

Fundus-First Bailout Cholecystectomy in Difficult Laparoscopic Cholecystectomy- A Retrospective Observational Study from a Tertiary Care Centre In Jharkhand

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Received: 01-06-2026 / Revised: 15-07-2026 / Accepted: 21-08-2026

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Conflict of interest: Nil

Abstract

Background: Difficult laparoscopic cholecystectomy (LC) may arise from severe inflammation, adhesions, fibrosis, or distorted anatomy around Calot's triangle. When the critical view of safety cannot be achieved safely, a bailout strategy may reduce the risk of major biliary injury. The fundus-first (retrograde/dome-down) approach is one such strategy.

Methods: We retrospectively reviewed operative and hospital records of 100 consecutive patients who underwent LC (Laparoscopic Cholecystectomy) at Medinirai Medical College and Hospital, Palamu, Jharkhand, between January 2024 and December 2025. Demographic characteristics, clinical presentation, laboratory and ultrasonographic findings, intraoperative difficulty, bailout procedures, operative time, postoperative outcomes, hospital stay, and histopathology were recorded. Descriptive statistics were used.

Results: Among 100 patients, 38 were male and 62 female, with a mean BMI of 21.7 kg/m². Thirty-one cases were classified as difficult by the local intraoperative assessment. Calot's triangle was not identifiable in 14 patients, and all 14 underwent a bailout procedure. Fundus-first LC was completed laparoscopically in 13 patients; one patient was converted to open fundus-first cholecystectomy after 30 minutes of surgery due to non-progression and bleeding. No bile duct injury was recorded. Bilious drain output lasting 3–14 days occurred in 7 of the 13 laparoscopic fundus-first cases and resolved with conservative management. Mean operative time was 58.34 minutes in straightforward cases and 109.32 minutes in difficult cases. Mean hospital stay was 2.54 days in straightforward cases and 5.3 days in difficult cases. There were no recorded readmissions or deaths.

Conclusion: In this retrospective single-centre series, fundus-first bailout cholecystectomy enabled laparoscopic completion in most selected difficult cases without recorded bile duct injury or mortality. The relatively frequent postoperative bilious drainage highlights the need for careful postoperative surveillance. These findings support the feasibility of the fundus-first approach in selected difficult cases, with further studies helping to validate these observations.

Keywords: Difficult Laparoscopic Cholecystectomy; Fundus-First Cholecystectomy; Bailout Strategy; Bile Leak; Critical View of Safety.

DOI: 10.25258/ijcpr.18.9.109

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Introduction

Laparoscopic cholecystectomy is the standard operative treatment for symptomatic gallstone disease. Although most procedures are completed uneventfully, operative difficulty increases when inflammation, fibrosis, adhesions, impacted neck stones, or distorted anatomy obscure the structures at Calot's triangle. [1,2]

In these circumstances, continued dissection without a clearly identifiable safe anatomy may increase the risk of bile duct and vascular injury.

Contemporary safe-cholecystectomy guidance emphasizes achieving the critical view of safety and changing strategy when the anatomy cannot be defined safely. [5] Bailout options include fundus-first dissection, subtotal cholecystectomy, and conversion to open surgery. Tokyo Guidelines 2018 specifically recommend considering a bailout procedure when a critical view cannot be achieved because of severe fibrosis or scarring.

A 2022 systematic review and meta-analysis of 12 comparative studies reported that fundus-first LC was associated with lower conversion, shorter operative time, lower bile duct injury risk, and shorter hospital stay than conventional LC in difficult cases. [6]

Published data from eastern India and, specifically, Jharkhand are limited. The present study describes the local experience with fundus-first bailout cholecystectomy, with emphasis on the indications for bailout, operative completion, postoperative bile drainage, hospital stay, and short-term outcomes.

Materials and Methods

Study design and setting: This retrospective observational study reviewed operative and hospital records of consecutive patients undergoing laparoscopic cholecystectomy at Medinirai Medical College and Hospital, Palamu, Jharkhand, from 1 January 2024 through 31 December 2025. Institutional ethical clearance was obtained and patient confidentiality was maintained.

Eligibility: Inclusion criteria were all consecutive laparoscopic cholecystectomy procedures performed during the study period.

Exclusion criteria were incomplete records, planned open cholecystectomy, and concomitant major procedures.

One hundred cases met the stated criteria.

