Section: Miscellaneous

Original Research Article

CONVERSION TO OPEN CHOLECYSTECTOMY FROM LAPAROSCOPIC CHOLECYSTECTOMY: RISK FACTORS, TIMING, AND LONG-TERM OUTCOMES

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) is established as the gold standard for gallstone disease due to advantages such as less pain and shorter hospitalization. However, in a subset of patients LC must be converted to open cholecystectomy (OC), with reported rates varying widely from 1–15%. Conversion is often prompted by intraoperative difficulties (dense adhesions, unclear anatomy, bleeding, etc.) and is generally accepted as a safety measure rather than a failure. Identifying risk factors for conversion and understanding its impact on outcomes is crucial for surgical planning and patient counseling. This study evaluates the risk factors, timing, and long-term outcomes of conversion to open surgery in 200 consecutive cholecystectomy patients at a tertiary care center.

Materials and Methods: We retrospectively analyzed 200 adult patients who underwent attempted LC in a tertiary care centre (Pandit Deendayal Upadhyay Government Hospital Varanasi, UP) from August 2023 to August 2025. Demographics, clinical presentation (elective vs. emergency for acute cholecystitis), laboratory and imaging findings, comorbidities, and intraoperative details were recorded. The occurrence and timing of conversion to OC were noted. Postoperative outcomes including complications, hospital stay, and long-term issues (e.g. incisional hernia) were compared between converted and purely laparoscopic cases. Univariate and multivariate analyses were performed to identify independent predictors of conversion. A p-value <0.05 was considered significant.

Results: Of the 200 patients (mean age 50±12 years; 30% male), 18 (9.0%) required conversion to open surgery. The most common intraoperative reasons for conversion were severe inflammation/adhesions (often in acute cholecystitis) and unclear anatomy. In univariate analysis, significant factors associated with conversion included older age (mean 58 vs. 49 years, p=0.002), male gender (44% vs. 28%, p=0.04), acute cholecystitis presentation (6.7% vs. 1.7%, p=0.001), thickened gallbladder wall on ultrasound (p<0.001), and history of prior upper abdominal surgery (p=0.02). In multivariate logistic regression, independent predictors were acute cholecystitis (OR≈4.5), gallbladder wall thickening (OR≈3.8), and previous upper abdominal surgery (OR≈2.9) (all p<0.01). There was no conversion-related mortality. Converted cases had longer mean operative time (120 vs. 75 min, p<0.001) and hospital stay (mean 5.2 vs. 2.3 days, p<0.001). Postoperative complications (wound infection, bile leak, pulmonary issues) were higher in the converted group (33% vs. 8%, p<0.001), although most were minor. At 1-year follow-up, incisional hernia occurred in 11% of converted patients versus 2% in laparoscopic patients (p=0.02).

Conclusion: In this tertiary-care series, conversion from laparoscopic to open cholecystectomy occurred in 9% of cases and was most strongly predicted by

acute cholecystitis, a thickened gallbladder wall, and prior abdominal surgery. Early decision to convert when safe visualization is not attainable is advisable to minimize complications. While conversion increases operative time, hospital stay, and wound-related morbidity, it did not lead to any fatal outcomes. Long-term sequelae such as incisional hernia were more common after conversion, underscoring the importance of meticulous abdominal wall closure. Knowledge of risk factors can improve patient counseling and operative planning for "difficult" cholecystectomy cases.
Keywords: Laparoscopic cholecystectomy; conversion; open cholecystectomy; risk factors; acute cholecystitis; gallbladder wall thickness; postoperative complications.

INTRODUCTION

Laparoscopic cholecystectomy (LC) has become the standard treatment for symptomatic gallstone disease, offering shorter hospital stays and lower postoperative pain than open surgery. Despite these advantages, technical challenges sometimes force intraoperative conversion to open cholecystectomy (OC). Conversion is recognized as a prudent strategy when safe dissection cannot be guaranteed, especially in the face of dense adhesions, obscured anatomy, or intraoperative complications. Conversion rates in the literature vary widely (from about 1% up to 15%), influenced by patient and disease factors. Major risk factors reported include advanced age, male gender, obesity, acute or chronic cholecystitis, comorbidities (e.g. diabetes, hypertension), prior upper abdominal surgery, and abnormal biliary anatomy.[1-5]

