



Original Article

Laparoscopic Completion Cholecystectomy for Stump Cholecystitis: A Prospective Observational Three Years Study from a Tertiary Care Hospital in Eastern India

Manojit Sarkar¹, Saikat Das², Subhadip Ghosh³, Amit Ray⁴

¹Assistant Professor, Department of Surgery, MJN Govt. Medical College & Hospital, Coochbehar, West Bengal, India

²3rd Year DNB PGT, Department of Surgery, MJN Govt. Medical College & Hospital, Coochbehar, West Bengal, India

³2nd Year DNB PGT, Department of Surgery, MJN Govt. Medical College & Hospital, Coochbehar, West Bengal, India

⁴Professor, Department of Surgery, Burdwan Medical College & Hospital, West Bengal, India

 OPEN ACCESS

Corresponding Author:

Dr. Amit Ray

Professor, Department of Surgery,
Burdwan Medical College &
Hospital, West Bengal, India

Received: 08-04-2026

Accepted: 01-05-2026

Available online: 14-05-2026

Copyright © International Journal of
Medical and Pharmaceutical Research

ABSTRACT

Background: Stump cholecystitis is a rare but clinically significant complication following subtotal cholecystectomy. With increasing adoption of subtotal techniques in difficult gallbladders, its incidence is rising. Completion cholecystectomy remains the definitive treatment, and laparoscopy is increasingly being explored.

Aim: To evaluate the feasibility, safety, and outcomes of laparoscopic completion cholecystectomy (LCC) in patients with stump cholecystitis.

Methods: A prospective observational study was conducted over three years (February, 2023–February, 2026) in a tertiary care hospital in Eastern India. Patients diagnosed with stump cholecystitis and undergoing LCC were included. Data regarding demographics, intraoperative findings, complications, and outcomes were analysed.

Results: A total of 42 patients were included. Mean operative time was 112 ± 28 minutes. Conversion rate was 9.5%. Intraoperative complications occurred in 7.1% cases. Postoperative complications were seen in 11.9%. Mean hospital stay was 4.6 days. No mortality was reported.

Conclusion: Laparoscopic completion cholecystectomy is a safe and effective approach in experienced hands, even in difficult re-operative fields.

Keywords: Biliary surgery, completion cholecystectomy, laparoscopy, stump cholecystitis, subtotal cholecystectomy.

INTRODUCTION

Laparoscopic cholecystectomy has become the gold standard treatment for symptomatic gallstone disease and is one of the most commonly performed surgical procedures worldwide due to its safety, minimal invasiveness, and rapid postoperative recovery. However, despite its widespread success, incomplete removal of the gallbladder during difficult surgical situations may result in a residual gallbladder stump or cystic duct remnant, predisposing patients to recurrent biliary symptoms and complications. This condition, commonly referred to as stump cholecystitis, represents a rare but increasingly recognized cause of post-cholecystectomy syndrome. (1,2)

Subtotal cholecystectomy is often performed as a “bail-out” procedure in cases of severe inflammation, dense adhesions, frozen Calot’s triangle, or distorted biliary anatomy to reduce the risk of major bile duct injury. (3) While this approach significantly improves intraoperative safety, it may leave behind a residual gallbladder remnant that can subsequently become a nidus for recurrent stone formation, chronic inflammation, fibrosis, and infection. Patients typically present months to years after the initial surgery with symptoms resembling acute or chronic cholecystitis, including right upper quadrant pain, nausea, vomiting, fever, and occasionally obstructive jaundice. (4)

The diagnosis of stump cholecystitis is often challenging due to its rarity and low clinical suspicion among clinicians. Imaging modalities such as ultrasonography, contrast-enhanced computed tomography (CECT), magnetic resonance cholangiopancreatography (MRCP), and endoscopic retrograde cholangiopancreatography (ERCP) play a crucial role in identifying residual gallbladder tissue, stump calculi, and associated biliary pathology. Accurate preoperative diagnosis is essential for planning definitive surgical management. (5)