Table 1: Variables recorded

Domain	Variables recorded
Demographics	Age, sex, BMI
Clinical	Diabetes, elective/emergency presentation, documented history of acute cholecystitis
Laboratory	Total leukocyte count
Ultrasound	Wall thickening/pericholecystic fluid, impacted neck stone, CBD diameter, gallbladder distension
Intraoperative	Acute inflammation, gangrenous change, anatomical distortion, Calot's triangle identification, local difficulty assessment
Operative	Bailout procedure, operative time, blood loss, drain placement
Postoperative	Bilious drain output/bile leak, bile duct injury, hospital stay, readmission, mortality
Pathology	Final histopathological diagnosis

Definition of difficult LC and bailout: Difficult laparoscopic cholecystectomy (LC) was defined on the basis of intraoperative findings, including severe inflammation or fibrosis, significant anatomical distortion, or inability to safely identify and dissect the structures within Calot's triangle despite reasonable attempts at conventional dissection. In cases where safe dissection through Calot's triangle was not possible, a fundus-first approach was considered as a bailout technique. Fundus-first dissection was performed by mobilizing the gallbladder beginning at the fundus and proceeding toward the neck, with the dissection plane maintained close to the gallbladder wall. Conversion to open surgery was considered when adequate laparoscopic progress could not be achieved safely after approximately 30 minutes of fundus-first dissection.

Statistical Analysis: Data were analyzed using descriptive statistical methods. Categorical variables were summarized as frequencies and percentages, while continuous variables were expressed as means with their corresponding ranges. The analysis was primarily descriptive, focusing on the demographic characteristics, clinical and operative findings, bailout procedures, and postoperative outcomes of the study population.

Results

Patient Characteristics: The cohort comprised 100 patients (62% female, 38% male) with a mean BMI of 21.7 kg/m²; 81% were elective procedures, 19% emergency, 46% had raised leukocyte counts, and 7% had diabetes. Most patients were young adults (77% aged 20–40 years), with zero prior documented acute cholecystitis.

Table 2: Characteristic

Characteristic	Result (n=100)
Male	38 (38%)
Female	62 (62%)
Mean BMI	21.7 kg/m ²
Diabetes mellitus	7 (7%)
Elective procedure	81 (81%)
Emergency procedure	19 (19%)
Raised total leukocyte count	46 (46%)
Previous documented acute cholecystitis	None

Operative Difficulty: By local intraoperative criteria, 69% of cases were categorized as straightforward, while 31% were classified as difficult.

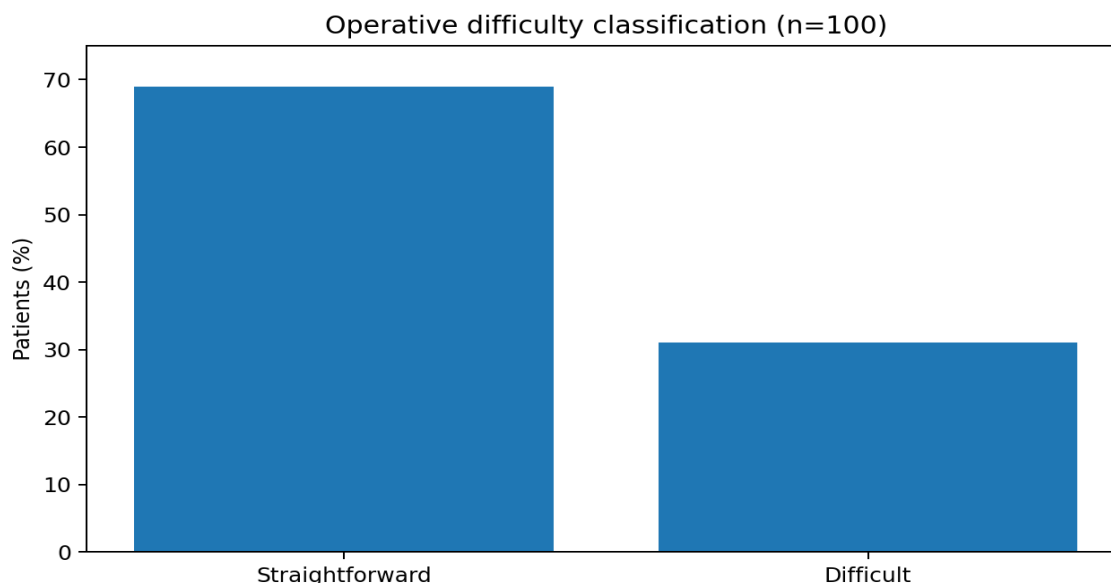


Figure 1: Operative difficulty classification (n=100)

Ultrasonographic findings: Preoperative ultrasound showed gallbladder wall thickening with pericholecystic fluid in 27% of patients, gallbladder distension in 23%, and impacted neck stones in 12%, while common bile duct (CBD) diameter was normal in 100% of cases.