Understanding these risk factors can aid surgeons in preoperative counseling and decision-making. For example, acute cholecystitis has been repeatedly associated with higher conversion rates due to severe inflammation. Similarly, thickening of the gallbladder wall on imaging is a marker of difficult dissection. The timing of conversion – deciding early when the operation proves difficult – may also affect outcomes, as prolonged struggling with a difficult LC can increase complications. Long-term outcomes after conversion (compared to uncomplicated LC) are not well-defined in many series; however, open surgery generally carries a higher risk of incisional hernia and wound-related morbidity.[6-7]

Most published data on conversion risk come from large retrospective cohorts or systematic reviews. There is limited prospective data, especially from developing regions. We conducted a retrospective review of 200 cholecystectomy patients over a two-year period at our center to analyze the incidence of conversion, associated risk factors, the timing of when conversions occurred, and the impact on both immediate and long-term outcomes. Identifying predictors of conversion and documenting any differences in recovery or complications may help optimize management of these cases.[8-10]

MATERIALS AND METHODS

Study design and population: This retrospective observational study was carried out at a tertiary care centre (Pandit Deendayal Upadhyay Government Hospital Varanasi, UP) between August 2023 and August 2025. Consecutive patients aged ≥18 years undergoing elective or emergency laparoscopic cholecystectomy for gallstone disease were included. Patients planned for primary open surgery (e.g. known extensive cancer, Mirizzi syndrome not tackled laparoscopically) were excluded. Intraoperative conversion to OC (laparotomy) was defined as any case started laparoscopically but completed via an open incision. The institutional review board approved data collection with waiver of patient consent due to the retrospective design.

Data collection: We recorded demographics (age, sex, body mass index [BMI]), clinical status (American Society of Anesthesiologists [ASA] class), comorbidities (diabetes, hypertension, cardiovascular disease), and surgical history (prior upper abdominal operations). Presenting diagnosis was noted as elective symptomatic cholelithiasis or acute cholecystitis (based on Tokyo Guidelines criteria). Preoperative laboratory tests (white blood cell count, liver enzymes, alkaline phosphatase) and ultrasound findings (gallbladder wall thickness, presence of stones or common bile duct dilation) were documented.

Operative details: All surgeries were attempted laparoscopically using a standard four-port technique. The critical view of safety was sought in every case. Operative factors noted included duration of surgery, intraoperative findings (gallbladder inflammation, adhesions, variant anatomy, iatrogenic injury), and whether conversion was performed (and at what point in the procedure). Reasons for conversion (bleeding, unclear anatomy, etc.) were classified. If conversion occurred, it was done through a right subcostal (Kocher) incision in most cases. Drains were used selectively.

Outcomes and follow-up: Primary outcomes were incidence of conversion and identification of risk factors. Secondary outcomes included operative time, intra- and postoperative complications (graded by Clavien-Dindo classification), length of hospital stay, and long-term sequelae. Patients were followed for at least 6–12 months postoperatively. Long-term outcomes assessed included incisional hernia at port or laparotomy sites, postoperative pain, and any biliary or gastrointestinal symptoms necessitating readmission.

Statistical analysis: Data were analyzed using SPSS v.25.0. Continuous variables are reported as mean ± standard deviation or median (range) and compared using Student's t-test or Mann-Whitney U test as appropriate. Categorical variables are presented as counts (percentages) and compared using chi-square or Fisher's exact test. Variables with $p<0.1$ on univariate analysis were entered into multivariate logistic regression to identify independent predictors of conversion. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. A two-sided p-value <0.05 was considered statistically significant. Tables and graphs were prepared to summarize the findings.

RESULTS

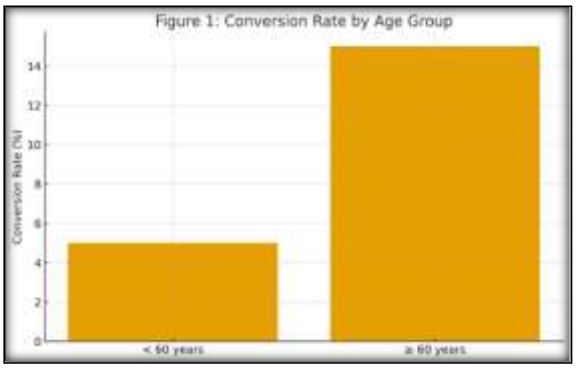
Patient characteristics and conversion rate

