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## 30-year experience of the diagnosis and treatment of gallstone ileus

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**Abstract. Background.** Gallstone ileus is a pathology characterized by a variety of clinical manifestations and types of the course. Therefore, it is difficult in the diagnostic and therapeutic aspect and leads to unsatisfactory treatment results. The aim of the work is to find out the features of diagnosis and treatment of patients with gallstone ileus. **Materials and methods.** A retrospective analysis was performed of 51 medical records of inpatients with gallstone obstruction operated in the clinic from 1990 to 2020. Women aged 61 to 85 (median of  $74.20 \pm 12.95$ ) years predominated — 44 (86.3 %). Most patients (81 %) had concomitant diseases, which in combination with gallstone ileus caused high surgical risk: coronary heart disease — 26 (51 %), essential hypertension — 11 (21.6 %), diabetes mellitus — 3 (5.9 %), obesity — 1 (2 %). **Results.** During the clinical, laboratory and instrumental examinations, the following preliminary diagnoses were made, for which surgical treatment was performed: acute adhesive intestinal obstruction — 29 (56.9 %), gallstone ileus — 9 (17.6 %), acute bowel obstruction — 4 (7.8 %), acute mesenteric circulatory failure — 4 (7.8 %), acute cholecystitis — 3 (5.9 %), hernia — 1 (1.9 %), peritonitis — 1 (1.9 %). Gallstone obstruction was detected at different levels: in the duodenum — in 3 (5.9 %) patients, jejunum — in 17 (33.3 %), ileum — in 23 (45.1 %) and colon — 8 (15.7 %) patients. The cause of stones in the lumen of the digestive tract was cholecystoduodenal fistula — in 48 (94.1 %) and choledochoduodenal fistula — in 3 (5.9 %) patients. Diagnosis of biliary fistulas was performed during postoperative radiological and endoscopic examination. The scope of surgery was aimed at eliminating acute intestinal obstruction; enterotomy was performed 5–10 cm distal to the site of obstruction with lithoextraction. In one patient with areas of focal necrosis at the site of stone entrapment, a loop of the small intestine was resected with entero-enterostomy “side-by-side”. In case of duodenal obstruction, lithoextraction was performed through gastrotomy. In the perioperative period, 43 (84.3 %) patients received antibiotic prophylaxis using cephalosporines, fluoroquinolones and metronidazole. Purulent-septic complications in the postoperative period developed in 9 (17.6 %) patients: suppuration of the postoperative wound in 6, infiltrate of the abdominal cavity in 1 and bronchopneumonia in 2. Two patients died, postoperative mortality was 3.9 %. **Conclusions.** Gallstone intestinal obstruction is difficult to diagnose due to a variety of clinical manifestations and course, and, accordingly, it is accompanied by frequent complications and high mortality. Surgical treatment should eliminate intestinal obstruction in conditions of high surgical risk without repair of biliodigestive fistula. Early detection and determination of indications for planned surgical sanitation of the biliary tract is a reliable way to prevent gallstone ileus.

**Keywords:** acute intestinal obstruction; gallstone; biliodigestive fistula; aerobilia; enterotomy; lithoextraction

### Introduction

Gallstone ileus (GI) is a pathology characterized by a variety of clinical manifestations and types of the course. Therefore, it is difficult in the diagnostic and therapeutic aspect and leads to unsatisfactory treatment results. It was firstly observed by the Danish anatomist T. Bartholin in the 17<sup>th</sup> century at autopsy of a patient who died of intestinal

obstruction. In 1890, Courvoisier [2] published the first series of 131 cases of GI, with a mortality rate of 44 %. In 1896, Bouveret [4] described a syndrome of gastric outlet obstruction caused by an impacted gallstone in the duodenal bulb after its migration through a cholecysto- or choledochoduodenal fistula. This was the first preoperative diagnosis of the currently known Bouveret’s syndrome. In the reviews of



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P. Mirizzi (Italy, 1951) and E. Day (USA, 1975), about 1,000 observations of ileus in gallstones were given.

