.

Statistical processing of numerical indicators obtained during the study was carried out on the basis of nonparametric (Mann-Whitney) criteria and the Pearson correlation coefficient.

Results and discussion. During the study, grade I bile leaks (excretion of up to 100 ml of bile during the day from the drainage in the abdominal cavity or the presence of a limited amount of liquid derivatives up to 5 cm in diameter in the projection of the gallbladder bed during ultrasound) was observed in 38 (23.8%) patients, grade II bile leaks (excretion of 100-500 ml of bile during ultrasound days from drainage in the abdominal cavity or the presence of free fluid in the suprahepatic or subhepatic region during ultrasound) in 108 (67.5%) patients, Grade III bile leaks (removal of more than 500 ml of bile during the day from the drainage in the abdominal cavity or the presence of free fluid in 3 or more areas of the abdominal cavity during ultrasound) was detected in 14 (8.7%) patients.

Bile leaks after mini-laparotomy cholecystectomy was 3.4 and 4.7 times more frequent compared to laparoscopic and traditional cholecystectomy, respectively. The difference between the incidence of postoperative bile leaks found in the groups was statistically significant ($p<0.05$). There were 2 times more cases of bile leaks after emergency operations compared to planned operations.

The tactics of observation with active dynamics were applied under the condition of absolute ultrasound control in case of grade I bile leaks, estimated by the amount of bile released from the drainage or the presence of a limited liquid derivative, the size of which does not exceed 5 cm according to ultrasound data in the projection of the gallbladder bed, insufficient condition of the patient, absence of peritoneal symptoms, changes in blood. In such cases, as a rule, invasive interventions are not required. The bile leaks stopped by itself 2-5 days after the operation.

Fistulography was performed to determine the source of bile leaks in patients whose cholecystectomy ended with drainage of the gallbladder. The diagnosis of iatrogenic lesions of the extrahepatic bile ducts was confirmed in 5 patients during cholangiography.

We did not consider it appropriate to use laparoscopy in cases of obvious impossibility of correcting bile leaks at the preoperative stage using less invasive technology-in the presence of clinical, ultrasound, radiological signs of damage to the intrahepatic bile ducts, insufficiency of hepatocholedog sutures, biliodigestive anastomoses. A total of 15 patients with suspected grade III bile leaks and damage to the intrahepatic bile ducts were recommended recurrent laparotomy without diagnostic laparoscopy.

We considered the following indications for therapeutic and sanitization laparoscopy in patients with postoperative bile leaks:

1. Bile leaks of II-III degree (bile leaks of more than 100 ml after operations on the bile ducts) (n=93);
2. The appearance of peritoneal symptoms along with ultrasound signs of the presence of free fluid in the abdominal cavity (n=45);
3. Impossibility or ineffectiveness of percutaneous drainage under ultrasound control when a limited liquid derivative is detected in the abdominal cavity (n=7).

The main cause of bile leaks in most patients was additional bile flows in the gallbladder bed, as well as iatrogenic lesions of the bile ducts (Table 1).

Contraindications to laparoscopy, we found out the following:

1. Excessively severe condition of the patient (n=3);
2. Hemodynamic instability in patients (blood pressure below 100 mmHg, pulse rate more than 120 beats per minute) (n=2);

In such clinical situations, therapeutic and rehabilitation laparoscopy was performed after the patient's condition was stabilized with the help of intensive care measures.

With observations in 73.1% (n=106) during repeated laparoscopy, it was possible to determine the source of bile leaks after surgery.

Grade I bile leaks (n=48) was associated with additional outflows of bile in the gallbladder bed in 33.3% of cases (n=16) (in 7 patients - outflow of Lyushka, in 9 patients - additional outflow of the square lobe of the liver), in 16.7% (n=8) cases - with insufficiency of bile ducts pathways, and in 12.5% of cases (n=6) - with iatrogenic lesions of the extrahepatic bile ducts. In 37.5% of observations (n=18), it was not possible to determine the source of bile leaks.

Grade II bile leaks (n=93) in 34.4% of cases (n=32) is associated with additional outflows of bile in the gallbladder bed (in 14 patients - outflow of the Lushka, in 18 patients - additional outflow of the square lobe of the liver), in 22.6% (n=21) cases - with iatrogenic lesions of extrahepatic bile ducts, and in 20.4% of cases (n= 19) - with insufficient outflow of the gallbladder. In 22.6% of observations (n=21), it was not possible to determine the source of bile leaks.