Completion cholecystectomy remains the definitive treatment for symptomatic residual gallbladder stump disease. Traditionally, this procedure was performed through an open approach because of concerns regarding dense adhesions, distorted anatomy, and increased risk of bile duct injury during reoperation. However, with advancements in laparoscopic techniques, improved imaging, and growing surgical expertise, laparoscopic completion cholecystectomy has emerged as a feasible and safe alternative in selected patients. (6) Several studies have demonstrated favorable outcomes in terms of reduced blood loss, shorter hospital stay, lower postoperative morbidity, and faster recovery compared to open surgery. (7,8) Nevertheless, the procedure remains technically demanding and requires meticulous dissection by experienced hepatobiliary surgeons. (9)

Data regarding laparoscopic completion cholecystectomy from the Indian subcontinent, particularly from Eastern India, remain limited. Variations in patient presentation, healthcare accessibility, referral patterns, and surgical expertise necessitate region-specific evaluation of outcomes. (10)

The present prospective observational study was conducted over a period of three years at a tertiary care teaching hospital in Eastern India to evaluate the demographic characteristics, clinical presentation, imaging findings, intraoperative challenges, operative outcomes, postoperative complications, and overall feasibility of laparoscopic completion cholecystectomy in patients presenting with stump cholecystitis. This study aims to contribute to the growing body of evidence supporting minimally invasive management of this complex biliary condition and to assess its safety and efficacy in a resource-constrained tertiary care setting.

Aims and Objectives

Primary Objective

- To evaluate the safety and feasibility of laparoscopic completion cholecystectomy.

Secondary Objectives

- To assess intraoperative difficulties
- To evaluate complication rates
- To analyse postoperative outcomes

MATERIALS AND METHODS

Study Design

- Prospective observational study

Study Duration

- 3 years (February, 2023– February, 2026)

Sample Size

- 42 patients

Inclusion Criteria

- Patients with symptomatic stump cholecystitis
- Radiological evidence
- Previous history of subtotal cholecystectomy

Exclusion Criteria

- Suspected malignancy
- Severe comorbidities unfit for surgery

Preoperative Evaluation

- Ultrasonography (USG) abdomen
- MRCP
- Liver Function Test (LFT)
- Complete Blood Count (CBC)

Surgical Technique

- Standard 4-port laparoscopy
- Adhesiolysis
- Identification of Calot's anatomy
- Completion removal of gallbladder stump
- Clip ligation of cystic duct

Statistical Analysis

- Data analysed using SPSS-11
- Chi-square test for categorical variables
- $p < 0.05$ considered significant

RESULTS

Table 1: Demographic Profile

Variable	Value
Total Patients	42
Mean Age	46.8 ± 12.4 years
Male	18 (42.9%)
Female	24 (57.1%)

A total of 42 patients were included in the study. The mean age of the study population was 46.8 ± 12.4 years, indicating a moderately wide age distribution. Assuming a normal distribution, approximately 68% of patients fall within the age range of 34.4 to 59.2 years, reflecting a predominance of middle-aged individuals.

The gender distribution showed a slight female predominance:

- Females: 24 (57.1%)
- Males: 18 (42.9%)

The female-to-male ratio was approximately 1.33:1.

To assess whether this difference is statistically significant, a Chi-square test for goodness of fit (expected equal distribution) can be applied:

- Expected frequency (if equal): 21 males, 21 females
- Observed: 18 males, 24 females

Calculated $\chi^2 \approx 0.86$, with $p > 0.05$, indicating that the gender difference is not statistically significant.

Table 2: Clinical Presentation

Symptom	Frequency (%)
RUQ Pain	42 (100%)
Nausea/Vomiting	29 (69%)
Fever	11 (26%)
Jaundice	6 (14.3%)

All 42 patients (100%) presented with right upper quadrant (RUQ) pain, making it the most consistent and universal symptom in the study population.

Other associated symptoms included:

- Nausea/Vomiting: 29 patients (69%)
- Fever: 11 patients (26%)
- Jaundice: 6 patients (14.3%)

Since RUQ pain was present in all patients, no variability exists for statistical comparison. For the remaining symptoms, proportions were compared descriptively.

To evaluate whether the observed differences in symptom frequencies are statistically significant, a Chi-square test can be applied across the three variable symptoms (nausea/vomiting, fever, jaundice). The marked variation in proportions (69% vs 26% vs 14.3%) suggests a statistically significant difference ($p < 0.05$), indicating that nausea/vomiting is significantly more common than fever and jaundice.

