

Outcomes of Early Laparoscopic Cholecystectomy in Cases of Acute Cholecystitis

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ABSTRACT

Background: Acute cholecystitis is a common and potentially severe condition requiring timely surgical intervention. Early laparoscopic cholecystectomy has been advocated as a treatment option to reduce morbidity and shorten hospital stays, yet its efficacy and safety continue to be subjects of clinical investigation.

Objective: This study aimed to evaluate the outcomes of early laparoscopic cholecystectomy in patients presenting with acute cholecystitis, focusing on operative time, intraoperative findings, postoperative complications, and length of hospital stay.

Methods: A prospective randomized study was conducted on 50 patients diagnosed with acute cholecystitis, who underwent laparoscopic cholecystectomy within 2 to 7 days of symptom onset. The study was carried out at Sohag University hospitals through the period from June 2022 to July 2023. Patients were over 21 years. Preoperative assessments, surgical techniques, and postoperative care protocols were standardized. Data were collected on demographics, operative details, and clinical outcomes.

Results: The mean age of patients was 46.6 ± 15.08 years, with predominance of female patients (62%). The average operative time was 91.4 ± 23.67 minutes. Intraoperatively, 64% of patients had a thickened gallbladder wall, and 78% had a distended gallbladder. Conversion to open cholecystectomy occurred in 2% of cases. Postoperative complications included bleeding in 8%, wound infections in 14%, bile leaks in 4%, and collections in 2% of patients. The average hospital stay was 4.8 ± 0.91 days.

Conclusions: Early laparoscopic cholecystectomy for acute cholecystitis is associated with a low conversion rate to open surgery, manageable postoperative complications, and a short hospital stay.

Keywords: Acute cholecystitis, Early laparoscopic cholecystectomy, Postoperative complications, Operative time, Hospital stay.

INTRODUCTION

The inaugural laparoscopic cholecystectomy was performed by Muhe in 1985, with the findings presented at the German Surgical Society in 1986 [1]. Mouret followed with a procedure in 1987, and Dubois performed another in May 1988 in France. However, the method widely utilized today was developed by Reddick and Olsen, who executed their first case in September 1988. This procedure was established as an elective treatment for chronic calculous cholecystitis [2].

Laparoscopic cholecystectomy has become the most commonly performed laparoscopic surgery globally. The initial management of acute calculous cholecystitis involves gastrointestinal rest, intravenous fluids, correction of electrolyte imbalances caused by recurrent vomiting, adequate analgesia, and intravenous antibiotics [3]. Patients with uncomplicated conditions are typically managed on an outpatient basis and scheduled for elective laparoscopic cholecystectomy within 6–8 weeks [4]. Laparoscopic cholecystectomy has become the preferred method for addressing symptomatic gallstones [3].

Initially, acute cholecystitis was regarded as a contraindication for this procedure. As a result, patients were first managed with conservative treatment and then scheduled for elective surgery at a later time [5].

It is advisable to carry out laparoscopic cholecystectomy within 72 hours of the start of symptoms as it leads to shorter hospital stays, decreased

expenses, and lower rates of readmission [6]. Nevertheless, there have been apprehensions regarding early intervention, which encompass heightened technical complexity, a greater likelihood of transitioning to open surgery (as documented in different studies ranging from 6% to 35%), and an increased risk of biliary complications, such as bile leaks and damage to the common bile duct. The dangers are more noticeable when doing surgery on an inflamed gallbladder [7].

The optimal timing for performing laparoscopic cholecystectomy in situations of acute cholecystitis is still a subject of ongoing discussion. Prior to the introduction of laparoscopic surgery, randomized prospective studies indicated that it was most advantageous to undergo cholecystectomy within 7 days of the beginning of symptoms [8, 9]. This method was associated with reduced hospitalization duration and a decreased likelihood of late sequelae, such as gangrenous or emphysematous cholecystitis. Furthermore, there was no observed rise in postoperative morbidity and death rates [9]. Therefore, our current study was designed to evaluate the results of early laparoscopic cholecystectomy in the patient with acute cholecystitis.