All observations with grade III bile leaks (n=4) were associated with iatrogenic damage to the main bile ducts (Table 2).

In patients of the main group with clinical signs of bile leaks , laparoscopic surgery was performed on 3.5 ± 2.2 days of the subsequent period, and in patients of the control group - on 6.1±4.6 days of relapse. Repeated intervention in the first three days was performed in 56.8% of the observations in the main group and in 37% in the control group.

Table 1

Sources of bile leaks after surgery according to laparoscopy

Group of patients (method of initial surgery)	Source of bile leaks					Total
	The presence of additional secretions in the bed of the gallbladder	Defeat of the bile ducts	Absence of gallbladder outflow	Spontaneous drainage of the gallbladder	The source is not specified	
Laparoscopic cholecystectomy	31	16	15	---	23	85 (58.6)
Minimally invasive cholecystectomy	8	---	4	---	2	14 (9.6)
Traditional cholecystectomy	9	15	6	2	14	46 (31.8)

Note. HE – cholecystectomy.

Table 2

Dependence of the degree of postoperative bile leaks on the source

Degree of bile leaks	Source of bile leaks					Total	Pearson correlation coefficient, r
	The presence of additional secretions in the bed of the gallbladder	Damage to the bile ducts	Absence of gallbladder outflow	Spontaneous drainage of the gallbladder	The source is not specified		
I degree	16	6	8	---	18	48	0.797
II degree	32	21	17	2	21	93	0.861
III degree	---	4	---	---	---	44	0.629
Total	48 (33.1)	31 (21.4)	25 (17.2)	2 (1.4)	39 (26.9)	145 (100)	

A correlation interaction between the degree of bile leaks and its source (R<0.01) was established during statistical analysis.

The amount of bile in the abdominal cavity ranged from 70 ml to 200 ml when bile leaks occurred from the duct of the Club. Local accumulation in the subhepatic region was observed in 14 patients (limited in 1 patient), and bile outflow to the right subhepatic region was observed in 7 patients. After the sanitation of the abdominal cavity, the bed of the gallbladder was carefully examined. We determined the leaks of bile from the bun ducts in the form of a section in the bed of the gallbladder with a diameter of up to 3 mm, through which bile is excreted in drops. In such cases, we performed additional sanitation of the abdominal cavity after stopping the outflow of bile by inserting 1-2 clamps into the aberrant flow, and at the end-drainage into the bed of the gallbladder. Laparoscopy duration averaged 35±7.9 minutes. The postoperative period in all patients was calm. Drainage is removed from the abdominal cavity on the 2nd day. The average duration of treatment in the clinic was 12±3.4 bed days. No fatal outcome was recorded.

When performing therapeutic and prophylactic laparoscopy associated with bile leaks from the gallbladder (n=27), from 100 ml to 150 ml of bile was detected in the abdominal cavity, with one observation, a diagnosis of disseminated bile peritonitis was established. After the abdominal cavity is sanitized, the operating area is examined and the insufficiency of the direction of the outflow of the gallbladder is detected, the latter is tied with a clamp. The operation ended with drainage of the subcutaneous area. The average laparoscopy duration was 63.6±3.2 minutes. The period after the second intervention passed without complications. The average duration of treatment was 10.3±2.6 bed days.

Since in 3 of our observations it was not possible to eliminate bile leaks by clamping the damaged intrahepatic outflow of bile, retrograde cholangiography was performed, followed by endoscopic papillosphincterotomy and endoprosthetics of the damaged outflow with plastic stents.

