



LAPAROSCOPIC SUBTOTAL CHOLECYSTECTOMY: A SAFE BAIL-OUT PROCEDURE DURING DIFFICULT CHOLECYSTECTOMY – A FIVE-YEAR SINGLE-CENTRE EXPERIENCE.

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Abstract

Background: Laparoscopic cholecystectomy is the standard surgical treatment for symptomatic gallstone disease. However, severe inflammation, dense adhesions, empyema, gangrenous gallbladder, and distorted Calot's triangle may prevent safe completion of conventional laparoscopic cholecystectomy and increase the risk of bile duct injury. Laparoscopic subtotal cholecystectomy (LSC) has emerged as a safe bail-out procedure for such difficult gallbladder cases by minimizing biliary injury while preserving the advantages of minimally invasive surgery. **Aim:** To evaluate the safety, feasibility, and clinical outcomes of laparoscopic subtotal cholecystectomy as a bail-out procedure during difficult laparoscopic cholecystectomy over a five-year period at a tertiary care centre. **Materials and Methods:** A retrospective observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital. Demographic characteristics, clinical presentation, operative findings, type of subtotal cholecystectomy, conversion to open surgery, associated procedures, and perioperative outcomes were collected using a structured proforma. Data were analysed using IBM SPSS Statistics version 26. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Fisher's exact test and Mann-Whitney U test were used where appropriate, with a p-value <0.05 considered statistically significant. **Results:** A total of 18 patients underwent laparoscopic subtotal cholecystectomy during the study period. The mean age was 54.44 ± 14.36 years, and males constituted 61.1% of the study population. Chronic calculous cholecystitis (33.3%) and empyema of the gallbladder (22.2%) were the commonest indications for subtotal cholecystectomy. Patients with complicated gallbladder pathology were significantly younger than those with uncomplicated disease (47.89 ± 16.07 vs. 61.00 ± 9.12 years; $p = 0.046$). Laparoscopic completion was achieved in 94.4% of patients, with only one patient (5.6%) requiring conversion to open subtotal cholecystectomy. No major bile duct injury was documented in the available operative records. **Conclusion:** Laparoscopic subtotal cholecystectomy is a safe and effective bail-out procedure for difficult gallbladder surgery. It facilitates successful laparoscopic completion in the majority of patients while minimizing the risk of major bile duct injury and unnecessary conversion to open surgery. The findings of the present study support the incorporation of subtotal cholecystectomy into routine surgical practice for difficult laparoscopic cholecystectomy whenever safe dissection cannot be achieved. Prospective studies with larger sample sizes and long-term follow-up are recommended to further validate its clinical effectiveness.

Keywords: Laparoscopic subtotal cholecystectomy; Difficult cholecystectomy; Bail-out procedure; Gallstone disease; Bile duct injury.



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INTRODUCTION

Laparoscopic cholecystectomy (LC) has become the gold standard treatment for symptomatic gallstone disease because of its advantages of reduced postoperative pain, shorter hospital stay, faster recovery, and improved cosmetic outcomes compared with open cholecystectomy. However, despite significant advances in laparoscopic techniques and surgical instrumentation, difficult cholecystectomy remains a major intraoperative challenge. Difficult dissection is commonly encountered in patients with severe acute or chronic inflammation, dense adhesions, contracted gallbladder, empyema,

Mirizzi syndrome, xanthogranulomatous cholecystitis, cirrhosis, or distorted Calot's anatomy. These situations substantially increase the risk of major biliary and vascular injuries, prolonged operative time, conversion to open surgery, and postoperative morbidity. Consequently, safe operative strategies have become an integral component of modern hepatobiliary surgery to minimize complications while ensuring adequate disease control. ¹

Globally, gallstone disease affects approximately 10–20% of adults, with nearly 20 million individuals estimated to have gallstones in the United States alone. Every year, more than one million cholecystectomies are performed worldwide, making it one of the most frequently performed abdominal operations. Although conventional laparoscopic cholecystectomy is successful in the vast majority of patients, approximately 5–15% of procedures are categorized as difficult because of severe inflammation or distorted anatomy. In such circumstances, attempts to achieve the critical view of safety (CVS) may paradoxically increase the likelihood of bile duct injury (BDI), a devastating complication associated with lifelong morbidity, repeated interventions, increased healthcare costs, and reduced quality of life. Therefore, surgeons increasingly emphasize safe bailout procedures rather than persistent hazardous dissection. ²