SUBJECTS AND METHODS

Study design: This prospective randomized study was conducted on 50 patients who underwent laparoscopic

cholecystectomy between 2 to 7 days after the onset of acute cholecystitis. The patients presented to Sohag University Hospitals through the period from June 2022 to July 2023.

Inclusion criteria: Patients (both males and females) above 21 years of age with symptoms and signs of acute cholecystitis.

Exclusion criteria: Patients under 21 years of age, pregnant females in their third trimester, patients with previous major abdominal surgeries or midline exploratory surgeries, jaundice, diabetes, common bile duct stones, and pancreatitis.

Pre-operative assessment:

Clinical assessment for acute cholecystitis involved a detailed history, focusing on jaundice and previous episodes, alongside with comprehensive physical exams, including checks for hypochondrial tenderness and surgical scars. Diagnostics primarily used pelviabdominal ultrasound, occasionally supplemented by MRCP, chest X-rays, and echocardiograms. Laboratory tests included complete blood counts, coagulation profiles, and liver and kidney function tests to support diagnosis and preoperative planning.

Operative technique:

Upon admission, all patients were instructed to abstain from eating (N.P.O) until their symptoms improved, which usually occurred within a timeframe of 24 to 58 hours. The patients received intravenous fluids, consisting of 500 cm³ of 5% glucose every 8 hours, 500 cm³ of Ringer's solution every 12 hours, and 500 cm³ of normal saline every 24 hours. In addition, they were administered a 1-gram dose of a broad-spectrum third-generation cephalosporin every 12 hours for a period of 5 days.

Preparation and positioning:

Patients undergoing laparoscopic cholecystectomy were administered general anesthesia, intubated, and mechanically ventilated. Procedures included stomach decompression via a Ryle tube, thrombosis prevention with lower limb stockings, and a pre-emptive third-generation cephalosporin dose. Patients were positioned in reverse Trendelenburg, with the surgical team strategically placed around them for optimal access and monitoring.

The surgery began with inserting the umbilical port using the open Hasson technique, followed by the introduction of CO₂ to create pneumoperitoneum. Subsequently, a diagnostic laparoscopy was conducted. Three supplementary ports were carefully placed: One in the epigastrium to the right of the midline, another along the midclavicular line, and a third in the anterior axillary line. The adhesions connecting the omentum, gallbladder, liver, and front abdominal wall were meticulously separated. If the gallbladder was enlarged,

it was drained with a needle before manipulating the upper part using 5 mm forceps.

Dissection of the cystic pedicle:

The process entails making precise cuts in the front and back layers of the peritoneum that cover Calot's triangle, usually with the aid of an L-shaped hook, to form openings between the cystic artery and duct (Figure 1). After attaining a critical assessment of safety (Figures 2), both the cystic artery and duct were secured with clips. Avoidance of mass division or clipping of any substantial cluster of tissue or duct structure was conducted with great care. Particular emphasis was placed on the looping right hepatic artery, as it has the potential to be erroneously identified as the cystic artery.

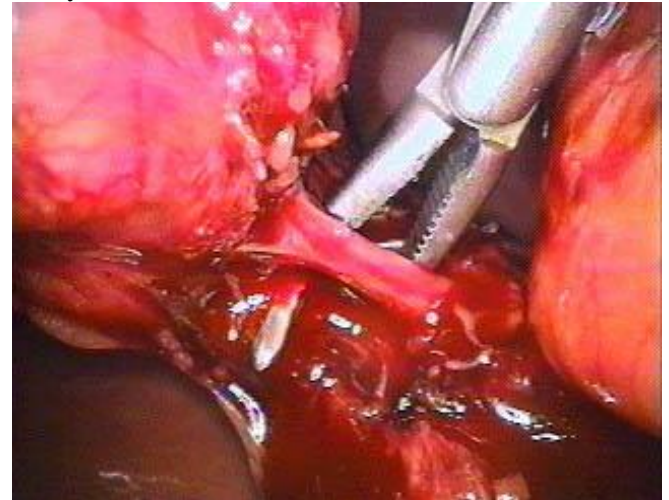


Figure (1): Dissection of cystic artery.



