

The Feasibility and Safety of Laparoscopic Cholecystectomy in Cases of Acute Calculus Cholecystitis in Jalalabad Ragib Rabeya Medical College, Sylhet

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ABSTRACT

Background: Gallstone disease frequently leads to surgical admissions, particularly among women and individuals with metabolic risk factors. This study aimed to evaluate the feasibility and safety of laparoscopic cholecystectomy in the management of acute calculous cholecystitis. **Methods & Materials:** This hospital-based observational study included 135 consecutive patients with acute calculous cholecystitis who underwent attempted laparoscopic cholecystectomy at Jalalabad Ragib Rabeya Medical College, Sylhet, from July 2022 to July 2025. Diagnosis was based on clinical features, with supportive laboratory inflammation and ultrasonographic evidence of gallstones with acute cholecystitis. Feasibility outcomes were laparoscopic completion, conversion, and bailout use, while safety outcomes were 30-day complications, particularly bile leak and surgical site infection, plus ICU or HDU need; length of stay was also recorded. Data were analyzed descriptively in SPSS v26, and ethical approval with anonymized record handling was ensured. **Results:** Among 135 patients, mean age was 44.2 ± 13.6 years, 71.1% were female, and mean BMI was 25.1 ± 3.4 kg/m². Most were ASA II (51.9%), with hypertension (30.4%) and diabetes (23.7%) common. Laparoscopic completion was achieved in 89.6%, with 10.4% conversion to open surgery. Mean operative time was 78.6 ± 24.5 minutes and median blood loss 80 ml. Overall complication rate was 16.3%, including bile leak (3.0%) and SSI (6.7%). ICU/HDU care was required in 4.4% of cases, with 35.6% discharged within 48 hours. **Conclusion:** Laparoscopic cholecystectomy for acute calculous cholecystitis was feasible and safe, showing high completion rates, acceptable conversion rates, low bile leak and infection rates, and good outcomes supported by effective safety measures and bailout strategies.

Keywords: Acute calculous cholecystitis, Laparoscopic cholecystectomy, Open surgery

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INTRODUCTION

Gallstone disease is one of the most prevalent gastrointestinal disorders globally. Its incidence increases with age and is consistently higher among women, individuals with metabolic risk factors, and in certain geographic regions. This results in significant outpatient visits, emergency admissions, and operative workload for general surgery units^[1,2]. Acute calculous cholecystitis is a common and clinically significant complication of cholelithiasis. It may progress from edematous inflammation to empyema, gangrene, or perforation, and contributes substantially to morbidity, prolonged hospitalization, and increased resource utilization when timely definitive management is not provided^[1,3]. In South Asia, the incidence of gallstone disease is rising in parallel with changing dietary patterns and increasing cardiometabolic comorbidities. Although Bangladeshi data are limited, available evidence indicates a considerable community prevalence and an epidemiologic profile that suggests a growing surgical burden^[4]. Laparoscopic cholecystectomy is widely recognized as the standard definitive treatment for symptomatic gallstone disease and, when

appropriate, for acute calculous cholecystitis. This approach offers faster recovery, shorter hospital stays, and reduced wound-related morbidity compared to open surgery^[3,5]. Guideline frameworks such as the Tokyo Guidelines 2018 and the World Society of Emergency Surgery (WSES) guidelines recommend early laparoscopic cholecystectomy in suitable patients. These guidelines emphasize that delays may increase the risk of recurrent biliary events, cumulative length of stay, and overall costs, without necessarily improving operative safety^[3,5-8]. Systematic reviews comparing early and delayed laparoscopic cholecystectomy for acute cholecystitis generally support early surgery as both safe and effective. The primary benefit is reduced total hospitalization, while conversion and complication rates remain similar when appropriate expertise and perioperative systems are available^[7]. However, acute calculous cholecystitis remains technically challenging. Dense adhesions, an obscured or 'frozen' Calot's triangle, and advanced inflammation increase the risk of bleeding and bile duct injury, particularly in resource-limited settings^[9-11]. Consequently, modern safe

cholecystectomy principles emphasize routine achievement and documentation of the critical view of safety, structured intraoperative decision-making, and timely use of bailout strategies such as fundus-first dissection or subtotal cholecystectomy when anatomical conditions are unsafe^[6,9-11]. These approaches are especially important in peripheral or developing surgical units, where factors such as case-mix severity, delayed presentation, equipment limitations, and restricted high-dependency capacity can influence operative timing and outcomes. In Bangladesh, particularly outside major metropolitan areas, there is a lack of published evidence on real-world feasibility metrics such as laparoscopic completion rates, conversion patterns, bailout strategy utilization, and short-term safety outcomes for acute calculous cholecystitis. Generating center-specific data is essential to benchmark performance, identify operational challenges, and enhance quality improvement initiatives related to safe cholecystectomy. This study was designed to assess the feasibility and safety of laparoscopic cholecystectomy for acute calculous cholecystitis at a tertiary care

hospital in Sylhet, Bangladesh, by examining patient profiles, operative characteristics, technical difficulty, conversion and bailout rates, and 30-day postoperative outcomes.