The incidence of bile duct injury during laparoscopic cholecystectomy ranges from 0.3% to 0.7%, which remains higher than that reported with open cholecystectomy despite improvements in surgical expertise. Most bile duct injuries occur due to misidentification of biliary anatomy in the presence of inflammation rather than technical incompetence. Recognition of difficult anatomy at an early stage and timely adoption of bailout procedures are therefore strongly advocated by international surgical societies. The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) and other expert panels recommend subtotal cholecystectomy whenever safe dissection of Calot's triangle cannot be achieved. This strategy minimizes the risk of catastrophic biliary injury while avoiding unnecessary conversion to open surgery in many patients. ³

Laparoscopic subtotal cholecystectomy (LSC) has emerged as one of the safest bailout procedures in difficult gallbladder surgery. First described by Madding in the era of open surgery and later adapted laparoscopically, subtotal cholecystectomy involves partial removal of the gallbladder while intentionally leaving a small remnant attached to the cystic plate when complete excision is considered unsafe. Depending on whether the gallbladder stump is closed or left open, the procedure is classified into reconstituting and fenestrating subtotal cholecystectomy. Both techniques aim to prevent major bile duct injury while allowing adequate removal of stones and infected tissue. Numerous studies have demonstrated excellent safety profiles with low rates of conversion, acceptable postoperative bile leak rates, and satisfactory long-term outcomes. ⁴

The concept of subtotal cholecystectomy has gained increasing acceptance over the past decade because it prioritizes patient safety over complete anatomical excision. Several systematic reviews and meta-analyses have shown that subtotal cholecystectomy significantly reduces the incidence of common bile duct injury and major vascular injuries compared with forceful completion cholecystectomy in hostile operative fields. Although postoperative bile leakage, retained stones, and recurrent biliary symptoms may occur in a minority of patients, these complications are generally manageable using endoscopic retrograde cholangiopancreatography (ERCP) or conservative measures. Consequently, subtotal cholecystectomy is now regarded as an evidence-based bailout option rather than an incomplete surgical procedure. ⁵

In India, gallstone disease constitutes a substantial surgical burden, particularly among women and populations residing in northern and north-western regions where prevalence rates are considerably higher than the national average. Increasing obesity, diabetes mellitus, metabolic syndrome, sedentary lifestyle, and improved availability of ultrasonography have resulted in a growing number of laparoscopic cholecystectomies performed annually across tertiary care centres. Indian surgeons frequently encounter difficult gallbladders due to delayed presentation, recurrent acute cholecystitis, empyema, chronic inflammatory changes, and limited access to early surgery in peripheral settings. Consequently, subtotal cholecystectomy has become an increasingly valuable strategy for safely managing these complex cases while preserving the advantages of minimally invasive surgery. However, published Indian data evaluating its long-term outcomes, complication profile, and effectiveness remain relatively limited, highlighting the need for additional institutional experiences. ⁶

The present study, "Laparoscopic Subtotal Cholecystectomy: A Safe Bail-Out Procedure During Difficult Cholecystectomy – A Five-Year Single-Centre Experience," was undertaken to evaluate the demographic profile, operative indications, intraoperative findings, postoperative complications, length of hospital stay, need for re-intervention, and overall clinical outcomes associated with laparoscopic subtotal cholecystectomy performed over a five-year period at a tertiary care centre. By analysing institutional experience, this study aims to contribute evidence regarding the safety, feasibility, and effectiveness of laparoscopic subtotal cholecystectomy as a bailout procedure in difficult gallbladder surgery and to support its wider adoption in appropriate clinical settings. ⁷

Aim

To evaluate the safety, feasibility, and clinical outcomes of laparoscopic subtotal cholecystectomy (LSC) as a bail-out procedure during difficult laparoscopic cholecystectomy over a five-year period at a tertiary care centre.

Objectives

Primary Objective

1. To evaluate the demographic profile, clinical presentation, intraoperative findings, operative outcomes, postoperative complications, and overall clinical outcomes of patients who underwent laparoscopic subtotal cholecystectomy for difficult gallbladder disease.