Figure (2): Clipping of cystic duct.

Dissection of the gallbladder from its liver bed:

The gallbladder was removed via the epigastric port, and the fascia was closed at the umbilical location. In order to prevent spilling, the port was enlarged for swollen gallbladders. If a conversion to open cholecystectomy was required as a result of challenging dissections, a surgical incision was made in the right subcostal region. The procedure entailed ligating and separating the cystic artery and duct, dissecting the

gallbladder, guaranteeing the control of bleeding, and sealing the abdominal wall in layers.

Post-operative evaluation:

The post-operative treatment involved administering intravenous fluids for 12 hours, then switching to oral intake and a soft diet. This was followed by a day of receiving intravenous third-generation cephalosporin. Patients were discharged following the removal of the drain and once they were able to consume food orally without difficulty. During the hospitalization period and at a follow-up appointment one week later, the monitoring primarily aimed to identify any complications that may arise, such as bleeding within the abdominal cavity, injury to the bile ducts, infections at the surgical wound site, and hernias at the port site.

Ethical considerations:

The study was done after being accepted by The Research Ethics Committee, Sohag University. All patients provided written informed consents prior to their enrolment. The consent form explicitly outlined their agreement to participate in the study and for the publication of data, ensuring protection of their confidentiality and privacy. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Data Management:

Statistical analysis was performed using SPSS version 26 (IBM Inc., Chicago, IL, USA). Quantitative variables were reported as mean and standard deviation (SD), while qualitative variables were presented as frequency and percentage (%).

RESULTS

The average age of the patients was 46.6 ± 15.08 years, with 38% males and 62% females. The mean weight was 74.5 ± 9.71 kg, the mean height was 1.7 ± 0.08 meters, and the mean BMI was 27.5 ± 4.54 kg/m². In terms of ASA physical status, 58% of patients were classified as ASA I, 32% as ASA II, and 10% as ASA III. Regarding comorbidities, 14% had diabetes mellitus, and 18% had hypertension. A history of biliary colic was present in 24% of patients, and 28% had undergone previous surgery. The mean operative time was 91.4 ± 23.67 minutes (Table 1).

Table (1): Demographics, risk factors and operative time of the studied patients

		(n=50)
Age (years)	Mean ± SD	46.6 ± 15.08
	Range	22 - 69
Sex	Male	19 (38%)
	Female	31 (62%)
Weight (kg)	Mean ± SD	74.5 ± 9.71
	Range	58 - 91
Height (m)	Mean ± SD	1.7 ± 0.08
	Range	1.54 - 1.78
BMI (kg/m²)	Mean ± SD	27.5 ± 4.54
	Range	19.3 - 36.2
ASA physical status	I	29 (58%)
	II	16 (32%)
	III	5 (10%)
Diabetes myelitis	Yes	7 (14%)
	No	43 (86%)
Hypertension	Yes	9 (18%)
	No	41 (82%)
History of biliary colic	Yes	12 (24%)
	No	38 (76%)
Previous surgery	Yes	14 (28%)
	No	36 (72%)
Operative time (min)	Mean ± SD	91.4 ± 23.67
	Range	60 - 140

Data were presented as mean ± standard deviation (SD), number (%), BMI: Body mass index, ASA physical status: American Society of Anesthesiologists

The duration of acute symptoms ranged from 78 to 96 h with a mean value of 86.7 ± 5.71 h. 32 (64%) patients had thick GB wall. Distended GB was found in 39 (78%) patients. Pericholecystic coli was found in 3 (6%) patients. WBCs was found to be more than 11.000/ml in 30 (60%) patients. Conversion rate from laparoscopic cholecystectomy to open cholecystectomy occurred in 3 (6%) patients. Gallbladder decompression occurred in 36 (72%) patients. Widening of epigastric port occurred in 12 (24%) patients (Table 2).