GI has shown a constant incidence of 30–35 cases per 1,000,000 admissions over a 45-year period [1]. This entity develops in 0.3–0.5 % of patients with cholelithiasis [1]. It constitutes the etiologic factor in less than 5 % of cases of intestinal obstruction, but up to one quarter of non-strangulated small bowel obstructions in elderly patients [4, 7]. In a nationwide study in the United States from 2004 to 2009, only 0.095 % of mechanical bowel obstruction cases were caused by a gallstone [1]. GI has been observed with a higher frequency among the elderly American patients aged from 60 to 84 years [1]. Due to the predominance of female patients among those with gallstone disease, the majority of GI patients are females (72–90 %) [1, 2, 5].

GI is frequently preceded by an initial episode of acute cholecystitis. The inflammation in the gallbladder and surrounding structures leads to adhesion formation. The inflammation and pressure effect of the offending gallstone causes erosion through the gallbladder wall, leading to fistula formation between the gallbladder and the adjacent and adhered portion of the gastrointestinal tract, with further gallstone passage [1, 2, 5, 6]. Less commonly, a gallstone may enter the duodenum through the common bile duct and a dilated ampulla of Vater [4, 7]. The most frequent fistula occurs between the gallbladder and the duodenum due to their proximity [2, 8]. The stomach, small bowel and the transverse portion of the colon may also be involved. This process might be part of the natural history of Mirizzi syndrome [1]. Once the gallbladder is free of calculi, it may become a blind sinus tract and contract down to a small fibrous remnant [4, 9].

Absence of clear diagnostic criteria for GI and lack of awareness of the most physicians in matters of diagnosis and treatment are the causes of late detection, errors in surgical tactics, development and progression of nonspecific syndrome of endogenous intoxication and, as a consequence, high postoperative mortality.

Accordingly, the surgical treatment of GI remains one of the most difficult and unresolved issues in emergency abdominal surgery.

**Aim** of the work is to find out the features of diagnosis and treatment of the patients with gallstone ileus.

## Materials and methods

This study consists of a retrospective review of hospital records of patients diagnosed with GI and hospitalized at the Department of Surgery and Endoscopy of Danylo Halytskyi Lviv National Medical University between 1990 and 2020. The total number of patients was 51, the majority were women (44 (86.3 %)) aged between 61 and 85 (median of  $74.20 \pm 12.95$  years). Most participants (81 %) had comorbidities, which in combination with GI caused high surgical risk: coronary heart disease — 26 (51 %), essential hypertension — 11 (21.6 %), diabetes mellitus — 3 (5.9 %), obesity — 1 (2 %). Seven (13.7 %) patients were operated for acute abdominal pathology and had a confirmed diagnosis of COVID-19.

GI was manifested as acute, intermittent or chronic episodes of gastrointestinal obstruction. Nausea, vomiting, crampy abdominal pain and variable distension were com-

monly present. The intermittent nature of pain and vomiting of proximal gastrointestinal contents, later becoming dark and feculent, is due to the “tumbling” gallstone advancement. Therefore, there may be intermittent partial or complete intestinal obstruction, with temporary advancement of the gallstone and relief of symptoms, until the gallstone either passes through the gastrointestinal tract or it definitively becomes impacted and complete intestinal obstruction ensues. The nature of vomitus depended on the obstruction location. When the gallstone was in the stomach or upper small intestine, the vomitus is mainly gastric content, becoming feculent when the ileum is obstructed.

## Result and discussion

During the clinical, laboratory and instrumental examinations, the following preliminary diagnoses were made, for which surgical treatment was performed:

- acute adhesive intestinal obstruction — 29 (56.9 %);
- GI — 9 (17.6 %);
- acute bowel obstruction — 4 (7.8 %);
- acute mesenteric circulatory failure — 4 (7.8 %);
- acute cholecystitis — 3 (5.9 %);
- hernia — 1 (1.9 %);
- peritonitis — 1 (1.9 %).

