A RETROSPECTIVE ANALYSIS OF THE CLINICAL COURSE OF ACUTE APPENDICITIS ON THE BACKGROUND OF LIVER CIRRHOSIS AND ITS COMPLICATIONS

Abidov U.O
https://orcid.org/0000-0003-4872-0982
Ruziboev A.F
https://orcid.org/0009-0009-5374-9406
Bukhara State Medical Institute named after Abu Ali ibn Sina Uzbekistan Bukhara, A.Navoi st. 1 Tel: +998(65) 223-00-50 e-mail: info@bsmi.uz
Bukhara branch of the Republican Scientific Center for Emergency Medical Care Uzbekistan, Bukhara region, 200100, Bukhara, st. Bakhouddin Nakshbandi 159, tel: +998652252020 E-mail: bemergency@rambler.ru

Resume

Acute appendicitis (AA) is one of the most common urgent surgical diseases, which in conditions of cirrhosis of the liver (LC) leads to serious problems in diagnosis and treatment. Immunodeficiency, blood clotting disorders, ascites, and portal hypertension, characteristic of LC, aggravate the course of AA.

Between 2017 and 2024, 64 patients with AA were analyzed. The study included a retrospective analysis (24 patients) and a prospective follow-up (40 patients). In addition to standard laboratory tests, patients with LC underwent biochemical liver examination and modern instrumental diagnostic methods (MRI).

It has been established that with LS, AA often manifests itself with atypical symptoms. The majority of patients (87.5%) had decompensated LC. The phlegmonous form of AA was diagnosed in 50% of cases, catarrhal – in 37.5%, gangrenous – in 12.5%. Severe forms of AA were more often registered against the background of decompensated LC. Postoperative complications were high, and mortality was 25%.

The analysis confirmed the importance of an individual approach in the diagnosis and treatment of AA in patients with LC. Improved surgical tactics and enhanced postoperative monitoring can help reduce complications and mortality.

Key words: acute appendicitis, cirrhosis of the liver, postoperative complications, laparoscopic appendectomy, peritonitis, C-reactive protein, complications of LC.

Introduction

Acute appendicitis (AA) is one of the most common surgical pathologies requiring emergency surgical intervention. Appendectomy is among the most frequently performed emergency surgical procedures. According to published data, it accounts for 20–85% of all emergency surgeries [1, 2, 3, 4, 6].

Based on average statistical data, the global incidence of AA is 7–12 cases per 10,000 population per year. In some countries, this figure is higher, reaching 8–12 cases [5, 7].

The course of AA against the background of liver cirrhosis (LC) has distinctive pathogenetic and clinical features and presents significant challenges in diagnosis and treatment. Conditions such as immune suppression, coagulation disorders (coagulopathy), ascites, and portal hypertension associated with LC may complicate the course of AA.

Numerous monographs, dissertations, articles, and presentations at surgical symposia of various levels have been devoted to AA. Although the technique of appendectomy has remained largely unchanged over the past century, the clinical presentation of the disease and its differential diagnosis have been thoroughly covered in many publications. Nevertheless, despite the accumulation of substantial scientific knowledge and broad clinical experience in the study of acute appendicitis, questions regarding the diagnosis and treatment of this complex disease remain highly relevant.

According to various authors, the mortality rate in AA ranges from 0.14% to 0.5%, while among the elderly, it reaches 4.6%. It is noteworthy that among patients admitted to the hospital within the first 6 hours of disease onset, the mortality rate is only 0.02%, increasing to 0.09% between 6 and 24 hours, and reaching 1% after 24 hours. These figures may not seem high, but considering the large number of operations performed for acute appendicitis annually (1–1.5 million), the absolute number of deaths is substantial — approximately 4,000 per year (A.F. Dronov et al., 2000; V.M. Sedov et al., 2002). Treatment outcomes clearly depend on the timing of hospitalization and diagnosis.

Therefore, the issue of timely and prompt diagnosis of AA, as well as the management of complicated forms, remains highly relevant today.

Materials and Methods: This study analyzes retrospective medical records of 24 patients (0.8%) over the age of 17 with AA treated between 2017 and 2020 at the Emergency Surgery Departments of the Republican Scientific Center of Emergency Medical Care (RSCEMC) in Bukhara and Khorezm, and prospective data from 40 patients (1.4%) diagnosed and treated between 2021 and 2024, based on a proposed diagnostic and therapeutic strategy.