Table (2): Duration of acute symptoms, US findings and intraoperative modifications of the studied patients

		(n=50)
Duration of acute symptoms (h)	Mean ± SD	86.7 ± 5.7
	Range	78 - 96
Thick GB wall	Yes	32 (64%)
	No	18 (36%)
Distended GB	Yes	39 (78%)
	No	11 (22%)
Pericholecystic coli	Yes	3 (6%)
	No	47 (94%)
Conversion rate	Yes	1 (2%)
	No	49 (98%)
Gallbladder decompression	Yes	36 (72%)
	No	14 (28%)
Widening of epigastric port	Yes	12 (24%)
	No	38 (76%)

GB: Gallbladder. US: Ultrasound

Regarding complications, bleeding occurred in 4 (8%) patients, wound infection occurred in 7 (14%) patients, bile leak occurred in 2 (4%) patients and collection occurred in 1 (2%) patient. The hospital stays ranged from 3.5 to 6 days with a mean of 4.8 ± 0.91 days (Table 3).

Table (3): Complications and hospital stay of the studied patients

		(n=50)
Bleeding	Yes	4 (8%)
	No	46 (92%)
Wound infection	Yes	7 (14%)
	No	43 (86%)
Bile leak	Yes	2 (4%)
	No	48 (96%)
Collection	Yes	1 (2%)
	No	49 (98%)
Hospital stays (days)	Mean \pm SD	$4.8 \pm .91$
	Range	3.5 - 6

DISCUSSION

Since its inception in 1985, laparoscopic cholecystectomy has evolved from a therapeutic approach for chronic cholecystitis to an early intervention for acute instances, resulting in substantial reductions in both hospital stays and expenses. In our study, we assessed the efficacy of performing laparoscopic cholecystectomy early in 50 patients diagnosed with acute calculous cholecystitis. These patients underwent the procedure between 3 to 7 days from the start of symptoms, after first receiving conservative treatment [1].

The gender distribution in our study was 19 males to 31 females. By contrast, **Sushant et al.** [10] documented a male-to-female ratio of 4:26.

The study included patients diagnosed with acute cholecystitis, whose ages ranged from 22 to 69 years, with an average age of 46.6 ± 15.08 years. In a study conducted by **Eldar et al.** [11], the age range of patients who underwent laparoscopic cholecystectomy was found to be between 18 and 92 years, with an average age of 62 ± 15 years. According to **Greenwald et al.** [12] the average age of patients who had laparoscopic cholecystectomy for acute cholecystitis was 49.6 ± 17.3 years. The study conducted by **Eldar et al.** [11] found a greater percentage of conversion to open cholecystectomy, specifically 24%. This can be due to the fact that their patients were older in age. **Greenwald et al.** [12] found that the average age of patients in their study was 49.6 years, which is comparable to the average age in our study. As a result, the percentage of patients who had to undergo open cholecystectomy in their study was 13%, but in our study, it was 6% (3 out of 50 patients).

The study found that the acute symptoms lasted between 78 and 96 hours, with an average length of 86.7 ± 5.71 hours. **Kolla et al.** [13] documented an average duration of symptoms of 35.1 ± 19.1 hours.

Out of the total of 30 patients included in our study, 60% exhibited a white blood cell count over 11,000/ml. Similar results are seen by **Sushant et al.** [10], where 18 out of 30 patients had a white blood cell count higher than 11,000/ml.

Ultrasound is the initial diagnostic method commonly employed for biliary colic and is particularly efficient in identifying acute cholecystitis and gallbladder calculi. It is readily available and economical. Ultrasound is highly effective in detecting gallstones, thickening of the gallbladder wall, and collections of fluid around the gallbladder. In addition, it enables the evaluation of the patient's discomfort location relative to the gallbladder [14]. The study found that 64% of the patients (32 out of 50) had a thicker gallbladder wall as detected by abdominal ultrasound. Additionally, 6% of the patients (3 out of 50) had pericholecystic fluid collection. In their study, **Kolla et al.** [13] found that 60% of the patients had an enlarged gallbladder wall, 85% had a swollen gallbladder, and 15% had fluid accumulation around the gallbladder.