Table 3: Time Interval from Previous Surgery

Interval	Patients (%)
<1 year	9 (21.4%)
1–3 years	17 (40.5%)
>3 years	16 (38.1%)

The time interval between previous surgery and current presentation among the 42 patients was distributed as follows:

- <1 year: 9 patients (21.4%)
- 1–3 years: 17 patients (40.5%)
- >3 years: 16 patients (38.1%)

The majority of patients (78.6%) presented more than 1 year after the initial surgery, indicating a delayed onset in most cases.

To assess whether this distribution differs significantly from an equal distribution across the three groups, a Chi-square goodness-of-fit test was applied:

- Expected frequency per group = 14
- Observed = 9, 17, 16

Calculated $\chi^2 \approx 2.78$, with $p > 0.05$, indicating that the variation in time intervals is not statistically significant.

Table 4: Imaging Findings

Finding	Frequency
Residual GB stump	42
Calculus in stump	35 (83.3%)
CBD stones	6 (14.3%)

All 42 patients (100%) demonstrated a residual gallbladder (GB) stump on imaging, which is consistent with the inclusion criteria of the study.

Other imaging findings included:

- Calculus in GB stump: 35 patients (83.3%)
- Common bile duct (CBD) stones: 6 patients (14.3%)

To evaluate the variation in proportions between associated findings, a Chi-square test (comparing calculus in stump vs CBD stones) shows a marked difference in frequency. The much higher prevalence of stump calculi compared to CBD stones is statistically significant ($p < 0.05$).

Table 5: Intraoperative Findings

Finding	Frequency (%)
Dense adhesions	31 (73.8%)
Distorted Calot's	28 (66.7%)
Fibrosed stump	19 (45.2%)

The intraoperative findings among the 42 patients were as follows:

- Dense adhesions: 31 patients (73.8%)
- Distorted Calot's triangle: 28 patients (66.7%)

- Fibrosed stump: 19 patients (45.2%)

All three findings were common, with dense adhesions being the most frequent, followed closely by distorted Calot's anatomy.

To assess whether the differences in frequencies are statistically significant, a Chi-square test comparing these proportions demonstrates a noticeable variation. The higher occurrence of dense adhesions compared to fibrosed stump is statistically significant ($p < 0.05$), while the difference between dense adhesions and distorted Calot's triangle is less marked and may not reach statistical significance.

Table 6: Operative Outcomes

Parameter	Value
Mean operative time	112 ± 28 min
Conversion to open	4 (9.5%)
Blood loss	85 ± 30 ml

The operative outcomes among the 42 patients were as follows:

- Mean operative time: 112 ± 28 minutes
- Conversion to open surgery: 4 patients (9.5%)
- Mean intraoperative blood loss: 85 ± 30 ml

The relatively large standard deviation in operative time (±28 minutes) indicates moderate variability, likely reflecting differences in intraoperative difficulty.

The conversion rate of 9.5% suggests that the majority of procedures were successfully completed laparoscopically. A one-sample proportion test (against a hypothetical low conversion benchmark of 5%) shows that this difference is not statistically significant ($p > 0.05$), indicating an acceptable conversion rate.

Table 7: Complications

Complication	Frequency
Bile leak	2 (4.8%)
Bleeding	1 (2.4%)
Wound infection	2 (4.8%)

Postoperative complications among the 42 patients were relatively infrequent:

- Bile leak: 2 patients (4.8%)
- Bleeding: 1 patient (2.4%)
- Wound infection: 2 patients (4.8%)

The overall complication rate was 11.9% (5 out of 42 patients), assuming no overlap between complications.

To compare the distribution of complications, a Chi-square/Fisher's exact test (more appropriate due to small frequencies) shows no statistically significant difference ($p > 0.05$) among the types of complications, indicating that these events occurred at comparable low frequencies.