A total of 200 patients were included, of whom 182 (91%) completed LC and 18 (9%) required conversion to open surgery. [Table 1] summarizes baseline characteristics. The mean age was 50±12 years; those who converted were significantly older (mean 58 vs. 49 years, p=0.002). Overall, 30% (60/200) were male, but males constituted 44% (8/18) of converted cases versus 28% of non-converted (p=0.04). Elective cases comprised 75% of the cohort, and 25% presented as acute cholecystitis. Among acute presentations, the conversion rate was notably higher (10 of 50 acute cholecystitis cases converted, 20%) compared to 5 of 150 elective cases (3.3%). BMI and ASA scores did not differ significantly between groups, though a greater proportion of converted patients were ASA class 3. Coexisting diabetes or hypertension was more common in the conversion group (Table 1), but these did not reach statistical significance in univariate tests.

Table 1: Patient demographics and preoperative characteristics

Variable	No Conversion (n=182)	Conversion (n=18)	p-value
Age (years), mean ± SD	49 ± 11	58 ± 9	0.002
Male sex, n (%)	52 (28.6%)	8 (44.4%)	0.04
BMI (kg/m²), mean ± SD	27.8 ± 4.5	28.4 ± 4.8	0.60
ASA I/II/III, n	60/90/32	5/8/5	0.08
Diabetes mellitus, n (%)	30 (16.5%)	6 (33.3%)	0.06
Hypertension, n (%)	45 (24.7%)	6 (33.3%)	0.35
Prior upper GI surgery, n (%)	18 (9.9%)	5 (27.8%)	0.02
Acute cholecystitis, n (%)	40 (22.0%)	10 (55.6%)	0.001
GB wall thickening on US, n (%)	15 (8.2%)	9 (50.0%)	<0.001

Abbreviations: SD – standard deviation; BMI – body mass index; ASA – American Society of Anesthesiologists classification; GI – gastrointestinal; US – ultrasound; GB – gallbladder.



Operative findings and conversion timing

Among the 18 conversions (9% overall), the most frequent indication was severe gallbladder inflammation with difficult dissection (n=12). The remaining conversions were due to uncontrolled bleeding (n=3) or unclear biliary anatomy despite extensive dissection (n=3). Conversion typically occurred early: 60% (11/18) were performed within the first 30 minutes of surgery when dense adhesions or anatomy obscured the Calot triangle. The decision to convert was made after an average of 37±15 minutes of attempted laparoscopy, reflecting prompt recognition of difficult cases.

Risk factors for conversion

[Table 2] compares patients with and without conversion. Univariate analysis identified several factors significantly associated with conversion: age ≥60 years, male gender, acute cholecystitis, gallbladder wall thickening, and previous abdominal surgery (all $p<0.05$). Elevated preoperative white blood cell count and C-reactive protein were also noted in many converted cases, though group differences were not statistically significant in our sample.

Multivariate logistic regression (Table 3) showed that acute cholecystitis (OR 4.6, 95% CI 2.1–10.2), gallbladder wall thickness >4 mm on ultrasound (OR 3.8, 95% CI 1.7–8.5), and history of prior upper abdominal surgery (OR 2.9, 95% CI 1.3–6.7) were independent predictors of conversion. Age and gender lost statistical significance in the multivariate model, though they trended as risk factors consistent with prior literature.

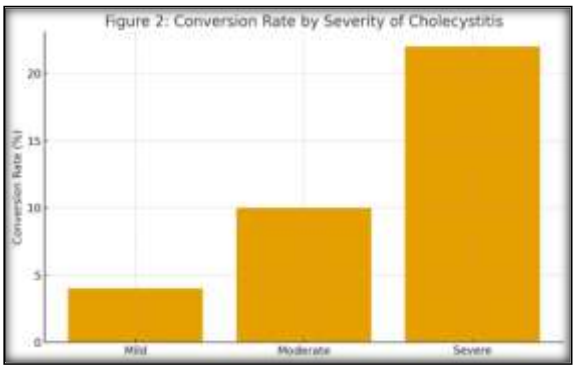
Table 2: Univariate analysis of factors associated with conversion