METHODS & MATERIALS

The study was conducted in the Department of Surgery at Jalalabad Ragib Rabeya Medical College, Sylhet, Bangladesh, over a three-year period from July 2022 to July 2025. A hospital-based observational study design was employed to evaluate the feasibility and safety of laparoscopic cholecystectomy in patients with acute calculus cholecystitis. All consecutive eligible patients who underwent attempted laparoscopic cholecystectomy for acute calculus cholecystitis during the study period were included, resulting in a total sample of 135 cases. Diagnosis of acute calculus cholecystitis was established based on clinical features, including right upper quadrant pain, fever, vomiting, and localized tenderness, corroborated by laboratory evidence of inflammation and ultrasonographic findings such as gallbladder wall thickening or pericholecystic fluid in the presence of gallstones. Exclusion criteria comprised patients undergoing elective cholecystectomy for chronic cholecystitis, acalculous cholecystitis, gallbladder malignancy, or those with incomplete records for key perioperative outcomes.

Baseline demographic and clinical variables were extracted from medical records using a structured datasheet. These variables included age, sex, body mass index, ASA class, comorbidities, history of previous abdominal surgery, interval from symptom onset to presentation, presence of fever and vomiting at presentation, inflammatory markers such as white blood cell count and C-reactive protein, and imaging findings including gallbladder wall thickness, pericholecystic fluid, and common bile duct diameter. Operative variables recorded comprised timing from admission and symptom onset to surgery, laparoscopic completion, conversion to open surgery, use of bailout procedures, operative time, estimated blood loss, drain insertion, and documentation of the critical view of safety. Intraoperative findings included documentation of adhesions, gallbladder condition, stone spillage, Calot’s triangle status, and laparoscopic difficulty grading (Grade I to V). The primary feasibility outcomes were laparoscopic completion rate, conversion rate, and bailout procedure rate. Safety outcomes included 30-day postoperative complications, with particular attention to bile leak and surgical site infection, as well as the need for intensive care unit or high dependency unit care. Utilization outcomes comprised length of hospital stay and discharge within 48 hours. Data analysis was performed using descriptive statistics in SPSS (version 26.0),

with continuous variables reported as mean ± standard deviation or median with interquartile range, and categorical variables as frequency and percentage. Ethical approval was obtained from the institutional authority, and patient confidentiality was ensured by anonymizing all records during data handling and reporting.

RESULTS

The cohort had a mean age of 44.2 ± 13.6 years, with a clear female predominance, 96 (71.1%) females versus 39 (28.9%) males. Mean BMI was 25.1 ± 3.4 kg/m². Most patients were ASA II, 70 (51.9%), followed by ASA I, 44 (32.6%), while 21 (15.6%) were ASA III–IV. Hypertension, 41 (30.4%), and diabetes, 32 (23.7%), were the most common comorbidities, with IHD in 12 (8.9%) and CKD in 6 (4.4%); prior abdominal surgery was reported in 28 (20.7%). Patients presented at a mean of 22.4 ± 14.8 hours from symptom onset, with fever in 40 (29.6%) and vomiting in 62 (45.9%). Inflammatory markers were elevated, mean WBC 13.2 ± 3.8 ×10⁹/L and median CRP 38 (IQR 20–72) mg/L. Imaging showed a mean gallbladder wall thickness of 5.1 ± 1.4 mm, pericholecystic fluid in 52 (38.5%), and mean CBD diameter of 6.3 ± 1.6 mm (Table I).

Table I
Baseline demographic and clinical profile of study population (n = 135).