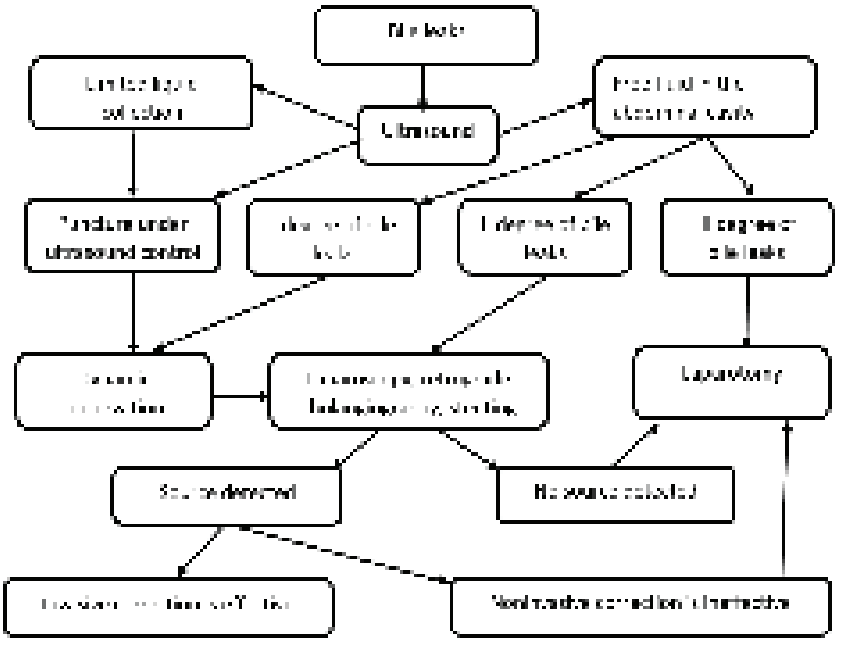
In 39 of our observations, when examining the surgical intervention area, it was not possible to detect the source of bile leaks . The criterion for refusing recurrent laparotomy in 24 clinical situations, we considered the absence of bile leakage during an adequate examination of the operating area and sanitation manipulation (while in 18 there was no accumulation of bile in the abdominal cavity during laparoscopy, despite leakage of up to 100 ml of bile with drainage during the day).

11 patients who had iatrogenic injuries of the extrahepatic bile ducts during laparoscopy, as well as 4 patients underwent relaparotomy due to active bile leakage during the rehabilitation event and the inability to visualize this source. 3 patients died, 1 due to pulmonary embolism and 2 due to cardiovascular insufficiency after relapse due to iatrogenic damage of extrahepatic bile ducts.

In cases where it is impossible to adequately stop bile leakage during laparoscopy (n=8), as well as when bile leakage occurs after recurrent laparoscopy and it is impossible to visualize its source during repeated laparoscopy with relapse performed on day 2-4 (n= 11), conversion to recurrent laparotomy is performed.

Thus, at the diagnostic stage of relaparoscopy, complications were excluded in 12.4% of our observations (N=18), relaparotomy was recommended in 10.3% (N=15), and conversion was recommended in 13.1% (N=19) due to the ineffectiveness of minimally invasive technologies.

In 64.2% of our observations (n=93) effective minimally invasive interventions were performed, and in 23.4% (n=34) relaparotomy was performed. The duration of surgery in the main group averaged 30.2±8.9 minutes, postoperative compli-



Diagnostic and therapeutic algorithm for postoperative bile leaks

cations 4.8% (n=7), the duration of inpatient treatment was 12.8±5.6 days. The mortality rate was 2.1% (n=3).

The duration of surgery in the control group was 64.3±10.7 minutes, the number of complications after surgery was 34.1% (n=14), the duration of inpatient treatment was 28.8±8.4 days. The mortality rate was 26.8% (n=11).

The use of our proposed algorithm for the diagnosis and treatment of postoperative bile leaks based on minimally invasive technologies significantly reduces the postoperative mortality rates, which is explained by the earlier detection and recurrence of the developing complication, timely operations and a lower degree of surgical aggression. (Picture)

Thus, we considered the indications for the conversion of laparoscopy into laparotomy:

1. Preservation of signs of bile discharge after sanitation and the inability to detect the source of bile discharge due to clearly visible inflammatory-infiltrative and adhesive processes;

2. Impossibility of endosurgical removal of bile discharge.

Conclusion

1. The use of minimally invasive endoscopic technologies in the early diagnosis of postoperative bile leaks of the gallbladder and biliary tract makes it possible to determine the nature of this complication, the optimal method of elimination, justify the transition to conversion, and also avoid inappropriate relapses.

2. The use of diagnostic and therapeutic algorithm for postoperative bile leaks with the help of minimally invasive technology allowed to reduce the duration of the operation by about 2 times (30.2 ± 8.9 min and 64.3 ± 10.7 min, respectively), to reduce postoperative complications from 34.1% to 4.8%, and the duration of inpatient treatment can be reduced from 28.8 ± 8.4 days to 12.8 ±5.6 days with accuracy ($p<0.05$).

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