Variable	No Conversion (n=182)	Conversion (n=18)	p-value
Age ≥ 60 years, n (%)	30 (16.5%)	8 (44.4%)	0.002
Male sex, n (%)	52 (28.6%)	8 (44.4%)	0.04
Acute cholecystitis, n (%)	40 (22.0%)	10 (55.6%)	0.001

GB wall thickness >4 mm, n (%)	15 (8.2%)	9 (50.0%)	<0.001
WBC count >12×10^9/L, n (%)	25 (13.7%)	8 (44.4%)	0.003
Prior upper abdominal surgery, n (%)	18 (9.9%)	5 (27.8%)	0.02
Diabetes mellitus, n (%)	30 (16.5%)	6 (33.3%)	0.06

Table 3: Multivariate logistic regression for predictors of conversion

Predictor	Odds Ratio (95% CI)	p-value
Acute cholecystitis	4.6 (2.1–10.2)	<0.001
GB wall thickening (>4 mm)	3.8 (1.7–8.5)	<0.001
Prior upper abdominal surgery	2.9 (1.3–6.7)	0.01



Postoperative outcomes: All patients survived the operation. [Table 4] compares postoperative outcomes between groups. Converted cases had significantly longer operative times (mean 120 vs. 75 minutes, p<0.001) and higher estimated blood loss. The average hospital stay was also longer for converted patients (5.2±2.8 days vs. 2.3±1.1 days, p<0.001).

Early (30-day) postoperative complications occurred in 6 of 18 (33%) converted patients versus 14 of 182 (7.7%) in the laparoscopic group (p<0.001). Wound infections were most common among conversions (3 cases, including one deep infection requiring drainage), reflecting the larger incisions. Other complications in the converted group included one bile leak (Clavien-Dindo III) managed with endoscopic stenting, two cases of pneumonia (Clavien III requiring antibiotics), and one cardiac arrhythmia (Clavien II). In contrast, the LC group had mainly minor complications (wound seromas, urinary retention, each in 2–3% of patients). There were no bile duct injuries in either group.

At a mean follow-up of 10 months, incisional hernia was detected in 2 of 18 (11%) patients who had undergone conversion; both hernias occurred at the umbilical port site (now a larger fascial defect) and required elective repair. In the non-converted group, 4 patients (2.2%) developed small trocar-site hernias (all at the umbilicus) during follow-up (p=0.02 vs. conversion group). There were no late biliary strictures or recurrent biliary symptoms attributable to the surgical approach in either group.

Table 4: Postoperative outcomes by surgical approach

Outcome	No Conversion (n=182)	Conversion (n=18)	p-value
Operative time (min), mean ± SD	75 ± 20	120 ± 25	<0.001
Hospital stay (days), mean ± SD	2.3 ± 1.1	5.2 ± 2.8	<0.001
Any complication, n (%)	14 (7.7%)	6 (33.3%)	<0.001
Wound infection, n (%)	3 (1.6%)	3 (16.7%)	0.002
Pneumonia, n (%)	2 (1.1%)	2 (11.1%)	0.01
Bile leak, n (%)	0	1 (5.6%)	0.03
Mortality, n (%)	0	0	–
Incisional hernia*, n (%)	4 (2.2%)	2 (11.1%)	0.02

*Port-site hernias occurring within 1 year. No routine prophylactic mesh was used.

DISCUSSION

In this two-year series from a tertiary care center, 9% of attempted laparoscopic cholecystectomies required conversion to open surgery. This rate is within the mid-range of published rates (often 5–10%). Conversion is more common in centers with more emergency cases or a larger proportion of complicated cholecystitis, and our conversion rate was higher in acute cases (20%) than in elective cases (3.3%). This underscores that acute inflammation remains a dominant driver of conversion.[11-13]

Consistent with many studies, we found that acute cholecystitis is the strongest predictor of conversion. The inflamed, often gangrenous gallbladder can obliterate normal tissue planes, making the critical view unattainable. In our cohort, the odds of conversion were nearly five-fold higher with acute cholecystitis, and nearly half of acute cases were converted. This aligns with Chin et al.'s systematic review identifying "old, male, and acute cholecystitis" as frequent risk factors. Similarly, Kama et al. (2001) identified acute cholecystitis and thickened gallbladder wall on imaging as predictors. Gallbladder wall thickening in our series (often indicating chronic inflammation) increased conversion risk almost four-fold.[14-16]