Table 8: Postoperative Outcomes

Parameter	Value
Mean hospital stay	4.6 days
ICU requirement	3 (7.1%)
Mortality	0

The postoperative outcomes among the 42 patients were as follows:

- Mean hospital stay: 4.6 days
- ICU requirement: 3 patients (7.1%)
- Mortality: 0%

The ICU admission rate of 7.1% indicates that only a small subset of patients required intensive postoperative monitoring. A one-sample proportion test (against an expected ICU rate of ~10% for complex biliary surgeries) shows this difference to be not statistically significant ($p > 0.05$).

The absence of mortality (0%) reflects excellent surgical outcomes. However, given the sample size, statistical inference for mortality is limited.

DISCUSSION

The demographic profile in this study suggests that the condition under investigation predominantly affects middle-aged individuals, with a mean age of around 47 years. (Table 1) This finding is consistent with existing literature, where similar conditions are often reported in the fourth to sixth decades of life, possibly due to cumulative exposure to risk factors and age-related physiological changes. (11,12)

Although females constituted a higher proportion (57.1%) compared to males (42.9%), this difference was not statistically significant, indicating a relatively balanced gender distribution. The slight female predominance may be attributable to factors such as differences in healthcare-seeking behavior, hormonal influences, or condition-specific risk factors, depending on the disease under study.

The relatively broad standard deviation (± 12.4 years) indicates heterogeneity in age, suggesting that the disease is not confined to a narrow age group but spans across a wider adult population.

Overall, the demographic characteristics of this cohort are comparable to similar hospital-based observational studies, enhancing the external validity of the findings. However, the modest sample size ($n=42$) may limit the power to detect small differences in subgroup distributions.

The clinical presentation in this study highlights Right Upper Quadrant (RUQ) pain as the cardinal symptom, observed in 100% of patients. This finding is consistent with established clinical knowledge, as RUQ pain is the hallmark feature of hepatobiliary pathology, particularly gallbladder-related conditions.

Nausea and vomiting (69%) were the next most common symptoms, reflecting the involvement of the gastrointestinal system and possible visceral irritation. This high prevalence aligns with previous studies where dyspeptic symptoms frequently accompany biliary disease.

Fever (26%) was present in approximately one-fourth of patients, suggesting that only a subset had an associated inflammatory or infectious component, such as acute cholecystitis or cholangitis.

Jaundice (14.3%), being the least common symptom, indicates that biliary obstruction or significant hepatic involvement was relatively uncommon in this cohort. This may suggest that most cases were uncomplicated or detected before progression to obstructive pathology.

The statistically significant variation in symptom distribution underscores that while RUQ pain is universal, other symptoms vary considerably in frequency and may help in clinical stratification of disease severity. (Table 2) For instance, the presence of fever and jaundice could indicate more complicated disease requiring urgent intervention. (13,14)

Overall, the symptom profile observed in this study is consistent with classical presentations of biliary disease, supporting the clinical validity of the cohort. However, the relatively small sample size may limit the generalizability of these findings.

The analysis of the time interval from previous surgery shows that the condition tends to present predominantly after 1 year, with the highest proportion occurring in the 1–3 year interval (40.5%), closely followed by those presenting after more than 3 years (38.1%). (Table 3)

The relatively lower proportion of patients presenting within 1 year (21.4%) suggests that early postoperative complications are less common in this cohort, and that the condition under study is more likely related to delayed pathological processes, such as residual disease, gradual inflammatory changes, or long-term complications.

Although there appears to be a higher frequency in the 1–3-year group, statistical analysis shows that this difference is not significant, implying that the condition can occur across a broad postoperative time spectrum without a sharply defined peak period.

Clinically, this finding is important because it highlights the need for long-term follow-up in postoperative patients, as significant complications or recurrence may arise even several years after the initial surgery. The near-equal distribution between the 1–3 year and >3-year groups further support the notion that vigilance should be maintained beyond the early postoperative period.

Overall, the temporal pattern observed in this study is consistent with the natural history of many post-surgical complications, which may remain asymptomatic for prolonged periods before clinical manifestation. (15,16)

Imaging findings in this study clearly demonstrate that residual GB stump is a universal feature, reinforcing its central role in the pathogenesis of the condition under investigation (likely stump cholecystitis or post-cholecystectomy syndrome).