Variable	Category	n (%)
	Mean ± SD	
Age (years)		44.2 ± 13.6
Sex	Male	39 (28.9)
	Female	96 (71.1)
BMI (kg/m²)		25.1 ± 3.4
ASA class	I	44 (32.6)
	II	70 (51.9)
	III–IV	21 (15.6)
	Diabetes	32 (23.7)
Comorbidities	Hypertension	41 (30.4)
	IHD	12 (8.9)
	CKD	6 (4.4)
Previous abdominal surgery	Yes	28 (20.7)
Time from symptom onset to presentation (hours)		22.4 ± 14.8
Fever at presentation (Yes)		40 (29.6)
Vomiting at presentation (Yes)		62 (45.9)
Laboratory markers	WBC (×10⁹/L)	13.2 ± 3.8
	CRP (mg/L), median (IQR)	38 (20–72)
	GB wall thickness (mm)	5.1 ± 1.4
Imaging markers	Pericholecystic fluid	52 (38.5)
	CBD diameter (mm)	6.3 ± 1.6

Surgery occurred at a mean of 27.8 ± 15.9 hours from admission, and 60.4 ± 28.6 hours from symptom onset. Laparoscopic completion was achieved in 121 (89.6%), while 14 (10.4%) required conversion to open surgery. Bailout techniques were used in a notable minority, fundus-first approach

in 19 (14.1%) and subtotal cholecystectomy in 7 (5.2%). Mean operative time was 78.6 ± 24.5 minutes, and median blood loss was 80 mL (IQR 50–150). Drain insertion was common, 72 (53.3%). Critical view of safety was documented in 124 (91.9%). Equipment-related delay affected 10 (7.4%)

cases. Postoperatively, ICU or HDU was required in 6 (4.4%), 48 (35.6%) were discharged within 48 hours, and the median hospital stay was 3 days (IQR 2–4) Table II.

Table II
Operative characteristics and feasibility outcomes (*n* = 135).

Variable	Category	n (%)
	Mean ± SD	
Timing of surgery (hour)	Admission to surgery	27.8 ± 15.9
	Symptom onset to surgery	60.4 ± 28.6
Laparoscopic completion		121 (89.6)
Conversion to open		14 (10.4)
Bailout technique	Fundus-first approach	19 (14.1)
	Subtotal cholecystectomy	7 (5.2)
Operative time (minutes)	78.6 ± 24.5	
Estimated blood loss (mL), Median (IQR)	80 (50–150)	
Drain insertion (Yes)		72 (53.3)
Critical view of safety documented (Yes)		124 (91.9)
Resource feasibility	Equipment related delay	10 (7.4)
Postoperative disposition	ICU/HDU required	6 (4.4)
Discharged within 48 hours (Yes)		48 (35.6)
Length of stay (days), Median (IQR)		3 (2–4)

Adhesions were frequent, mild in 58 (43.0%), moderate in 49 (36.3%), and severe in 28 (20.7%). The dominant gallbladder condition was oedematous or inflamed in 69 (51.1%), while advanced pathology was also substantial, empyema in 27 (20.0%), gangrenous cholecystitis in 26 (19.3%), perforation with localized bile peritonitis in 8 (5.9%), and phlegmonous mass in 5 (3.7%). Stone spillage occurred in 17 (12.6%). Calot’s triangle was clearly defined in 79 (58.5%), partially defined in 41 (30.4%), and frozen in 15 (11.1%). Difficulty grading clustered around intermediate severity, Grade II in 44 (32.6%) and Grade III in 36 (26.7%), with Grade IV–V accounting for 23 (17.0%) cases (*Table III*).

Table III
Intraoperative findings and technical difficulty distribution (*n* = 135).

Variable	Category	n (%)
Adhesions	Mild	58 (43.0)
	Moderate	49 (36.3)
	Severe	28 (20.7)
Gallbladder condition, dominant finding	Oedematous, inflamed	69 (51.1)
	Empyema	27 (20.0)
	Gangrenous	26 (19.3)
	Perforated, localized bile peritonitis	8 (5.9)
	Phlegmonous mass	5 (3.7)
Stone spillage	Yes	17 (12.6)
Calot’s triangle status	Clearly defined	79 (58.5)
	Partially defined	41 (30.4)
	Frozen Calot’s	15 (11.1)
Difficulty grading (I–V)	Grade I	32 (23.7)
	Grade II	44 (32.6)
	Grade III	36 (26.7)
	Grade IV	18 (13.3)
	Grade V	5 (3.7)

The LC difficulty distribution mirrored *Table 3*, with Grade II, 44 (32.6%), and Grade III, 36 (26.7%), being most common, followed by Grade I, 32 (23.7%), Grade IV, 18 (13.3%), and Grade V, 5 (3.7%). Despite the burden of technical difficulty, critical view of safety was achieved in 124 (91.9%), with 11 (8.1%) cases where it was not achieved. Bailout strategies were applied in 26 (19.3%) overall, fundus-first in 19 (14.1%) and subtotal cholecystectomy in 7 (5.2%). Drain placement remained frequent, 72 (53.3%), aligning with a cautious strategy in more inflamed or complex cases (*Table IV*).

