

## Results of surgical treatment of cholelithiasis by laparotomic and minimally invasive accesses

Laparotomik ve minimal invaziv yaklaşımla cerrahi kolelitiazis tedavisinin sonuçları

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*This article presents the results of surgical treatment of 1038 patients with cholelithiasis, acute and chronic calculous cholecystitis and other complicated forms of the disease. Traditional laparotomic, laparoscopic and minimally invasive approaches were performed. Indications for choosing access, as well as the advantages and disadvantages of various surgical options in cholelithiasis patients are discussed.*

*Bu çalışmada kolelitiazis, akut ve kronik taşlı kolesistit ve safra yolları hastalıklarının diğer karmaşık formlarını içeren 1038 hastanın cerrahi tedavi sonuçları tartışılmaktadır. Tedavide geleneksel laparotomik, laparoskopik ve minimal invaziv yaklaşım sergilenmiştir. Yazıda seçim için endikasyonların yanı sıra safra taşı hastalarında çeşitli cerrahi seçeneklerin avantajları ve dezavantajları tartışılmıştır.*

**Key words:** Chronic cholecystitis, acute cholecystitis, laparoscopic cholecystectomy, cholecystectomy by mini-laparotomy access

**Anahtar kelime:** Kronik kolesistit, akut kolesistit, laparoskopik kolesistektomi, mini-laparotomi ile kolesistektomi

### INTRODUCTION

Cholelithiasis is an extremely common disease and concretions in the gallbladder are detected in approximately 10% of the adult population. Additionally, the number of complicated forms of the calculous cholecystitis remains persistently high (1-3). There is a common belief that minimally invasive interventions are the "gold standard" for the treatment of the disease. Conversely, application of laparotomic access in the treatment of cholelithiasis remains clinically relevant (1,2). The current conception of minimally invasive interventions combines different surgical methods, including both video-endoscopic and mini-laparotomic access (5,7,10). The aim of this study was to evaluate the selection of variants in surgical access for patients with cholelithiasis.

by laparoscopy (standard 4 port) and 452 by mini-laparotomic (4-5 cm) access. 245 patients had traditional operations performed by laparotomic access (Kocher incision by 8-10 cm). Ratio of patients by group is shown in the Figure 1. The number of patients were comparable across groups.

Data from clinical sites involved in this study include: the Department of Hospital Surgery with the Course of Pediatric Surgery of the State Higher Education Institution of the People's Friendship University of Russia; City Clinical Hospital No.17, City of Moscow, Russian Federation; E. Efendiyev City Clinical Hospital No. 2, Medical Centre "International Medical Centre-2", City of Baku, Republic of Azerbaijan.

### MATERIALS and METHODS

The current study is based on the evaluation of treatment results in 1038 patients with cholelithiasis, acute and chronic calculous cholecystitis, and other complicated forms of the disease. Minimally invasive methods were used in 793 cases, including 341 patients operated

The mean age of patients in the study groups is shown in Figure 2. The age of patients operated on through laparoscopic access was slightly younger than the other groups but the difference was not statistically significant ( $P>0.05$ ). Analysis of the ratio of young and elderly patients among the study groups showed that a fifth of patients operated by laparoscopy were older than 60,

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while slightly more than a third underwent operation by laparotomic access.

The main diagnoses of patients in the study groups are listed in Table 1.

## RESULTS

Ratio of patients with chronic and acute inflammation in the study groups varied (Figure 3). Figure 3 shows that nearly an equal number of patients with acute and chronic cholecystitis underwent minimally invasive interventions, although, among patients operated by laparoscopy, there was a lower number with acute inflammation compared with those who underwent mini-laparotomic access ( $P>0.05$ ). Conversely, only about a fifth of the patients operated by laparotomic access had indications

that included chronic calculous cholecystitis; other cases included intervention due to acute calculous cholecystitis of various severity (Table 1).

Patients with acute phlegmonous and gangrenous inflammation represented the smallest number of patients operated by laparoscopy (10%) and the largest number performed by laparotomic access (52%) ( $p>0.01$ ). The patients who underwent intervention by mini-laparotomic access ranged in the middle according to results and significantly differed in the incidence of phlegmonous cholecystitis compared with patients operated by laparoscopic access.

Maximum duration of the disease in the group of patients operated by traditional access was 28 years; mini-laparotomic access, 20 years; and laparoscopic access, 15 years. Mean disease duration also significantly differed, including a statistically significant difference ( $p>0.05$ ), with the groups of patients operated by laparoscopy compared to the other two groups.