This analysis excluded cases with appendicular infiltrate and patients younger than 17 years. Also excluded were patients with complications such as diffuse or generalized peritonitis.

In addition to clinical examinations, extended instrumental diagnostics (MRI) were conducted in patients of the main group with suspected AA and underlying liver cirrhosis (LC), to assess the condition and determine treatment tactics.

Apart from standard complete blood count tests, patients in the main group also underwent liver biochemical tests (bilirubin, ALT, AST, total protein, creatinine, HBsAg, HBeAg, anti-HBe, anti-HBc markers), INR (International Normalized Ratio), and C-reactive protein tests.

Results of the Study: In the control group, 18 patients (75%) had a pre-established diagnosis of LC or were being treated for viral hepatitis before hospital admission, while in 6 patients (25%), the diagnosis was made during surgery.

In the main group, 25 patients (63%) had a known LC diagnosis or history of hepatitis treatment at admission; in 10 patients (25%), the presence of diffuse liver disease was suspected and subsequently diagnosed using modern instrumental methods; and in 5 patients (12%), the diagnosis was made intraoperatively.

Diagnosis was based on clinical data, laboratory tests, and instrumental examinations. Patients were admitted via emergency services, referral from outpatient clinics, or personal transport. Every patient who presented to the emergency department with suspected bleeding underwent surgical examination.

A detailed medical history was obtained, including the presence or absence of viral hepatitis B and C, as well as a history of LC.

Demographic Analysis: In the main group (Group I), female patients accounted for 14 cases (58.3%), and males for 10 cases (41.7%). In the control group (Group II), 23 females (57.5%) and 17 males (42.5%) were recorded. The total number of female patients was 37 (58.8%), and male patients was 27 (42.2%). The mean age of patients in the main group was 56.5 ± 6.5 years, while in the control group it was 58.5 ± 8.6 years (see Table 1).

Table 1

Occurrence of forms of AA among males and females in both groups (n=64)

Gender	Form of AA			Total
	Catarrhal	Phlegmonous	Gangrenous	
Female				
Control	5 (35,7%)	8 (57,1%)	1 (7,1%)	14
Main	6 (26,1%)	15(65,2%)	2 (8,7%)	23
Male				
Control	4 (40%)	4 (40%)	2 (20%)	10
Main	5 (29,4%)	10 (58,8%)	2 (11,8%)	17
Total	20 (31,3%)	37(57,8%)	7 (10,9%)	64

In both groups, the most common form of acute appendicitis (AA) was phlegmonous, found in 57.8% of patients. The catarrhal form was observed in 37.5%,

while the gangrenous form was noted in only 11% of cases. There was no significant difference in the distribution of appendicitis forms between males and females in either group.

Appendicitis is the most frequent cause of an “acute abdomen” that requires surgical intervention. According to statistics, approximately 6% of the population will experience appendicitis at some point in their lives. History taking and physical examination remain the simplest and most effective diagnostic methods. However, the signs of appendicitis can be mistaken for a number of other conditions, which complicates the diagnosis, especially in the early stages of the disease.

To reduce the number of “unnecessary appendectomies”, various acute abdomen assessment systems have been developed. In 1986, American surgeon Alfredo Alvarado created a 10-point clinical scoring system for identifying AA based on clinical symptoms and simple laboratory tests in patients with signs of an acute abdomen.

A. Alvarado included 8 predictive factors in this scale, which he considered useful for diagnosing acute appendicitis:

Signs and Symptoms	**Points**
Pain in the right iliac fossa	+2
Elevated body temperature (>37.3°C)	+1
Positive Shchetkin–Blumberg sign	+1
Positive Kocher–Volkovich sign	+1
Loss of appetite	+1
Nausea/Vomiting	+1
Leukocytosis (>10^9/L)	+2
Total	**10**

Assessment of data

< 5 points	Low probability of acute appendicitis
5–6 points	Possible appendicitis; patient should be observed
7–8 points	High probability of acute appendicitis
8–9 points	Very likely appendicitis; emergency surgery is recommended

The Alvarado scoring system allows for risk stratification in patients with abdominal pain, linking the probability of appendicitis to recommendations such as ruling out the diagnosis, dynamic observation, or surgical intervention.