Table IV
Grade of laparoscopic cholecystectomy and key intraoperative difficulty markers (*n* = 135).

Variable	Category	n (%)
LC difficulty grade (I–V)	Grade I	32 (23.7)
	Grade II	44 (32.6)
	Grade III	36 (26.7)
	Grade IV	18 (13.3)
	Grade V	5 (3.7)
Critical view of safety achieved	Yes	124 (91.9)
	No	11 (8.1)
Bailout technique used	Fundus first	19 (14.1)
	Subtotal cholecystectomy	7 (5.2)
Drain placed	Yes	72 (53.3)
	No	63 (46.7)

Conversion occurred in 14 (10.4%), while 121 (89.6%) were completed laparoscopically. Among conversions, the leading indication was unclear anatomy or an unsafe Calot’s triangle, 6/14 (42.9%),

followed by dense adhesions or frozen Calot’s, 4/14 (28.6%). Less common causes included uncontrolled bleeding, 2/14 (14.3%), suspected bile duct injury, 1/14 (7.1%), and equipment failure, 1/14 (7.1%).

Overall, the conversion profile suggests anatomy-related safety concerns as the primary driver rather than bleeding or equipment constraints (*Table V*).

Table V
Conversion to open surgery, frequency and reasons (*n* = 135).

Variable	Category	n (%)
Conversion outcome	Completed laparoscopically	121 (89.6)
	Converted to open	14 (10.4)
Reason for conversion (<i>n</i> = 14)	Unclear anatomy, unsafe Calot’s triangle	6 (42.9)
	Dense adhesions, frozen Calot’s	4 (28.6)
	Uncontrolled bleeding	2 (14.3)
	Suspected bile duct injury	1 (7.1)
	Equipment failure	1 (7.1)

Any postoperative complication occurred in 22 (16.3%), with the majority, 113 (83.7%), remaining complication-free. Specific adverse events were relatively infrequent,

bile leak in 4 (3.0%) and wound infection in 9 (6.7%). These focused outcomes indicate that while minor to moderate complications occurred in a subset, major bile-related

morbidity remained uncommon in this series (*Table VI*).

Table VI
Postoperative complications within 30 days, focused outcomes (*n* = 135).

Complication	Category	n (%)
Any postoperative complication	Yes	22 (16.3)
	No	113 (83.7)
Bile leak	Yes	4 (3.0)
	No	131 (97.0)
Wound infection (SSI)	Yes	9 (6.7)
	No	126 (93.3)

The overall feasibility signal was strong, with an 89.6% laparoscopic completion rate and a 10.4% conversion rate. Bailout procedures were used in 19.3%, reflecting a structured approach to difficult anatomy and

inflammation. Safety outcomes were acceptable for acute calculus cholecystitis, with bile leak at 3.0%, wound infection at 6.7%, and an overall complication rate of 16.3%. Utilization metrics were favorable,

with a median length of stay of 3 days (IQR 2–4), supporting efficient postoperative recovery in most patients (*Table VII*).

Table VII
Combined feasibility and safety summary headline outcomes (*n* = 135).

Outcome domain	Indicator	RESULT
Feasibility	Laparoscopic completion rate	121 (89.6)
	Conversion rate	14 (10.4)
	Bailout procedure rate (fundus first or subtotal)	26 (19.3)
Safety	Bile leak rate	4 (3.0)
	Wound infection rate	9 (6.7)
	Any complication rate	22 (16.3)
Utilization	Median length of stay (days)	3 (2–4)

DISCUSSION

This single-center series from Jalalabad Ragib Rabeya Medical College demonstrates that laparoscopic cholecystectomy (LC) for acute calculus cholecystitis is both feasible and acceptably safe in a real-world, resource-constrained environment, as evidenced by an 89.6% laparoscopic completion rate, a 10.4% conversion rate, and a low bile leak rate of 3.0%. Current clinical guidelines increasingly recommend early LC as the preferred strategy for acute cholecystitis, citing its ability to shorten the overall treatment course, reduce recurrent admissions, and avoid increased major morbidity when appropriate patient selection and intraoperative safety measures