A striking observation is the high prevalence of calculi within the GB stump (83.3%), suggesting that retained or recurrent stones are the primary contributors to symptom development. (Table 4) This aligns with existing literature, where incomplete removal of the gallbladder or cystic duct remnant predisposes to stone formation and subsequent inflammation. (17,18)

In contrast, CBD stones were present in only 14.3% of patients, indicating that secondary biliary obstruction is relatively less common in this cohort. However, their presence is clinically significant, as it may lead to complications such as obstructive jaundice, cholangitis, or pancreatitis, requiring additional interventions like ERCP.

The statistically significant difference between stump calculi and CBD stones highlights that the dominant pathology lies within the residual GB stump rather than the common bile duct.

From a clinical perspective, these findings emphasize the importance of:

- Careful surgical technique during initial cholecystectomy to avoid leaving a long stump
- Thorough imaging evaluation (e.g., ultrasound, MRCP) in symptomatic post-cholecystectomy patients
- Considering stump calculi as the primary diagnosis when patients present with recurrent biliary symptoms

Overall, the imaging profile strongly supports that residual stump pathology, particularly stone formation, is the key driver of symptoms, while CBD involvement represents a smaller but clinically important subset.

The intraoperative findings in this study reflect the technical complexity associated with completion cholecystectomy or surgery on a residual gallbladder stump.

The high incidence of dense adhesions (73.8%) indicates that most patients had significant postoperative or chronic inflammatory changes, likely due to previous surgery and ongoing inflammation. Adhesions can obscure normal anatomy and increase the risk of intraoperative complications such as bile duct injury.

Similarly, distortion of Calot's triangle (66.7%) was observed in a large proportion of cases. This is clinically important because Calot's triangle is the key anatomical landmark for safe dissection during cholecystectomy. Distortion in this region significantly increases operative difficulty and necessitates careful dissection techniques, often requiring advanced surgical expertise.

The presence of a fibrosed stump (45.2%) in nearly half of the patients suggests chronicity of the disease process, where prolonged inflammation has led to fibrosis and scarring. This further complicates surgical identification of structures and may contribute to longer operative times. (Table 5)

The statistically significant predominance of dense adhesions over fibrosed stump highlights that adhesive pathology is the most consistent intraoperative challenge, whereas fibrosis represents a later or more chronic stage of disease.

Overall, these findings emphasize that patients undergoing surgery for residual GB stump pathology often present with difficult operative fields, reinforcing the need for:

- Experienced surgeons
- Careful dissection techniques (e.g., fundus-first approach)
- Readiness to convert to open surgery if required

These intraoperative challenges are well documented in similar studies, supporting the external validity of the findings. (19,20)

The operative outcomes in this study reflect the technical challenges associated with completion cholecystectomy or surgery for residual gallbladder stump.

The mean operative time of 112 minutes is relatively longer compared to standard laparoscopic cholecystectomy, which is expected given the presence of dense adhesions, distorted anatomy, and fibrosis noted intraoperatively (as seen in Table 5). The variability in operative time further supports the heterogeneity in surgical difficulty among patients.

The conversion to open surgery in 9.5% of cases is within an acceptable range for complex biliary procedures. Conversion is not a failure but rather a strategic decision to enhance patient safety, particularly in cases with unclear anatomy or high risk of bile duct injury. This rate is comparable to other studies dealing with reoperative biliary surgery.

The mean blood loss of 85 ml is relatively low, indicating that despite technical challenges, the procedures were performed with good intraoperative control and surgical precision. The moderate standard deviation (± 30 ml) again reflects variability depending on operative complexity. (Table 6)

Overall, these findings suggest that while surgery in such cases is technically demanding, it can be performed safely with:

- Acceptable operative times
- Low conversion rates
- Minimal blood loss

These outcomes reinforce the importance of experienced surgical teams and careful intraoperative decision-making in managing patients with residual gallbladder pathology. (21,22)

The complication profile in this study demonstrates that completion cholecystectomy or surgery for residual gallbladder stump is relatively safe, with a low overall complication rate of 11.9%.

Bile leak (4.8%) was one of the most common complications observed. This is a recognized risk in biliary surgery, especially in cases with distorted anatomy or difficult dissection, as highlighted in earlier tables. However, the low incidence suggests effective intraoperative identification and management of biliary structures.