Table 3: Finding

Finding	Patients
Thickened gallbladder wall with pericholecystic fluid	27 (27%)
Impacted neck stone	12 (12%)
Gallbladder distension	23 (23%)
Normal CBD diameter	100 (100%)

Intraoperative findings and difficulty: Intraoperatively, 29% had acute inflammation, 16% had anatomical distortion, and 4% had gangrene. Total 31 cases were classified as difficult and out of these 31 cases, Calot's triangle was unidentifiable in 14 patients (14%), requiring bailout surgical process.

Table 4: Finding

Finding	Patients
Acute inflammation	29 (29%)
Gangrenous changes	4 (4%)
Anatomical distortion	16 (16%)
Calot's triangle identifiable	86 (86%)
Calot's triangle unidentifiable	14 (14%)
Classified difficult by local assessment	31 (31%)

Bailout procedures and operative outcomes: Conventional dissection was completed in 86 patients, 14 patients needed bailout surgical process. Out of these 14 patients, 13 underwent completed laparoscopic fundus-first LC and 1 converted to open fundus-first surgery. There were zero bile duct injuries, zero blood transfusions, and 100% received routine drains.

Table 5: Outcome

Outcome	Patients / value
No bailout	86 (86%)
Fundus-first laparoscopic LC	13 (13%)
Conversion to open fundus-first LC	1 (1%)
Bile duct injury	0
Blood transfusion	0
Routine drain placement	100 (100%)

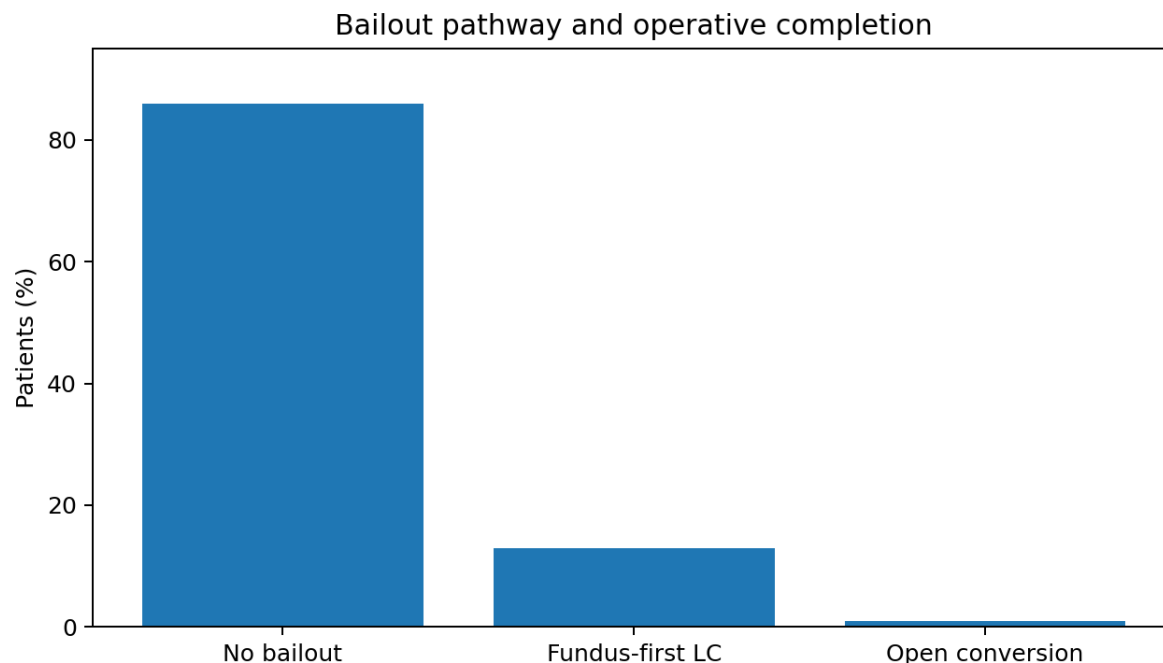


Figure 2: Bailout pathway and operative completion

Operative Time and Blood Loss: Mean operative time was roughly doubled in difficult cases (109.32 minutes) compared to straightforward cases (58.34 minutes), with minimal blood loss across all patients. Mean operative time was 58.34 minutes in straightforward cases and 109.32 minutes in difficult cases. Blood loss was described as minimal in all patients.