Decision-making in cases of acute appendicitis (AA) remains challenging. While anamnesis and physical examination are still the foundation of diagnosis, misdiagnoses and unnecessary appendectomies still occur at a relatively high rate. The decision of whether or not to operate is critical, as surgical intervention in AA is not without complications.

The development of AA in the context of liver cirrhosis (LC) presents additional diagnostic and treatment difficulties.

In these cases: Pain beginning in the epigastric region was noted in only half of the patients — 10 patients (41.7%). Pain in the right iliac region was observed in 21 patients (87.5%). Muscle rigidity in the right iliac region was found in only about one-third of patients — 7 cases (29.2%).

Table 2

Clinical Manifestations of Acute Appendicitis in Patients of the Control Group

Symptoms	Number of Patients (abs.)	Percentage (%)
Epigastric pain	10	41.7%
Pain in the right iliac region	21	87.5%
Muscle rigidity in the right iliac region	7	29.2%
Dry and coated tongue	20	83.3%
Nausea and vomiting	10	41.7%
Loss of appetite	18	75%
Tachycardia	22	91.7%
Rovsing's sign	10	41.7%
Sitkovsky and Bartomier-Michelson signs	14	58.3%
Shchetkin–Blumberg sign	8	33.3%
Leukocytosis (>8.5×10³/mm³)	5	20.8%
Elevated body temperature	4	16.7%

Among the intoxication symptoms, dry and coated tongue was noted in 20 patients (83.3%). Dyspeptic symptoms, such as nausea and vomiting, were observed in fewer than half the patients — 10 cases (41.7%), while loss of appetite was found in 18 cases (75.0%). Tachycardia was observed in 22 patients (91.7%), which was assessed as being due to intoxication and anemia caused by the underlying disease.

Classical signs of acute appendicitis (AA) were present in some patients: Rovsing’s sign in 10 cases (41.7%), and Sitkovsky and Bartomier-Michelson signs in

14 cases (58.3%). Peritoneal irritation symptoms, such as the Shchetkin–Blumberg sign, were identified in destructive forms of AA and were recorded in 8 cases (33.3%). Fever (elevated body temperature) was observed in 4 cases (16.7%). An increase in leukocyte count (leukocytosis) was found in only 5 cases (20.8%) (see Table 2).

Therefore, in addition to leukocytes, it is important to monitor C-reactive protein (CRP) as another inflammatory marker, which can provide additional information in evaluating the effectiveness of treatment.

Among patients in the control group, the most frequently observed clinical signs of AA included pain in the right iliac region, tachycardia, and dry tongue. However, classical inflammatory indicators such as leukocytosis and elevated temperature were relatively uncommon. This suggests that underlying primary diseases such as liver cirrhosis (LC) may mask the symptoms of AA, making diagnosis more difficult.

Hence, it becomes clear that modern instrumental and laboratory diagnostics should be employed for diagnosis, and that an individualized approach and the use of modern surgical techniques are essential in treatment.

Out of 24 patients in the control group, 21 (87.5%) had decompensated liver cirrhosis, indicating that the majority were at an advanced stage of liver dysfunction. Decompensated cirrhosis is characterized by the development of severe symptoms and complications such as ascites, hepatic encephalopathy, portal hypertension, and increased risk of bleeding.

Table 3

Distribution of Morphological Forms of Acute Appendicitis in the Control Group According to the Degree of Liver Cirrhosis

Cirrhosis Stage	Catarrhal	Phlegmonous	Gangrenous
Compensated	2 (8.3%)	1 (4.2%)	–
Decompensated	7 (29.2%)	11 (45.8%)	3 (12.5%)
Total	9 (37.5%)	12 (50%)	3 (12.5%)

The distribution of patients according to the morphological forms of acute appendicitis (AA) — *catarrhal*, *phlegmonous*, and *gangrenous* — in relation to the degree of liver cirrhosis (LC) is presented in Table 3.

Among patients with compensated LC (Child-Pugh Class A), there were 2 cases (8.3%) of catarrhal appendicitis and 1 case (4.2%) of phlegmonous appendicitis. Gangrenous appendicitis was not observed in this group. The total number of patients with compensated LC was 3 (12.5%).