The American Surgical Association (ASA) Physical Status Classification System was used to determine the physical condition and the severity of concomitant disease in these patients prior to interventions. There was a significant difference among groups, notably between patients who underwent minimally invasive interventions (laparoscopic and mini-laparotomic access) and those operated by traditional laparotomic access (Figure 4). The laparotomic access group significantly differed by the large incidence of severe concomitant diseases compared with patients who underwent minimally invasive operations.

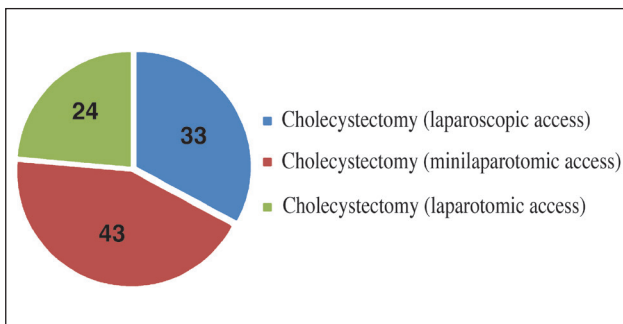


Figure 1. Distribution of patients by groups (%)

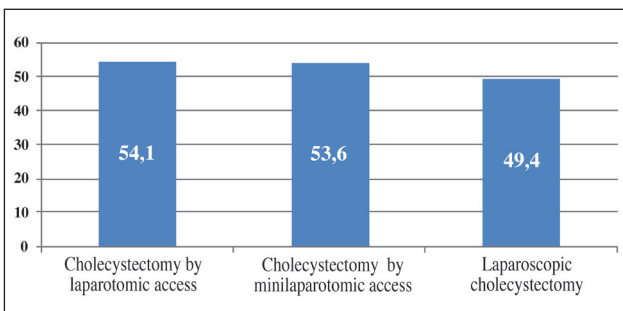


Figure 2. Average age of patients in groups (years)

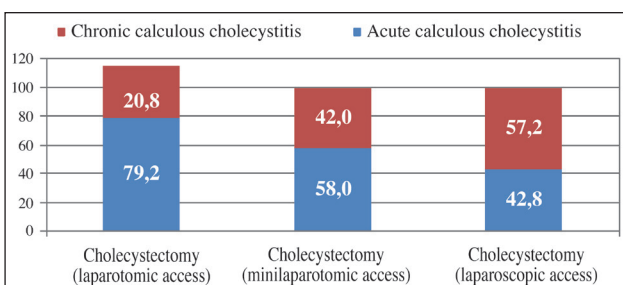


Figure 3. Correlation of patients with acute and chronic cholecystitis (%)

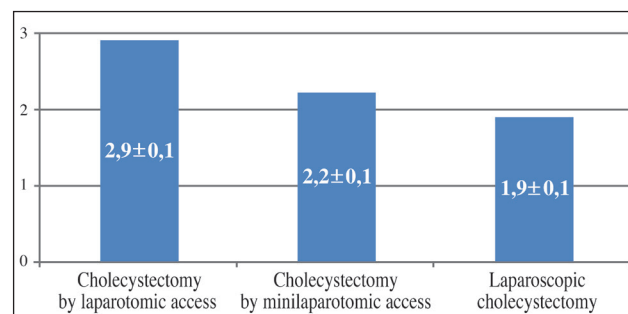


Figure 4. Distribution of patients by asa ACE scale (%)

Complications of cholelithiasis were detected at the stage of preoperative examination in the patients of all study groups but their incidence varied. In the group of patients operated by traditional access, a third had complications of the primary disease, while a fifth of the patients experienced complications following operation using the mini-laparotomic access. Only a seventh

**Table 1.** Main diagnosis in patients operated due to the cholelithiasis

	Intervention by laparotomic access		Intervention by mini-access		Intervention by laparoscopic access	
	N	%	N	%	N	%
Acute calculous cholecystitis (catarrhal inflammation stage)	93	38.0	192	42.5	132	38.7
Acute calculous cholecystitis (phlegmonous inflammation stage)	59	24.1	48	10.6	9	2.6
Acute calculous cholecystitis (gangrenous inflammation stage)	42	17.1	22	4.9	5	1.5
Chronic calculous cholecystitis	51	20.8	190	42.0	195	57.2
<b>Total</b>	<b>245</b>	<b>100.0</b>	<b>452</b>	<b>100.0</b>	<b>341</b>	<b>100.0</b>