The duration of the surgical procedure varied between 60 and 140 minutes, with an average of 91.4 ± 23.67 minutes. The increased duration of the surgical procedure can be related to the time needed for the meticulous separation of adhesions, the challenging task of securely holding the gallbladder, and the inclusion of supplementary stages such as aspirating the gallbladder. **Sushant et al.** [10] observed a mean operative duration of 65.78 minutes in their early intervention group, whereas **Kolla et al.** [13] recorded a mean operative time of 104.3 ± 44 minutes in their early group.

The study found that the conversion rate to open cholecystectomy was 6%, with 3 patients. This was mainly attributed to challenges in dissecting Calot's triangle and intraoperative hemorrhage. **Gutt et al.** [15] documented a conversion rate of 9.9%. On the other hand, **Kolla et al.** [13] reported a conversion rate of 25%, which was greater. The underlying cause for these observations can be attributed to the development of the acute inflammatory process. In the early stages of acute cholecystitis, the presence of inflamed and swollen tissues can assist in clearly defining the boundaries between different tissue layers. As the inflammation worsens, the typical tissue planes are replaced by fibrotic adhesions, which makes the dissection more complicated [12].

Gallbladder decompression was required in 36 instances, accounting for 72% of the cases in this study. By contrast, **Sushant et al.** [10] found that 15 out of 30 cases (50%) necessitated gallbladder decompression.

In our study, the expansion of the epigastric port site after gallbladder extraction was necessary in 12 patients, accounting for 24% of the total cases. **Gutt et al.** [15] observed that in 10.2% of cases, it was essential to expand the epigastric port location.

During the present investigation, there were 4 instances (8%) of bleeding during surgery, resulting in the need to switch to an open cholecystectomy in one

case. In their study, **Gutt et al.** [15] documented a 3% incidence of intraoperative hemorrhage. In our investigation, we observed postoperative wound infection in 7 patients, which accounts for 14% of the total. In contrast, **Kolla et al.** [13] reported a lower wound infection rate of 5%.

Postoperative bile leaks occurred in 2 cases (4%) in our study, caused by slipped clips, and were treated with ERCP and stenting. **Kolla et al.** [13] observed postoperative bile leakage in 5% of instances. In our investigation, we observed postoperative collection in one case, which accounted for 2% of the total cases. An ultrasound detected a subhepatic collection, which was thereafter treated by inserting a pigtail. **Gutt et al.** [15] reported that postoperative collections were present in 3% of patients.

Within the scope of this investigation, a single instance (2%) of postoperative jaundice was seen. This occurrence was attributed to an overlooked stone in the common bile duct, and it was successfully managed with the implementation of ERCP and subsequent stone extraction.

In our study, the duration of hospitalization varied between 3.5 and 6 days, with an average of 4.8 ± 0.91 days. In their study, **Gutt et al.** [15] found that the length of hospital stay ranged from 4 to 6 days, with an average of 5.4 days. This closely aligns with the findings of our study. Additionally, it was discovered that patients who underwent delayed interval laparoscopic cholecystectomy (performed six to eight weeks after initial conservative treatment) had a hospital stay that was twice as long as those in the early group. This suggests that early laparoscopic cholecystectomy is a more economically efficient option. As reported by **Kolla et al.** [13] the average duration of hospitalization was 4.1 ± 8.6 days. In addition, their research revealed a noteworthy decrease in the duration of hospitalization for patients who underwent early laparoscopic cholecystectomy, as opposed to those who had delayed procedures. This finding is consistent with several other studies documented in the literature.

Limitations: This study had some limitations as it was a single center study with a relatively small sample size, thus future research is needed to validate our findings.

CONCLUSION

Early laparoscopic cholecystectomy for acute cholecystitis demonstrated a low conversion rate to open surgery, manageable postoperative complications, and a short hospital stay. These findings affirm the procedure's efficacy and safety, supporting its adoption as a standard treatment approach for suitable patients.

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