In patients with decompensated LC (Child-Pugh Classes B and C), 7 cases (29.2%) of catarrhal, 11 cases (45.8%) of phlegmonous, and 3 cases (12.5%) of

gangrenous appendicitis were recorded. Thus, patients with decompensated cirrhosis constituted the majority — 21 individuals (87.5%).

These data indicate that more severe forms of AA, including phlegmonous and gangrenous types, were more frequently diagnosed in the context of decompensated LC. Overall, among all patients, the most common form of appendicitis was phlegmonous (50%), followed by catarrhal (37.5%) and gangrenous (12.5%).

Treatment Outcomes:Among the patients in the control group, 18 (75%) had been previously diagnosed and treated for LC or viral hepatitis prior to hospital admission. In 6 patients (25%), the diagnosis of LC was made intraoperatively.

Most of the surgical procedures in the control group (18 patients, 75%) were open appendectomies (OAE) performed via the Volkovich-Dyakonov incision, while laparoscopic appendectomy (LAE) was performed in only 6 patients (25%). Anesthesia was administered under general anesthesia (both endotracheal and intravenous).

In treating AA in the context of LC, an individualized approach was not applied. Treatment methods were selected based on the degree of LC, presence of ascites, and the general condition of the patient. For successful management of AA in such patients, a comprehensive approach tailored to each patient's individual characteristics and condition is required.

A detailed analysis was conducted of the control group patients, including diagnostic findings, clinical manifestations, dynamics of laboratory indicators, surgical outcomes (e.g., wound infection, postoperative complications, hepatic encephalopathy, etc.), length of hospital stay, in-hospital mortality rates, and 30-day readmission rates.

Table 4

General and Local Postoperative Complications Observed in the Control Group (n=24)

Complications	Compensated (n=3)	Decompensated (n=21)	Total
30-day hospital readmission	–	6 (25%)	6 (25%)
Progression of hepatic encephalopathy (jaundice, encephalopathy)	–	3 (12.5%)	3 (12.5%)
Peritonitis	–	2 (8.3%)	2 (8.3%)
Wound suppuration	–	7 (29%)	7 (29%)
Sepsis (pneumonia)	–	2 (8.3%)	2 (8.3%)
Bleeding from the wound	–	2 (8.3%)	2 (8.3%)
Mortality	–	6 (25%)	6 (25%)

Postoperative general and local complications observed in control group patients with acute appendicitis (AA) on the background of liver cirrhosis (LC) are presented in Table 4.

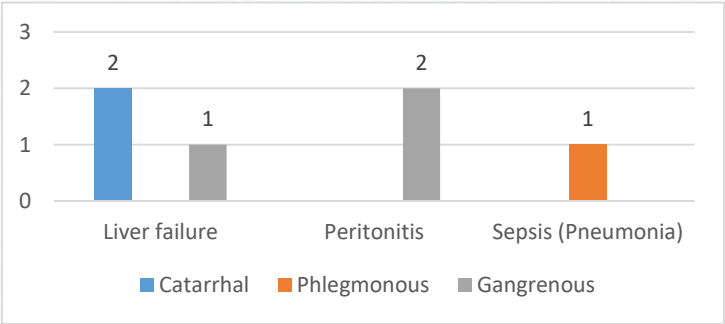
Analysis of the data shows that out of 24 patients with LC, only 3 patients (12.5%) had compensated LC, while the remaining 21 patients (87.5%) were diagnosed with decompensated LC.

All general and local postoperative complications occurred in patients with decompensated LC, corresponding to Child-Pugh Classes B and C. Progression of hepatic encephalopathy (HE), including jaundice and encephalopathy, was observed in 3 patients (12.5%). Progressive peritonitis was recorded in 2 patients (8.3%). Wound suppuration developed in 7 patients (29%), and wounds healed by secondary intention. Among septic complications, sepsis with pneumonia occurred in 2 patients (8.3%). Postoperative bleeding from the wound was noted in 2 patients (8.3%), all in the decompensated group.

It is particularly noteworthy that 6 patients (25%) from the control group required readmission within 30 days after surgery due to clinical deterioration.

Mortality. Postoperative mortality was recorded in 6 patients (25%), all of whom had decompensated LC. The primary causes of death were: Progression of hepatic encephalopathy – 3 patients (12.5%). Progressive peritonitis – 2 patients (8.3%). Sepsis (pneumonia) – 1 patient (4.2%)

It is noteworthy that among these patients, 3 cases involved destructive (gangrenous) forms of acute appendicitis (AA), 1 case was phlegmonous, and 2 were catarrhal.