Postoperative Outcomes: Bilious drain output occurred in total 7 cases which lasted 3–14 days, and all resolved conservatively without re-intervention. All these 7 cases belonged to the group of 13 cases of Bailout laparoscopic fundus first surgery. Mean hospital stay was 2.54 days for straightforward cases versus 5.3 days for difficult cases, with zero readmissions and zero mortality.

Table 6: Outcome

Outcome	Result
Bilious drain output among 13 laparoscopic fundus-first cases	7 cases
Duration of bilious drain output	3–14 days
Resolution	All resolved with conservative management
Re-intervention/endoscopic stenting	None
Mean hospital stay: straightforward cases	2.54 days (range 1–5)
Mean hospital stay: difficult cases	5.3 days (range 3–14)
Readmission	0 recorded
Mortality	0 recorded

Histopathology: Final pathology confirmed chronic cholecystitis in 63% of specimens, acute or acute-on-chronic cholecystitis in 29%, and cholesterosis in 8%.

Table 7: Histopathological finding

Histopathological finding	Patients
Chronic cholecystitis	63 (63%)
Acute or acute-on-chronic cholecystitis	29 (29%)
Cholesterosis	8 (8%)

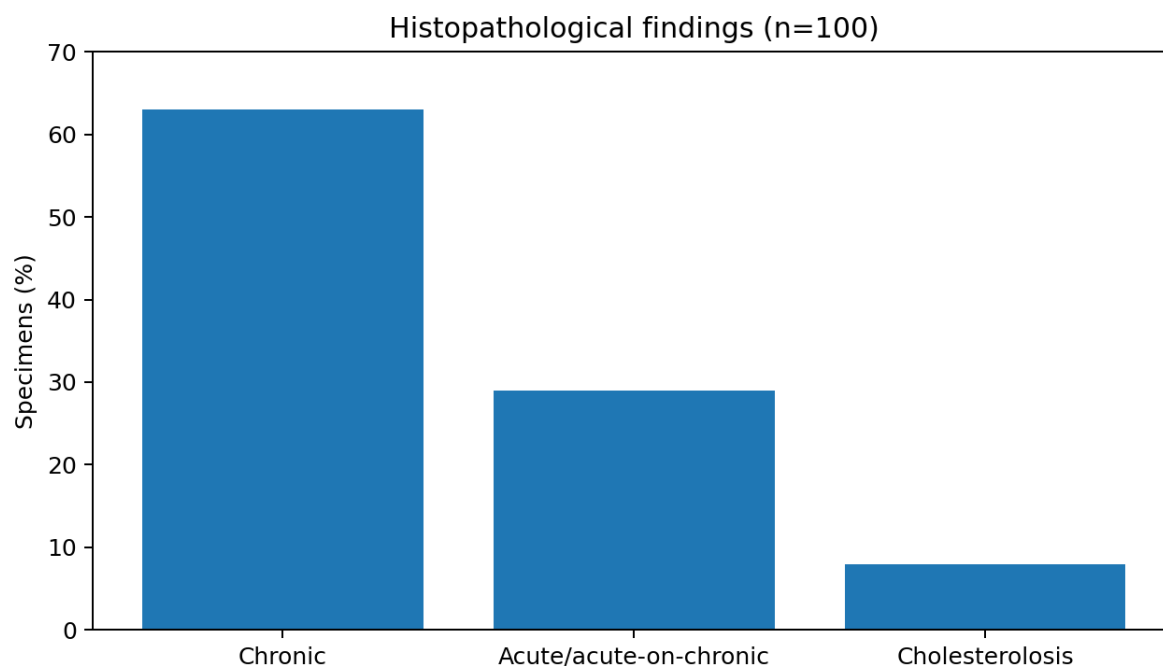


Figure 3: Histopathological findings (n=100)