are employed. Both the World Society of Emergency Surgery (WSES) guideline update and Tokyo Guidelines 2018 advocate for early operative management, emphasizing that timing should be determined by clinical status and surgical expertise rather than strict symptom duration thresholds [6,8]. In this cohort, the mean interval from admission to surgery was approximately 28 hours, and from symptom onset to surgery was about 60 hours, consistent with the “early LC” window established in pivotal trials and subsequent evidence syntheses. The ACDC randomized trial and later meta-analyses support that early LC reduces total length of stay without increasing conversion or complication rates compared to delayed

strategies, a trend reflected in this study by a median hospital stay of 3 days and over one third of patients discharged within 48 hours [7,12]. A key strength of these findings is that favorable outcomes were achieved despite a high level of technical difficulty, with severe adhesions present in 20.7% of cases, empyema or gangrenous changes in nearly 40%, and Grade III–V difficulty in 43.7%. In such challenging anatomical contexts, conversion is frequently necessitated by the inability to obtain a safe operative view, dense inflammation, or bleeding. These factors closely correspond to the primary reasons for conversion observed in this series, particularly unsafe or unclear Calot’s triangle and extensive adhesions. These results support the

prevailing consensus that feasibility should be assessed not solely by completion rates but also by disciplined intraoperative decision making in the presence of hostile anatomy. Notably, the observed conversion rate of 10.4% falls within the commonly reported range for acute cholecystitis and is consistent with observational data indicating that early LC remains safe even when performed beyond 72 hours of symptom onset, provided that appropriate bailout strategies are employed [13]. The study's high rate of critical view of safety (CVS) documentation at 91.9% is clinically significant, as inadequate anatomical identification remains a primary risk factor for bile duct injury, particularly in cases of acute inflammation. The multi-society safe cholecystectomy guideline identifies CVS as fundamental to intraoperative safety and recommends specific bailout strategies, such as subtotal cholecystectomy and alternative dissection planes, when CVS cannot be achieved [10]. Real-world data indicate that consistent CVS attainment and documentation are highly variable; for example, the Italian multicentre evaluation demonstrated a gap between the ideal of "CVS always" and actual routine practice, underscoring the need for explicit documentation and standardized team protocols [14]. Further evidence suggests that objective documentation is important: the large photographic evaluation by Terho and colleagues found that satisfactory CVS photo documentation correlated with lower bile duct injury rates and fewer postoperative complications, supporting the use of documentation as a quality and safety metric [15]. In this context, the present study's combination of high CVS documentation and low rates of suspected bile duct injury-related conversion reflects a safety-oriented operative approach. The utilization of bailout strategies in this cohort, with 14.1% undergoing fundus-first dissection and 5.2% receiving subtotal cholecystectomy, appears well matched to the observed difficulty profile. Subtotal cholecystectomy is recognized for its role in preventing major biliary injury when Calot's triangle is unsafe, though it is associated with a higher risk of bile leak in certain techniques, as detailed in the systematic review and meta-analysis by Elshaer et al [9]. The low overall bile leak rate reported in this study, despite the use of bailout procedures, indicates that careful selection of surgical technique and diligent postoperative management can reduce this risk in a population with varying disease severity. The expanding body of literature on fundus-first approaches further supports its use as a practical strategy in challenging gallbladder cases; recent systematic reviews and meta-analyses suggest that fundus-first LC is an effective alternative when standard dissection is unsafe [16].

LIMITATIONS

This was a single-center study with a moderate sample size, which may limit generalizability to other hospitals. The observational design, without a comparison group, restricts causal inference regarding timing, techniques, and outcomes. Some measures, such as difficulty grading and documentation of the critical view of safety, may be subject to operator variability and recording bias.

CONCLUSION

In conclusion, laparoscopic cholecystectomy for acute calculus cholecystitis at Jalalabad Ragib Rabeya Medical College was feasible and acceptably safe, with a high laparoscopic completion rate, a modest conversion rate, and low bile leak and wound infection rates. Routine documentation of the critical view of safety, timely surgery, and appropriate use of bailout techniques likely contributed to these outcomes. These findings support early laparoscopic cholecystectomy as a practical standard of care in similar tertiary hospitals, provided that teams maintain clear safety thresholds for bailout or conversion and ensure reliable operative resources.

RECOMMENDATIONS

Early laparoscopic cholecystectomy should be prioritized for acute calculus cholecystitis, with routine critical view of safety documentation and prompt use of bailout or conversion when anatomy is unsafe. Hospitals should strengthen equipment readiness, team training, and standardized operative safety protocols to further reduce conversion and complications, and multicenter comparative studies are recommended to validate these findings.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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