Picture 1. Causes of Postoperative Mortality in the Control Group (n = 6)

A total of 6 deaths were recorded, which were categorized based on different causes. Below is an analysis of the causes of death according to the form of appendicitis:

In two cases, the cause of death was progressive peritonitis. This condition developed as a result of severe inflammatory progression associated with complicated AA, affecting systemic circulation.

In three cases (50%), the cause of death was hepatic encephalopathy (HE). This outcome is attributed to surgical stress and the adverse effects of general anesthesia on the liver, particularly in cirrhotic patients.

Although catarrhal appendicitis is generally considered a mild form, in patients with underlying conditions such as liver cirrhosis (LC), even this form can pose a serious risk and lead to fatal outcomes.

In one case, death was caused by sepsis and pneumonia. This condition likely resulted from systemic infection and its impact on the respiratory system.

Conclusions.

1. In liver cirrhosis (LC), the degree of liver functional status (Child–Pugh Classes A, B, C) has a significant impact on postoperative complications and outcomes. Complications were primarily observed in patients with decompensated LC, including wound suppuration, bleeding, sepsis, peritonitis, and hepatic encephalopathy (HE). These patients were also characterized by a high 30-day readmission rate and elevated mortality.
2. The disease often presents with atypical clinical manifestations, requiring a specialized approach and close monitoring. This, in turn, necessitates a comprehensive diagnostic and treatment strategy. Laboratory findings may show non-expressed leukocytosis due to leukopenia caused by hypersplenism.
3. Although AA is the most common cause of acute abdomen in surgery, it still remains a clinical challenge in terms of both diagnosis and treatment. Combining clinical scoring systems with laboratory parameters and imaging modalities can improve diagnostic accuracy and treatment outcomes.
4. Patients with LC require thorough preoperative evaluation and continuous postoperative monitoring, which helps to minimize the risk of complications.
5. Treatment often includes surgery — appendectomy, but the approach and surgical technique may vary depending on the degree of liver function, especially in cases of decompensation.
6. Treatment should be carried out by a multidisciplinary team, including a hepatologist, surgeon, and, if necessary, an infectious disease specialist. Such an approach ensures the safest and most effective management for patients with these complex conditions.

REFERENCES

1. Acute appendicitis secondary to a granular cell tumor of the appendix in a 19-year-old male / M. Zoccali, A. Fichera, M. Krane [et al.] // J. Gastrointest. Surg. - 2011. - Vol. 15, № 8. - P. 1482-1485.
2. Bazeliuc, Iu. Acute appendicitis / Iu. Bazeliuc, V. Gugava, A. Bour // The Moldovan Med. J. - 2018. - Vol. 61, № 2. - P. 28-37.

3. Воробьев, Н. В. Клинический анализ частоты и структуры расхождения диагнозов «острый аппендицит» на догоспитальном и госпитальном этапах / Н. В. Воробьев, П. В. Кибанов // Проблемы соврем. науки и образования. - 2017. - № 18 (100). - С. 82-84.
4. Грошилин, В. С. Способ профилактики гнойно-септических осложнений при остром аппендиците / В. С. Грошилин, М. Ф. Черкасов, Г. А. Мрыхин // Гастроэнтерология Санкт-Петербурга. - 2013. - № 2. - С. М9- М16.
5. Лапароскопическая аппендэктомия: медицинские и социально-экономические аспекты / В. Д. Левитский, А. А. Гуляев, П. А. Ярцев [и др.] // Эндоскоп. хирургия. - 2011. - № 1. - С. 55-61. 10.
6. Лядов, К. В. Однопрокольная лапароскопическая холецистэктомия, аппендэктомия, нефрэктомия с помощью SILS-порта / К. В. Лядов, В. Н. Егиев, А. Л. Соколов // Альм. Института хирургии им. А.В. Вишневского. - 2010. - Т. 5, № 1 (1). - С. 59-59.
7. Хоха, Д. В. Острый аппендицит: сравнительный анализ результатов 1950 и 2005 гг. / Д. В. Хоха, В. М. Хоха // Вестн. хирург. гастроэнтерологии. - 2010. - № 4. - С. 57-60.