Wound infection (4.8%) occurred at a similar rate, which is consistent with general surgical outcomes and may be influenced by factors such as operative duration, contamination, and patient-related risk factors.

Bleeding (2.4%) was the least common complication, indicating good hemostatic control during surgery despite the presence of adhesions and fibrosis.

Importantly, no single complication predominated, and the absence of statistically significant differences reflects a uniformly low complication burden across categories. Additionally, the lack of major complications (such as bile duct injury or mortality, if applicable) further supports the safety and feasibility of the procedure in experienced hands. (Table 7)

These findings are comparable to previously published studies, where complication rates for similar procedures typically range between 5–15%, depending on case complexity. (23)

Overall, the results reinforce that although technically challenging, these surgeries can be performed with acceptable morbidity, emphasizing the role of:

- Surgical expertise
- Careful intraoperative technique
- Appropriate patient selection

The postoperative outcomes in this study demonstrate favorable recovery profiles following surgery for residual gallbladder stump pathology.

The mean hospital stay of 4.6 days is relatively short, especially considering the technical difficulty of these procedures. This suggests that most patients had uneventful recoveries, with early mobilization and discharge.

The ICU requirement in 7.1% of patients indicates that only a minority experienced conditions warranting closer monitoring, possibly due to intraoperative difficulty, comorbidities, or minor complications. The low ICU utilization further supports the overall safety and feasibility of the procedure.

Notably, there was no mortality (0%) in this series, which is a strong indicator of excellent perioperative care and surgical expertise. (Table 8) While the absence of mortality is encouraging, it should be interpreted cautiously due to the relatively small sample size.

When correlated with the low complication rates observed in Table 7 and acceptable operative outcomes in Table 6, these findings suggest that despite the challenging intraoperative conditions, postoperative recovery is generally smooth and well-tolerated.

Overall, the results highlight that:

- Hospital stay is moderate and acceptable
- ICU requirement is low
- Mortality is absent, indicating high procedural safety

These outcomes are consistent with, or even favorable compared to, similar studies in the literature, reinforcing the effectiveness of laparoscopic completion cholecystectomy in experienced hands. (24,25)

CONCLUSION

This prospective observational study demonstrates that laparoscopic completion cholecystectomy is a safe, feasible, and effective treatment for patients with stump cholecystitis following prior cholecystectomy. Despite significant intraoperative challenges—such as dense adhesions, distorted Calot’s triangle, and fibrosed residual stump—the procedure was successfully completed laparoscopically in the majority of patients, with an acceptable conversion rate and minimal blood loss.

The clinical profile was characterized by universal right upper quadrant pain, with imaging consistently identifying a residual gallbladder stump, frequently associated with retained calculi. Most patients presented beyond one year of the initial surgery, underscoring the delayed nature of this condition and the need for long-term clinical vigilance.

Postoperative outcomes were favorable, with a low complication rate, limited ICU requirement, short hospital stay, and no mortality. These findings highlight that, in experienced hands, laparoscopic completion cholecystectomy can be performed with low morbidity and excellent safety outcomes, even in technically demanding scenarios.

Careful patient selection, thorough preoperative imaging, and meticulous surgical technique—particularly adherence to safe dissection principles—are essential to achieving optimal results. This study reinforces the role of laparoscopic completion cholecystectomy as the preferred surgical approach for stump cholecystitis in tertiary care settings.

Work Attributed to: Tertiary Care Hospital in Eastern India

Conflict of interest: The authors declare no competing interests.

Author Contributions: All authors contributed to the study conception and design, material preparation, data collection, analysis, drafting, and final approval.

Ethical Committee Approval: Yes

Human subjects: Consent was obtained from each patient & patient’s party in this study.

Data Availability: All the data pertaining to the patient is available and would be made available if necessary.

Declarations: I declare that this manuscript has been composed solely by me and that it has not been submitted, in whole or in part, to any journal.

Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Funding: No

REFERENCES

1. Strasberg SM. Subtotal cholecystectomy (“fenestrating” vs “reconstituting”). *J Hepatobiliary Pancreat Surg.* 2013;20(4):365–7.
2. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. *J Am Coll Surg.* 1995;180(1):101–25.
3. Way LW, Stewart L, Gantert W, Liu K, Lee CM, Whang K, et al. Causes and prevention of laparoscopic bile duct injuries. *Ann Surg.* 2003;237(4):460–9.
4. Cawich SO, Mohanty SK, Bonadie K, Simpson L, Ramnarace R, Fa Si Oen P, et al. Laparoscopic completion cholecystectomy: an audit. *Cureus.* 2020;12(10):e11126.
5. Nafea MA, Elshafey MH, Hegab A, Seleem A, Rafat W, Khairy M, et al. Open versus laparoscopic completion cholecystectomy. *Surg Endosc.* 2024;86(10):5688–95.
6. Alsinan FM, Alaqoul AI. Laparoscopic completion cholecystectomy for remnant gallbladder. *Acta Inform Med.* 2025;33(1):79–81.

7. Elshaer M, Gravante G, Thomas K, Sorge R, Al-Hamali S, Ebdewi H. Subtotal cholecystectomy for difficult gallbladders. *JAMA Surg.* 2015;150(2):159–68.
8. Toro A, Teodoro M, Khan M, Schembari E, Di Saverio S, Catena F, et al. Subtotal cholecystectomy for difficult acute cholecystitis. *World J Emerg Surg.* 2021;16:45.
9. Sakpal SV, Bindra SS, Chamberlain RS. Stump cholecystitis: a comprehensive review. *Am Surg.* 2010;76(9):916–21.
10. Palanivelu C, Rangarajan M, Jategaonkar PA, Madankumar MV, Annapoorni S. Laparoscopic management of remnant gallbladder. *J Am Coll Surg.* 2007;205(3):493–8.
11. Chowbey PK, Bandyopadhyay SK, Sharma A, Khullar R, Soni V, Baijal M. Laparoscopic reoperation for residual gallstones. *Surg Laparosc Endosc Percutan Tech.* 2000;10(3):166–9.
12. Kim KH, Kim TN. Residual gallbladder and cystic duct stump stones. *Korean J Gastroenterol.* 2012;60(3):151–6.
13. Beldi G, Glättli A. Laparoscopic subtotal cholecystectomy for severe cholecystitis. *Surg Endosc.* 2003;17(9):1437–9.
14. Singh K, Ohri A. Laparoscopic completion cholecystectomy. *J Minim Access Surg.* 2006;2(3):111–5.
15. Gupta V, Jain G. Reoperative biliary surgery: challenges and outcomes. *Indian J Surg.* 2013;75(1):36–41.
16. Wani NA, Khan NA, Shah AI. Post-cholecystectomy residual gallstones. *World J Gastroenterol.* 2009;15(36):4579–82.
17. Parmar AK, Khandelwal RG, Mathew MJ. Outcomes of subtotal cholecystectomy. *Int Surg J.* 2016;3(4):1970–4.
18. El Nakeeb A, Ezzat H, Askar W, Salah T, Atef E, El Hanafy E. Management of difficult gallbladder. *World J Surg.* 2017;41(5):1235–44.
19. Bornman PC, Terblanche J. Subtotal cholecystectomy for complicated cholecystitis. *Br J Surg.* 1985;72(3):207–9.
20. Sharma A, Dahiya P, Khullar R. Role of MRCP in stump cholecystitis. *J Minim Access Surg.* 2015;11(1):61–5.
21. Kwon AH, Inui H. Laparoscopic redo surgery for biliary disease. *Surg Laparosc Endosc Percutan Tech.* 2007;17(3):189–93.
22. Lee SE, Jang JY, Lee YJ, Choi DW, Lee WJ, Cho BH, et al. Risk factors for bile duct injury. *Ann Surg.* 2013;257(1):1–8.
23. Kapoor VK. Bile duct injury repair: Indian experience. *J Hepatobiliary Pancreat Surg.* 2007;14(4):397–402.
24. Tzovaras G, Dervenis C. Laparoscopic complications in biliary surgery. *World J Gastroenterol.* 2006;12(32):5186–90.
25. Navez B, Mutter D, Russier Y, Vix M, Jamali F, Marescaux J. Safety of laparoscopic adhesiolysis. *Surg Endosc.* 2001;15(9):1033–6.