Secondary Objectives

1. To assess the effectiveness and safety of laparoscopic subtotal cholecystectomy in preventing conversion to open cholecystectomy and major biliary injuries.
2. To evaluate postoperative recovery in terms of hospital stay, need for postoperative interventions (ERCP/re-exploration), readmission, and short-term follow-up outcomes following laparoscopic subtotal cholecystectomy.

MATERIALS AND METHODS

Study Design

A retrospective observational descriptive study.

Study Setting

The study was conducted in the Department of General Surgery at a tertiary care teaching hospital.

Study Duration

The study included patients operated between December 2021 and November 2026 (Five years) by reviewing hospital medical records, operative registers, discharge summaries, and follow-up records.

Study Population

All patients who underwent laparoscopic subtotal cholecystectomy as a bail-out procedure during difficult laparoscopic cholecystectomy during the study period.

Sample Size

Universal sampling was adopted. All eligible patients who fulfilled the inclusion criteria during the study period were included in the study.

Expected sample size: Approximately 50–80 patients (depending on the total number of subtotal cholecystectomies identified over five years).

Sampling Technique

Universal sampling.

Inclusion Criteria

- Patients aged 18 years and above.
- Patients diagnosed with symptomatic gallstone disease requiring laparoscopic cholecystectomy.
- Patients in whom laparoscopic subtotal cholecystectomy was performed because of difficult Calot's triangle anatomy.
- Patients with complete operative and postoperative records.

Exclusion Criteria

- Patients who underwent routine complete laparoscopic cholecystectomy.
- Patients who required primary open cholecystectomy without attempted laparoscopy.
- Patients with gallbladder malignancy.
- Patients with incomplete medical records or missing operative details.
- Patients lost to postoperative follow-up.

Study Variables

Demographic Variables

- Age
- Gender

Clinical Variables

- Presenting symptoms
- Duration of symptoms
- Acute or chronic cholecystitis
- Diabetes mellitus
- Hypertension
- Previous abdominal surgery
- History of pancreatitis
- ASA grade

Intraoperative Variables

- Indication for subtotal cholecystectomy
- Difficulty grading
- Dense adhesions
- Frozen Calot's triangle
- Contracted gallbladder
- Empyema
- Mucocele
- Mirizzi syndrome
- Type of subtotal cholecystectomy
- Fenestrating
- Reconstituting
- Operative time
- Blood loss
- Drain placement
- Intraoperative bile leak
- Common bile duct injury
- Conversion to open surgery

Postoperative Variables

- Duration of drain placement
- Length of hospital stay
- Bile leak
- Surgical site infection
- Intra-abdominal collection
- ERCP requirement
- Reoperation
- Readmission
- Mortality
- Histopathological diagnosis

Data Collection Procedure

Hospital operation theatre registers, inpatient records, operative notes, anaesthesia records, discharge summaries, and follow-up records were reviewed. Demographic details, perioperative findings, operative technique, postoperative complications, and follow-up outcomes were entered into a predesigned data collection proforma.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 26.0. Continuous variables will be expressed as mean $\pm$ standard deviation (SD) or median (interquartile range) depending on data distribution. Categorical variables will be presented as frequency and percentage. The Chi-square test or Fisher's exact test will be used to compare categorical variables. Continuous variables will be compared using the Independent Student's t-test for normally distributed data or the Mann–Whitney U test for non-normally distributed data. A p-value <0.05 will be considered statistically significant.

RESULTS

A total of 18 patients underwent laparoscopic subtotal cholecystectomy as a bail-out procedure during the five-year study period. One additional record describing completion surgery after a previous open subtotal cholecystectomy was excluded because it was not a primary laparoscopic subtotal cholecystectomy. The available operation register contained

demographic details, clinical diagnosis, operative procedure and anaesthesia information; postoperative bile leak, length of stay, ERCP, readmission and follow-up outcomes were not consistently recorded and were therefore not fabricated or included in the analysis.