Prior upper abdominal surgery (e.g. gastric or pancreatic surgery) was another independent predictor (OR ~2.9). Dense adhesions from prior surgery can make laparoscopic dissection treacherous, as also noted by Dinçer et al. and others. Age ≥60 and male gender were significant in univariate analysis but fell out in multivariate

analysis, likely reflecting that many older patients had acute cholecystitis. Still, the elderly should be counseled preoperatively about the higher likelihood of conversion, especially if other risk factors (thickened gallbladder, comorbidity) are present. Interestingly, we did not observe a significant effect of obesity or comorbid diabetes in our sample, possibly due to sample size; other studies and meta-analyses have reported such associations.[17-19]

Regarding timing, most conversions in our series were made early (within the first 30–40 minutes). This reflects a strategy of timely conversion rather than prolonged struggle. Early conversion can prevent complications; indeed, prolonged attempts at unsafe dissection are linked to bile duct injury and bleeding in other series. We had no major bile duct injuries, suggesting our threshold for conversion was appropriately cautious. Some guidelines now emphasize "the critical view or convert" philosophy to minimize biliary injuries.[20]

The impact of conversion on outcomes in our study was notable but expected. Converted patients stayed longer in hospital (~5.2 days vs 2.3 days) and had higher rates of wound infections and pulmonary complications. These findings mirror other reports that open procedures entail more wound trauma and recovery time. For example, Sanz-López et al. found wound hernias were more frequent after open cholecystectomy than laparoscopic (though not always statistically significant). In our series, open conversion indeed led to a significantly higher incisional hernia rate (11% vs 2.2% in laparoscopic patients, p=0.02), aligning with that concept. The relatively small trocar sites in laparoscopy render hernias uncommon, whereas even a mini-laparotomy may weaken the abdominal wall. Thus, it is important to secure fascial closure and counsel patients about hernia risk when conversion is performed.

Complication-wise, conversion cases had more events (33% vs 7.7%). While conversion itself is often necessitated by pathology that predisposes to complications (e.g. infection, necrosis), the act of converting adds factors like a larger incision. Wound infections tripled in the conversion group. However, most complications were manageable and there were no mortalities. Sadr-Azodi et al. in a population study noted that open cholecystectomy is associated with higher perioperative mortality, but much of that is due to patient factors (older age, comorbidities). In our elective and emergency cases, mortality was zero in both groups, suggesting that in experienced hands even converted cases can be performed safely.

Importantly, we found no significant difference in major biliary outcomes. No patient in either group had late stricture or biliary event on follow-up. This suggests that conversion (or careful laparoscopic technique) can effectively manage difficult cases without compromising biliary integrity. A recent study by Badve et al. compared converted open cholecystectomy with laparoscopic subtotal cholecystectomy in "difficult" gallbladders, and found similar long-term bile-related outcomes. Although those patients by definition were difficult, their conclusion parallels ours: surgeons have two safe bailout options. In our cohort, the few bile leaks (one in converted group) resolved with stenting.

Our results underscore the importance of recognizing risk factors preoperatively. Patients with acute cholecystitis, especially those who are older or have comorbidities, should be informed about the possibility of conversion. In some high-risk cases (e.g. super-obese patients with prior surgery), one might even consider a planned open approach. However, with growing laparoscopic expertise, many such cases can still be attempted safely laparoscopically.

This study has limitations: as a retrospective review, it is subject to selection and information bias. Although we had a relatively large sample, the number of conversions (18) was modest, which limits the precision of some statistical estimates. We did not randomly assign patients, so the worse outcomes in converted cases are partly due to underlying severity. Despite these limitations, the findings align well with larger series and reviews, lending credence to their generalizability.

CONCLUSION

Conversion from laparoscopic to open cholecystectomy occurred in 9% of cases in our series, primarily driven by acute inflammation and difficult anatomy. Key preoperative predictors included acute cholecystitis, gallbladder wall thickening, and prior upper abdominal surgery. Surgeons should maintain a low threshold to convert early when the dissection is unsafe. Although conversion is associated with longer operation and recovery times and higher wound morbidity, it does not worsen long-term biliary outcomes. Meticulous surgical technique and patient follow-up (e.g. to detect incisional hernia) are warranted. Future research could explore prospective risk-scoring models and techniques (like subtotal cholecystectomy) to manage high-risk cases.

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