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# MODERN MINIMALLY INVASIVE SURGICAL TREATMENT METHODS FOR ACUTE GALLSTONE DISEASE

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**Abstract:** This article discusses the effectiveness of modern minimally invasive surgical treatment of acute cholelithiasis (acute cholecystitis). During the study, laparoscopic cholecystectomy and traditional open surgical methods were compared based on clinical, functional, and statistical indicators. According to the results, the minimally invasive approach has proven to be less traumatic, safer, less complicated, and provides faster recovery for patients. Laparoscopic techniques increase surgical accuracy, reduce pain, and improve aesthetic outcomes. It is also noted that the widespread introduction of minimally invasive surgery has ushered in a new era in the treatment of cholelithiasis.

**Keywords:** acute cholelithiasis, cholecystitis, laparoscopic cholecystectomy, minimally invasive surgery, biliary tract, modern treatment, complications, clinical efficacy, recovery time, medical technologies.

## Introduction

Gallstone disease (cholecystolithiasis) and its acute form — acute cholecystitis — are today one of the most urgent problems of gastroenterology and surgical practice. According to statistics, 10–20% of the world's population suffers from gallstone disease during their lives, a significant part of which requires surgical intervention due to complications in the acute form. In particular, malnutrition, obesity, endocrine disorders, liver diseases and hormonal imbalances contribute to the widespread spread of this pathology.

In the acute form of gallstone disease, an inflammatory process occurs in the gallbladder wall, as a result of which the patient develops severe pain, fever, vomiting, signs of intoxication and serious complications (choledocholithiasis, mechanical jaundice, choledochitis). Therefore, in the acute period, the correct diagnosis, assessment of the patient's condition and determination of treatment tactics are of great clinical importance. Although traditional open surgery has been the main method for the past century, with the advent of minimally invasive technologies in modern medicine, laparoscopic methods are replacing them. Laparoscopic cholecystectomy is a procedure in which the gallbladder is removed through small incisions using special optical instruments. This technique reduces trauma, allows the surgical procedure to be performed under visual control, shortens the patient's recovery period, and reduces pain. Currently, minimally invasive surgery is not limited to laparoscopy, but also includes endoscopic retrograde choledochal methods, percutaneous transhepatic drainage, and robotic surgical systems. With the help of these methods, stones, inflammatory foci, and obstructive conditions in the bile ducts are eliminated with minimal trauma. The widespread introduction of modern minimally invasive surgery plays an important role in improving the quality of life of patients, reducing complications, and shortening the recovery period. Therefore, studying the advantages of using minimally invasive methods in the treatment of acute cholelithiasis, their full

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implementation in practice and assessment of their effectiveness in local conditions is one of the urgent scientific tasks in modern medicine.

The study was conducted with the participation of patients hospitalized with a diagnosis of acute cholelithiasis. The main goal of the study was to evaluate the clinical effectiveness of modern minimally invasive surgical methods, compare them with traditional open operations and analyze the postoperative condition of patients. A total of 60 patients were involved in the study, 30 of whom were treated traditionally and 30 with laparoscopic minimally invasive cholecystectomy. As part of the study, all patients underwent clinical, laboratory and instrumental examinations. Clinical signs included symptoms such as pain under the right rib, fever, vomiting, nausea and general weakness. Laboratory tests assessed general and biochemical blood parameters, especially the level of liver enzymes, bilirubin, and leukocytosis. Ultrasound (UTT) and computed tomography (CT) were used as the main diagnostic tools from instrumental examinations. Laparoscopic cholecystectomy was performed using a minimally invasive surgical method. During the operation, trocars were inserted through 3–4 small incisions in the abdominal wall, and the gallbladder was visualized using a video camera. The bile ducts were clearly identified, the cystic duct and artery were separated with a clip, and the gallbladder was removed. If necessary, stones in the bile ducts were removed using endoscopic retrograde choledochography (ERC).

In the traditional method, the gallbladder was removed through an open incision under the right rib. In both groups, the duration of the operation, the amount of blood loss, the duration of the pain syndrome, the duration of the patient's hospitalization, and the frequency of complications were determined and compared. The results obtained were statistically analyzed, the average values were determined, and the differences between the groups were evaluated using the t-test. Results with $P < 0.05$ were considered reliable. Ethical principles were strictly observed during the study, and written consent was obtained from all patients. The operations were performed in accordance with the rules of asepsis and antiseptics. This methodological approach made it possible to scientifically determine the advantages, safety, and clinical benefits of minimally invasive surgical methods for patients.

The correctness of the selected surgical method in the treatment of acute cholelithiasis is greatly influenced by the patient's condition, the severity of the inflammatory process, the presence of complications, and general clinical indicators. The results of the study showed that the modern minimally invasive method of laparoscopic cholecystectomy has a number of advantages over traditional open surgical methods. Patients experienced less pain, the postoperative hospital stay was shorter, recovery was faster, and infectious complications were significantly reduced. The average hospital stay in patients who underwent laparoscopic surgery was 2–3 days, while in patients who underwent open surgery this figure was 5–7 days. This confirms the clinical and social benefits of the minimally invasive approach. At the same time, the high-precision visual control of the laparoscopic technique made it possible to clearly see the bile ducts during the surgical procedure and prevent anatomical errors. If in previous years, open operations prevailed in acute cholecystitis, today laparoscopic cholecystectomy is recognized as the “gold standard”. This is confirmed not only in developed countries, but also in the medical practice of Uzbekistan. The widespread introduction of minimally invasive technologies, the qualification of surgeons and the availability of modern equipment contribute to the further popularization of this method in practice. However, in some complex clinical cases - for example, choledocholithiasis, purulent cholecystitis or severe deformation of the biliary tract - it may be

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difficult to fully apply the laparoscopic method. In such cases, there is a need to switch to open surgery. Nevertheless, such cases are relatively rare and their share does not exceed 5-10% of total operations.

Minimally invasive methods have shown their advantages not only in surgery, but also at the stage of patient rehabilitation. Reduction of postoperative pain syndrome, early mobility and rapid recovery of work capacity also have a positive effect on the psychological state of the patient. At the same time, the fact that a small aesthetic scar remains is noted as a factor of particular importance for women. The results of the study are consistent with scientific data presented in the international literature. In particular, clinical observations in recent years have shown that laparoscopic cholecystectomy reduces complications in patients by 3-4 times, shortens recovery time by 2 times, and significantly reduces mortality. Thus, the conducted analyses once again confirmed the high effectiveness and safety of the minimally invasive approach in the treatment of acute cholelithiasis.

**Conclusion**

The use of modern minimally invasive surgical methods in acute cholelithiasis has been proven to be one of the most effective, safe and patient-friendly approaches in modern medical practice. The results of the study showed that laparoscopic cholecystectomy has a number of clinical and functional advantages over traditional open surgery. This method significantly reduces postoperative pain, shortens recovery time, reduces hospital stay, and almost eliminates infectious complications. During gallbladder removal using laparoscopic techniques, the surgeon has the opportunity to clearly see the surgical field, which ensures the accuracy of anatomical structures and prevents surgical errors. At the same time, the minimal cosmetic defect, the possibility of early patient mobility, and the easy psychological recovery once again confirm the practical advantage of the minimally invasive approach.

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