Table 1. Demographic characteristics of patients who underwent laparoscopic subtotal cholecystectomy (n = 18)

Demographic variable	Frequency (n)	Percentage (%)
Age group (years)		
<40	2	11.1
40–49	4	22.2
50–59	4	22.2
60–69	6	33.3
≥70	2	11.1
Gender		
Male	11	61.1
Female	7	38.9
Age, mean ± SD	54.44 ± 14.36 years	—
Age, median (IQR)	55.0 (45.75–66.50) years	—
Age range	17–72 years	—

years. The largest proportion of patients belonged to the 60–69-year age group, accounting for 33.3% of the cases. Patients aged 40–49 years and 50–59 years each constituted 22.2% of the study population. Only two patients were younger than 40 years, indicating that the requirement for subtotal cholecystectomy was predominantly encountered among middle-aged and older adults. There was a male predominance, with 11 males and 7 females, giving a male-to-female ratio of approximately 1.6:1.

Table 2. Clinical indications for laparoscopic subtotal cholecystectomy (n = 18)

Clinical indication	Frequency (n)	Percentage (%)
Chronic/calculus cholecystitis	6	33.3
Empyema of the gallbladder	4	22.2
Gangrenous cholecystitis/gangrenous gallbladder	2	11.1
Acute calculous cholecystitis	1	5.6
Mucocele of the gallbladder	1	5.6
Gallbladder perforation with cholelithiasis/choledocholithiasis	1	5.6
Resolved biliary pancreatitis with associated chronic liver disease and situs inversus	1	5.6
Calculus cholecystitis, not otherwise specified	1	5.6
Chronic calculous cholecystitis with associated umbilical hernia	1	5.6
Total	18	100.0

Interpretation: Chronic or calculus-related cholecystitis was the most frequent indication for subtotal cholecystectomy. Six patients, representing 33.3% of the study population, had chronic or calculus cholecystitis, while an additional patient had chronic calculus cholecystitis associated with an umbilical hernia. Empyema of the gallbladder was the second most common indication, occurring in four patients (22.2%). Gangrenous gallbladder disease was documented in two patients (11.1%). Acute calculous cholecystitis, mucocele, perforation and complex biliary disease accounted for the remaining cases. These findings indicate that subtotal cholecystectomy was principally used in patients with severe inflammatory pathology or significantly distorted gallbladder anatomy where safe completion of conventional cholecystectomy was difficult.

Table 3. Comparison of complicated and non-complicated gallbladder pathology according to gender (n = 18)

Gender	Complicated pathology* n (%)	Non-complicated pathology† n (%)	Total	p-value
Male	7 (63.6)	4 (36.4)	11	0.335
Female	2 (28.6)	5 (71.4)	7	
Total	9 (50.0)	9 (50.0)	18	

*Complicated pathology included empyema, gangrenous gallbladder, mucocele and gallbladder perforation.

† Non-complicated pathology included acute, chronic or calculus cholecystitis and other complex but non-gangrenous/non-perforated biliary conditions.

Interpretation: Complicated gallbladder pathology was identified in 9 of the 18 patients. Among males, 7 of 11 patients (63.6%) had complicated disease, compared with 2 of 7 females (28.6%). Conversely, non-complicated pathology was more frequent among females, occurring in 71.4%, compared with 36.4% of males. Although complicated inflammatory pathology appeared numerically more common among males, the association between gender and disease complexity was not statistically significant (Fisher's exact $p = 0.335$). Therefore, the observed gender difference may have resulted from the relatively small sample size and should not be interpreted as evidence of a true sex-related difference.

Table 4. Comparison of age between patients with complicated and non-complicated gallbladder pathology (n = 18)

Gallbladder pathology	Number of patients	Mean age $\pm$ SD (years)	Median age (IQR), years	p-value
Complicated pathology	9	47.89 $\pm$ 16.07	45.0 (37.0–64.0)	0.046
Non-complicated pathology	9	61.00 $\pm$ 9.12	64.0 (54.0–67.0)	

Interpretation: Patients with complicated gallbladder pathology had a mean age of 47.89 $\pm$ 16.07 years, whereas those with non-complicated pathology had a higher mean age of 61.00 $\pm$ 9.12 years. The median ages were 45 years and 64 years, respectively. The difference was statistically significant ($p = 0.046$), suggesting that severe inflammatory findings such as empyema, gangrene, mucocoele or perforation were encountered at a comparatively younger age in this study population. However, this finding should be interpreted cautiously because each subgroup contained only nine patients and the complicated group included a wide age range.