**Table 2.** Complications of the main disease in patients operated due to the cholelithiasis

	Intervention by laparotomic access		Intervention by mini-access		Intervention by laparoscopic access	
	N	%	N	%	N	%
Gallbladder hydrops	8	17.0	2	2.2	4	4.3
Gallbladder empyema	7	14.9	22	24.7	25	26.9
Obstructive jaundice	2	4.3	8	9.0	11	11.8
Choledocholithiasis	2	4.3	7	7.9	11	11.8
Stricture of the terminal portion of the common bile duct	-	-	5	5.6	4	4.3
Local serous peritonitis	1	2.1	24	27.0	28	30.1
Perivesical abscess	1	2.1	3	3.4	8	8.6
Acute reactive pancreatitis	4	8.5	7	7.9	10	10.8
Local bile peritonitis	-	-	-	-	2	2.2
Diffuse serous peritonitis	-	-	-	-	6	6.5
Generalized bile/purulent peritonitis	-	-	-	-	6	6.5
Purulent cholangitis	-	-	-	-	2	2.2
Indurative pancreatitis	-	-	-	-	1	1.1
Pancreatic pseudocyst	-	-	-	-	1	1.1
Cholecysto-colonic fistula	-	-	1	1.1	-	-
Cholecysto-choledochal fistula (Mirizzi syndrome)	-	-	1	1.1	-	-
Cholecysto-duodenal fistula	-	-	-	-	1	1.1

of the laparoscopy patients experienced complications following their operation ( $p>0.05$ ). The combination of two or more complications was found quite frequently; therefore, the number of detected complications exceeded the total number of patients with complications of cholelithiasis.

The complications differed significantly by nature and severity among study groups (Table 2). The percentages were calculated for the total number of patients with complications in each group. Inflammatory complications

extending outside of the gallbladder were detected in isolated cases in patients undergoing laparoscopic access. Specifically, surgeons diagnosed the presence of 30 mL of cloudy effusion in the subhepatic space as a perivesical abscess, and serous effusion along the right lateral canal and in the small pelvis in a patient with acute phlegmonous calculous cholecystitis as local serous peritonitis. Analysis of patients operated by mini-laparotomic access showed that the nature of severe complications of the main diseases were the same as patients operated by laparoscopy, although, they occurred more frequently.

Complications detected in the laparotomic access group were both severe and extensive. Presence of biliary, peritonitis, pyogenic cholangitis, and formed subhepatic abscess were indications for intervention by laparotomic access.

Upon traditional intervention of the bile ducts, incision in the right hypochondrium according to Kocher (74.2% of patients), or supramedian laparotomy (25.8% of patients) was used as the access. Generally, the latter was used when abdominoscopy was required due to reasonable suspicion for peritonitis, or in case of the concomitant diseases requiring surgical intervention (e.g., median postoperative hernia, or when intervention was conducted through hernia-laparotomic access). Average duration of operations was 75.2±2.6 minutes.

Cholecystectomy by traditional access was conducted both in retrograde and antegrade variants, provided that preference was given to the retrograde method. Puncture of the gallbladder was required in 64 patients in this group (26.2%), with evacuation of 10 to 300 mL of bile (mean – 86.3±10.3 mL), generally, admixed with pus.

Intervention of the bile ducts were required in 18 patients (7.4%) (Table. 3); and combined abdominal operations (mainly hernioplasty and appendectomy) were required in 12 patients (4.9%).

**Table 3.** Interventions on the bile ducts in patients operated by the traditional access

Nature of interventions on the bile ducts	Number of interventions
Choledochotomy, drainage of the common bile duct according to Kerr	6
Choledochoduodenostomy according to Yurash	4
Drainage of the common bile duct according to Pikovskii	7
Choledochotomy, revision of the common bile duct	1

Two principal types of incisions were used during interventions by mini-laparotomy – right-sided transrectal and right-sided pararectal access, among which the former significantly predominated. Size of the access was standard for interventions by the mini-laparotomy access in virtually all of the cases [i.e., within 4-5 cm (mean 4.5±0.1 cm)]. Both antegrade and retrograde methods of intervention were used in these patients. Intervention time averaged 62.5±1.7 minutes. In this group, 45 (10.0%)

patients required puncture of the gallbladder, which was significantly lower than the group of patients operated by traditional access (p>0.05). Mean volume of the extracted punctate was also significantly less (from 10 to 200.0 mL, mean– 60.6±7.4 mL).