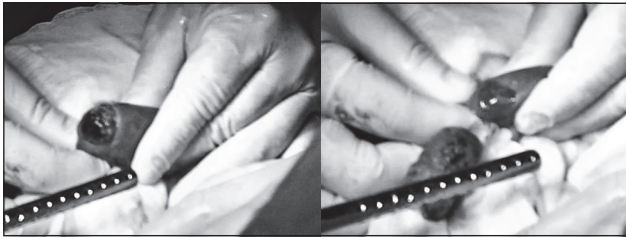
Preoperatively, GI was diagnosed by ultrasonography with detection of Rigler’s triad [3]: small-bowel dilation and aerobilia (6 patients), radioscopic examination with the shadow of the calculus outside the bile ducts (1 patient). Prior to the surgery, the following tests were performed: abdominal X-rays for 40 patients, abdominal ultrasounds for 26 patients, and CT scans for 8 patients. These tests yielded no positive results in 3 patients, who underwent surgery with no established pre-operative diagnosis.

Slightly more than half of the patients had surgery due to acute intestinal obstruction, the rest — due to other abdominal diseases. Eleven patients were operated in the first 6 hours after hospitalization, 24 — by the end of the first day, 16 — within 25–72 hours. In 19 patients, the surgery was performed from the middle access, which was convenient for a full revision of the abdominal organs, and in 2 cases, the Kocher access was used.

During the abdominal exploration, stones were found at different levels: duodenum — 3 (5.9 %) patients, jejunum — 17 (33.3 %), ileum — 23 (45.1 %) and large intestine — 8 (15.7 %). The size of gallstones ranged from  $3 \times 2$  to  $9 \times 4$  cm. The cause of stones in the lumen of the digestive tract was cholecystoduodenal fistula — in 48 (94.1 %) and choledochoduodenal fistula — in 3 (5.9 %) cases. Diagnosis of biliary fistulas was performed during postoperative radiological and endoscopic examination.

The question of the simultaneous elimination of obstruction and biliodigestive fistula today remains controversial. We believe that combined surgery is too difficult for patients, especially the elderly and senile, because of water-electrolyte imbalance due to high intestinal obstruction on the background of severe comorbidities.

In addition, without previous examinations (X-ray, endoscopic, ultrasonographic), it is difficult to determine the nature of the fistula and its relationship with neighboring organs, which greatly complicates radical surgery. That is why



**Figure 1. Enterotomy and gallstone lithoextraction**

the extent of surgery was mostly minimal, aimed at eliminating acute intestinal obstruction (50 (98 %) cases).

Therefore, taking into account both the bibliographical review and our own experience, fistula repair cannot be recommended during the same surgical procedure as the treatment of choice for gallstone ileus in all patients. This technique is clearly associated with greater mortality. The therapeutic decision should balance the risks and benefits for each type of procedure, considering that most patients were older than 70 years and with comorbidities, most had a delayed diagnosis (approximately 4 days in our series), and surgery was done under emergency conditions. In our opinion, the one-stage procedure should be performed in patients with greater life expectancy, less comorbidities, and no technical impairments.

Only one patient had a violation of the biliodigestive fistula during the revision of the subhepatic space, which necessitated cholecystectomy and duodenoplasty. In most patients (90.5 %), enterotomy was performed 5–10 cm distal to the site of obstruction (Fig. 1).

In one patient with areas of focal necrosis at the site of stone entrapment, a loop of the small intestine was resected with entero-enterostomy “side-by-side”. In case of duodenal obstruction, lithoextraction was performed through gastrotomy.

In the perioperative period, 43 (84.3 %) patients received antibiotic prophylaxis using cephalosporines, fluoroquinolones and metronidazole.

Median length of stay for each patient was 14 (range: 4–60) days. Post-surgical stay in hospital was approximately 9.5 (range: 3–36) days.

Purulent-septic complications in the postoperative period developed in 9 (17.6 %) patients: suppuration of the postoperative wound in 6, infiltrate of the abdominal cavity in 1, bronchopneumonia in 2.

Two patients died as a result of perforation of the small intestine at the site of obstruction caused by concretum with

the development of peritonitis on the background of severe concomitant diseases, despite relaparotomy and intensive care; postoperative mortality was 3.9 %.