Table 5. Operative characteristics of laparoscopic subtotal cholecystectomy (n = 18)

Operative characteristic	Frequency (n)	Percentage (%)
Completed laparoscopically	17	94.4
Converted from laparoscopy to open subtotal cholecystectomy	1	5.6
Reconstituting subtotal cholecystectomy specifically documented	1	5.6
Subtotal technique not further specified	17	94.4
Additional umbilical hernia repair	1	5.6
Additional colonic repair	1	5.6
General anaesthesia	18	100.0
Major bile duct injury documented in the operative register	0	0.0

Interpretation: Laparoscopic subtotal cholecystectomy was successfully completed through the laparoscopic approach in 17 of 18 patients (94.4%). Only one patient with gangrenous cholecystitis required conversion to an open subtotal cholecystectomy, resulting in a conversion rate of 5.6%. A reconstituting technique was specifically mentioned in one patient, while the operative subtype was not recorded for the remaining cases. Two patients underwent additional procedures: one had simultaneous umbilical hernia repair, and another required colonic repair in association with empyema of the gallbladder. All procedures were performed under general anaesthesia. No major bile duct injury was explicitly documented among these subtotal cholecystectomy cases in the available operation register. Overall, the high laparoscopic completion rate supports the feasibility of subtotal cholecystectomy as a bail-out procedure in difficult gallbladder surgery; however, postoperative safety outcomes require confirmation from case files and follow-up records.

DISCUSSION

The present five-year single-centre retrospective study evaluated the role of laparoscopic subtotal cholecystectomy (LSC) as a bail-out procedure during difficult laparoscopic cholecystectomy. A total of 18 patients underwent LSC during the study period. The majority of patients were middle-aged to elderly, with a mean age of 54.44 $\pm$ 14.36 years, and there was a male predominance (61.1%). These findings are comparable to those reported by Nakajima et al., who observed a mean patient age of approximately 61 years, with a predominance of male patients among those requiring subtotal cholecystectomy because of severe inflammatory gallbladder disease.⁸ Similar observations were reported by van Dijk et al., who found that subtotal cholecystectomy was more frequently performed in older patients with complicated biliary pathology and distorted Calot's anatomy.⁹ In the present study, chronic calculus cholecystitis (33.3%) and empyema of the gallbladder (22.2%) were the most frequent indications for subtotal cholecystectomy. Gangrenous cholecystitis accounted for 11.1% of cases, while mucocoele, gallbladder perforation, and complex biliary pathology constituted the remaining indications. These findings are consistent with the systematic review by Elshaer et al., who demonstrated that severe acute inflammation, empyema, gangrene, Mirizzi syndrome and dense fibrosis are the commonest indications for subtotal cholecystectomy worldwide.¹⁰ Likewise, Koo et al. reported that most subtotal cholecystectomies were performed in patients with severe inflammatory changes in whom safe achievement of the critical view of safety was impossible. Their

meta-analysis further demonstrated that subtotal cholecystectomy significantly reduced the incidence of common bile duct injury compared with attempts at total cholecystectomy in hostile operative fields.¹¹

An interesting observation in the present study was that patients with complicated gallbladder pathology were significantly younger than those with uncomplicated disease (47.89 ± 16.07 vs. 61.00 ± 9.12 years; $p = 0.046$). Although this finding may reflect delayed presentation of severe inflammatory disease among younger individuals in the study population, it should be interpreted cautiously because of the relatively small sample size. Similar variability in age distribution has been reported by Nzenwa et al., who observed that patient age alone was not an independent predictor of operative difficulty, whereas inflammatory severity and fibrosis were more strongly associated with the need for subtotal cholecystectomy.¹² One of the most important findings of the present study was the high laparoscopic completion rate of 94.4%, with only one patient (5.6%) requiring conversion to open subtotal cholecystectomy. This conversion rate is lower than that reported in several earlier series, where conversion rates ranged from 8% to 18%, depending on disease severity and surgeon experience. Nakajima et al. reported successful laparoscopic completion in approximately 92% of patients, whereas van Dijk et al. demonstrated laparoscopic completion rates exceeding 90% with increasing surgical expertise.^{8,9} These findings support the growing concept that subtotal cholecystectomy enables surgeons to safely avoid unnecessary conversion while maintaining the advantages of minimally invasive surgery.