Reparative interventions of the bile ducts were required in 10 patients in this group (2.2%), combined operations – in 5 patients (1.1%). Nature of interventions of the bile ducts is provided in the Table 4.

**Table 4.** Interventions on the bile ducts in patients operated by the minilaparotomic access

Nature of interventions on the bile ducts	Number of interventions
Choledochotomy, drainage of the common bile duct according to Kerr	2
Choledochoduodenostomy according to Yurash	2
Choledocholithotomy, drainage of the common bile duct according to Pikovskii	6

Laparoscopic interventions were conducted according to the standard method; isolated cholecystectomy was conducted in all cases; puncture was required in 12 patients, with evacuation of 30 to 60 mL of the content of gallbladder (mean 44.6±2.4 mL). Mean duration of the operation in patients of this group was 46.4±0.8 minutes, and it was significantly lower than in patients operated by the mini-laparotomic access and especially lower than those operated by laparotomic access.

There were significant differences between study groups in patient duration of treatment. Total number of hospitalization days in the group of patients who underwent the traditional operation was 11.9±0.3; 5.8±0.2 days for the mini-laparotomic access patients; and 2.4±0.1 days in patients operated by laparoscopic access (p>0.05). The shorter hospital stay in the latter group was due in part to patients being treated under conditions that replaced in-patient treatment.

In the group of patients operated by the laparotomic access, postoperative complications were detected in 20 patients (8.6%), including postoperative wounds in 8 patients (seroma, hematomas and, in one case, eventration). There were three mortalities in this group (patients aged 82 to 85 years); the patients were hospitalized with clinical signs of acute destructive cholecystitis and severe concomitant diseases. There were no mortalities in the other groups.

In the group of patients operated by the mini-laparotomic access, postoperative complications were seen in 5 (1.3%) patients, including post-operative wounds in 3 patients. In the group operated by the laparoscopy, 4 (1.2%) patients had post-operative wounds, including one patient who experienced pyosis of the wound. Thus, significant differences between study groups in the frequency of postoperative complications was seen.

## DISCUSSION

Currently, most surgeons support laparoscopic access as the "gold standard" in cholecystectomy. Significant extension of indications for laparoscopic operations of the bile ducts should be considered in older patients. The number of publications on operations conducted successfully in cases of severe concomitant diseases including cardiac malformations with abnormal hemodynamics, chronic coronary heart disease, cardiac arrhythmia, bronchial asthma, obesity, acute cholecystitis, as well as other diseases and conditions have increased (1,2). It is clear that the economic aspect is also important. According to B. I. Lengyel (12), treatment expenses in patients who experienced "open" cholecystectomy are 26% higher than in patients undergoing laparoscopic cholecystectomy, even when durable and complicated.

The results from our experience, presented in this article, suggests that laparoscopic intervention of the bile ducts can be sufficiently used in patients with cholelithiasis and its complications. However, laparoscopic intervention has a range of disadvantages, including the necessity of

carboxyperitoneum, difficulties in operations conducted in cases of adhesive processes in the abdominal cavity, risk of damage of the adjacent organs, etc. (7,8). These circumstances require alternative variants of minimally invasive interventions. In the 90s, operations through the mini-access were widely performed (3-6,9-11); advantages and disadvantages of these types of cholecystectomy were discussed. In this study, based on the experience of the surgical in-patient departments where urgent operations are conducted, the number of patients operated by the mini-laparotomic access was performed most frequently, suggesting its benefits and popularity. This result is no accident; interventions are generally conducted by the traditional surgical method and easily learned by surgeons. Advantages of the operation include possibility for conduct of the operation on the bile ducts (drainage, anastomosis) without change of the access.

The fewest number of patients were operated by laparotomic access and were also the most complicated. Specifically, this group was comprised of patients with severe complications of the disease, severe concomitant disease, and were elderly and advanced in years. Treatment results of the patients in this group were the worst; however, it should be noted that refusal of laparotomic access for minimally invasive interventions is currently not possible. Therefore, the variety and complexity of situations faced by a surgeon during interventions due to the cholelithiasis and its complications requires the consideration of different variants of interventions, both traditional and minimally invasive.

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