## Conclusions

1. Gallstone intestinal obstruction is difficult to diagnose due to a variety of clinical manifestations and course, and, accordingly, it is accompanied by frequent complications and high mortality.

2. Surgical treatment should eliminate intestinal obstruction in conditions of high surgical risk without repair of biliodigestive fistula.

3. Early detection and determination of indications for planned surgical sanitation of the biliary tract is a reliable way to prevent GI.

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### Тридцятирічний досвід діагностики та лікування жовчнокам'яної кишкової непрохідності

**Резюме.** *Актуальність.* Жовчнокам'яна кишкова непрохідність (ЖКН) — це гостра хірургічна абдомінальна патологія, яка характеризується різноманітністю клінічних ознак та варіантів перебігу і, відповідно, складністю діагностики, що призводить до незадовільних результатів лікування. *Мета роботи:* з'ясувати особливості діагностично-лікувальної тактики в пацієнтів із ЖКН. *Матеріали та методи.* Здійснено ретроспективний аналіз 51 карти стаціонарних хворих на ЖКН, оперованих у клініці з 1990 до 2020 р. Переважали жінки (44 (86,3 %) віком від 61 до 85 (у середньому  $74,20 \pm 12,95$ ) років. Більшість пацієнтів (81 %) мали супутню патологію, що в поєднанні з ЖКН обумовлювала високий операційний ризик: ішемічну хворобу серця — 26 (51 %) осіб, артеріальну гіпертензію — 11 (21,6 %), цукровий діабет — 3 (5,9 %), ожиріння — 1 (2 %). *Результати.* Під час клінічного, лабораторного та інструментального досліджень встановлено наступні попередні діагнози, з приводу чого хворих прооперовано: гостра спайкова кишкова непрохідність — 29 (56,9 %), жовчнокам'яна кишкова непрохідність — 9 (17,6 %), гостра товстокишкова непрохідність — 4 (7,8 %), гостре порушення мезентеріального кровообігу — 4 (7,8 %), гострий холецистит — 3 (5,9 %), защемлена грижа — 1 (1,9 %), перитоніт — 1 (1,9 %). Обструкцію жовчним конкрементом виявлено на різних рівнях: у дванадцятипалій кишці — у 3 (5,9 %) випадках, порожній — у 17 (33,3 %), клубовій — у 23 (45,1 %), товстій — у 8 (15,7 %). Причиною виходу каменів у просвіт травного каналу була холецистодуоденальна (48 (94,1 %) пацієнтів) та холодоходуоденальна

фістула (3 (5,9 %) випадки). Біліарну фістулу діагностували в післяопераційному періоді за допомогою радіологічного й ендоскопічного дослідження. Обсяг операційного втручання був спрямований на ліквідацію гострої кишкової непрохідності; ентеротомію виконували на 5–10 см дистальніше від місця непрохідності з літоекстракцією. В одного пацієнта з некрозом у місці защемлення конкремента проведено резекцію тонкої кишки з накладанням ентероентероанастомозу. У випадку дуоденальної обструкції здійснено літоекстракцію через гастротомію. У періопераційному періоді 43 (84,3 %) пацієнти отримали антибіотикопрофілактику з використанням цефалоспоринів, фторхінолонів та метронідазолу. Гнійно-септичні ускладнення розвинулись у 9 (17,6 %) хворих, а саме: нагноєння післяопераційної рани — у 6, інфільтрат черевної порожнини — в 1 та бронхопневмонія — у 2. Померло 2 пацієнти; післяопераційна летальність становила 3,9 %. *Висновки.* ЖКН важко діагностувати через різноманітність клінічних проявів і варіантів перебігу, що, відповідно, супроводжується частими ускладненнями та високою летальністю. Хірургічне лікування повинно усунути кишкову непрохідність в умовах високого хірургічного ризику без пластики білідигестивної фістули. Раннє виявлення та визначення показань до планової хірургічної санації жовчовивідних шляхів є надійним засобом профілактики жовчнокам'яної непрохідності.

**Ключові слова:** гостра кишкова непрохідність; жовчний конкремент; білідигестивна фістула; аеробілія; ентеротомія; літоекстракція