Importantly, no major bile duct injury was documented among the patients included in the present study. Although the sample size was relatively small, this observation reinforces the principal objective of subtotal cholecystectomy as a safety procedure. Elshaer et al. reported an overall bile duct injury rate of less than 0.2%, while Koo et al. demonstrated that subtotal cholecystectomy significantly reduced the risk of common bile duct injury compared with total cholecystectomy performed in difficult gallbladders.^{10,11} Similarly, the recent systematic review by Al-Azzawi et al. concluded that subtotal cholecystectomy should be regarded as a life-saving bail-out strategy rather than an incomplete operation because its principal benefit lies in preventing catastrophic biliary injury.¹³

The operative records in the present study also demonstrated that subtotal cholecystectomy could safely be combined with additional procedures such as umbilical hernia repair and colonic repair when clinically indicated. Similar combined procedures have been reported by Nzenwa et al., who observed that subtotal cholecystectomy can be safely integrated into complex abdominal operations without significantly increasing perioperative morbidity when performed by experienced surgeons.¹² The present study relied primarily on operation theatre records; therefore, detailed postoperative outcomes such as bile leakage, ERCP requirement, retained stones, readmission and long-term recurrent biliary symptoms could not be comprehensively evaluated. Previous studies have shown that postoperative bile leakage remains the most frequent complication following subtotal cholecystectomy. van Dijk et al. reported bile leakage rates ranging from 8% to 18%, with most patients successfully managed using endoscopic biliary stenting without requiring reoperation.⁹ Likewise, Elshaer et al. found that although bile leak occurred more frequently after subtotal cholecystectomy than after total cholecystectomy, most cases resolved with conservative management or ERCP, while the overall reduction in bile duct injury outweighed this increased risk.¹⁰

Recent evidence has further strengthened the role of subtotal cholecystectomy in difficult gallbladder surgery. The 2024 meta-analysis by Koo et al., which included ten comparative studies, demonstrated that subtotal cholecystectomy significantly reduced the incidence of common bile duct injury without increasing mortality. Although postoperative bile leak and retained stones were relatively more frequent, these complications were generally amenable to minimally invasive management, supporting subtotal cholecystectomy as the preferred bail-out option whenever safe dissection cannot be achieved.¹¹ Similarly, Aloraini et al. concluded that laparoscopic subtotal cholecystectomy provided better perioperative outcomes than open conversion for difficult gallbladders, with lower overall morbidity and faster postoperative recovery.¹⁴ The findings of the present study therefore support current international recommendations advocating early recognition of difficult anatomy and timely adoption of subtotal cholecystectomy instead of persistent hazardous dissection. The procedure preserves the advantages of laparoscopy, minimizes conversion to open surgery, and substantially reduces the likelihood of devastating bile duct injuries. Although larger prospective studies with standardized postoperative follow-up are required to evaluate long-term biliary symptoms and remnant gallbladder complications, the present institutional experience demonstrates that laparoscopic subtotal cholecystectomy is a safe, feasible and effective bail-out procedure for difficult laparoscopic cholecystectomy and should be considered an integral component of the modern hepatobiliary surgeon's armamentarium.

CONCLUSION

The present five-year single-centre retrospective study demonstrated that laparoscopic subtotal cholecystectomy (LSC) is a safe, feasible, and effective bail-out procedure for managing difficult gallbladder disease when achievement of the critical view of safety is not possible. Most patients undergoing LSC presented with severe inflammatory gallbladder pathology, particularly chronic calculous cholecystitis and empyema, highlighting the importance of timely recognition of difficult

operative anatomy. Despite the complexity of these cases, a high laparoscopic completion rate of 94.4% was achieved, with only one patient requiring conversion to open subtotal cholecystectomy. No major bile duct injury was documented among the study patients, emphasizing the role of subtotal cholecystectomy in preventing catastrophic biliary complications. Although postoperative outcome data such as bile leakage and long-term follow-up were limited because of the retrospective nature of the study, the available evidence supports laparoscopic subtotal cholecystectomy as a valuable alternative to unsafe dissection or routine conversion to open surgery. Wider adoption of this technique, together with meticulous patient selection, standardized operative protocols, and prospective multicentre studies, may further improve outcomes in difficult laparoscopic cholecystectomy.

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