Discussion

In the present study, 31% of laparoscopic cholecystectomies were classified as difficult, with 14% requiring a bailout procedure because of inability to safely identify Calot's triangle. Fundus-first dissection was the principal bailout strategy and permitted laparoscopic completion in 13 of 14 patients (92.9%), with only one patient requiring conversion to an open fundus-first procedure. The findings are consistent with previous literature supporting the use of fundus-first dissection in difficult laparoscopic cholecystectomy. Gupta et al., in a study of 145 patients, specifically evaluated the fundus-first technique in situations where exposure of the cystic duct was difficult because of adhesions around Calot's triangle and concluded that the technique could facilitate completion of difficult cases and reduce the need for conversion to open surgery. [7] More recently, Bhoopathy et al. evaluated 200 difficult laparoscopic cholecystectomies and reported favorable operative outcomes with the fundus-first technique compared with the standard approach. In their study, complete operative outcomes were achieved in 88% of patients managed with the fundus-first technique compared with 51% with the standard technique, supporting its role as a useful bailout strategy in difficult cases. [8] The principal rationale for a bailout strategy is avoidance of hazardous dissection when the anatomy around Calot's triangle is unclear. Tokyo Guidelines 2018 emphasize that a bailout procedure should be considered when severe scarring or fibrosis prevents achievement of the critical view of safety.

Postoperative bilious drainage was observed in [7%] of patients undergoing straightforward laparoscopic cholecystectomy compared with 7 of 13 patients (53.8%) undergoing laparoscopic fundus-first dissection in the difficult/bailout subgroup. Importantly, all episodes in the fundus-first group resolved with conservative management and none required ERCP, biliary stenting, re-intervention, or reoperation. The substantially higher frequency of bilious drain output in the difficult/bailout group may reflect the greater degree of gallbladder inflammation, difficult separation of the gallbladder from the liver bed, and more extensive dissection required in these cases. Published data similarly demonstrate a greater association between postoperative bile leakage and technically difficult cholecystectomy. In a large series of 5,675 laparoscopic cholecystectomies, patients developing postoperative bile leakage had significantly higher operative difficulty grades, with 56% classified as grade IV or V, compared with 16.1% among patients without bile leakage. [9] The same study also demonstrated a greater use of abdominal drains among patients with postoperative bile leakage (76% versus 51%), suggesting that routine drainage may increase detection of low-volume or clinically contained bile leakage. Authors are of the opinion that high rate of bilious drain output observed in the present bailout subgroup may represent predominantly low-output, clinically contained leakage rather than major bile duct injury.

The mean operative time was considerably longer in difficult laparoscopic cholecystectomy cases

than in straightforward cases (109.32 versus 58.34 minutes), representing an absolute difference of approximately 51 minutes. This finding is clinically plausible, as difficult cases frequently require prolonged adhesiolysis, careful dissection around the gallbladder neck and Calot's triangle, management of inflammatory changes, and, in selected patients, adoption of a bailout technique such as fundus-first dissection. Similar prolongation of operative time in technically challenging cholecystectomies has been reported in the literature. Gupta et al. observed that operative time varied according to the presence and severity of inflammation and reported substantially longer procedures in severely inflamed cases.

A recent prospective comparative study of 200 difficult laparoscopic cholecystectomies reported a significantly shorter mean operative time with the fundus-first technique compared with the standard technique (91.5 ± 18.3 versus 143.75 ± 13.7 minutes, respectively; $p < 0.001$). These findings suggest that the choice of operative strategy may substantially influence operative duration in technically difficult cholecystectomy. [8] In the present study, however, no formal statistical comparison was performed; therefore, the observed difference should be regarded as a descriptive finding rather than evidence of a statistically significant association between operative difficulty and operative duration.

The study population was relatively young and all patients were reported to have normal BMI. These characteristics may limit the generalisability of the findings to older or obese populations. The study also included only one centre and used a locally defined difficulty assessment rather than a prospectively validated grading system.

Overall, the findings support fundus-first dissection as a practical bailout option in selected difficult LC when safe conventional dissection is not possible. They do not demonstrate that fundus-first is universally preferable to subtotal cholecystectomy or conversion to open surgery. Current evidence supports an individualized bailout strategy based on the operative anatomy and surgeon expertise.

Conclusion

In this retrospective single-centre series, fundus-first bailout cholecystectomy permitted laparoscopic completion in most selected cases in which Calot's triangle could not be safely identified. No bile duct injury or mortality was recorded, while postoperative biliary drainage was relatively frequent but resolved with conservative management.

The findings support fundus-first dissection as one component of a bailout strategy for difficult LC, but larger prospective comparative studies are

required before drawing conclusions about its superiority over other bailout approaches.

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