

Frequency and intraoperative reasons leading to conversion of laparoscopic cholecystectomy to open cholecystectomy in a tertiary care hospital at Karachi

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Abstract

Objective: To determine the frequency of conversion of laparoscopic cholecystectomy to open cholecystectomy, and to assess the reasons behind the conversion in a public-sector tertiary care facility.

Method: The descriptive, cross-sectional study was conducted at the Department of Surgery, Jinnah Postgraduate Medical Centre, Karachi, from October 28, 2022, to April 28, 2023, and comprised patients undergoing laparoscopic cholecystectomy. The operating consultant recorded intraoperative conversion and reasons behind the decision. Data was analysed using SPSS 23.

Results: Of the 123 patients with mean age 37.2 ± 7.4 years, 77(62.6%) were female and 46(37.4%) were male. Conversion to open cholecystectomy was done in 15(12.2%) cases. The reason for conversion was adhesions 5(33.3%), fibrosis at Calot's triangle 4(26.7%), common bile duct injury 3(20.0%), difficult anatomy 2(13.3%) and gallbladder perforation 1(6.7%).

Conclusion: The primary reason necessitating the transition from laparoscopic to open cholecystectomy was the presence of adhesions, with fibrosis at Calot's triangle and common bile duct injury also playing significant roles.

Keywords: Cholecystectomy, Laparoscopic, Cholelithiasis, Fibrosis, Adhesions, Biliary tract diseases. (JPMA 76: 1685; 2026)

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Introduction

Gallstone disease is a prevalent health issue not only in the developed nations, but also in developing countries. Its incidence globally is approximately 6.1%,¹ while in Pakistan it is recorded to be as high as 10.2%.² One of the primary causes of abdominal discomfort is the presence of gallstones. The most effective approach to managing symptomatic gallstones is through cholecystectomy.³ Laparoscopic cholecystectomy (LC) is considered the superior method for treating symptomatic gallstones due to its associated lower morbidity, reduced postoperative pain and length of hospital stay (LOS), improved cosmetic results, and quicker resumption of normal activities.⁴ These benefits position it as the preferred choice for gallstone management. However, there are various reasons during surgery that may necessitate the conversion of a laparoscopic cholecystectomy to an open cholecystectomy. These reasons can be attributed to the patient's characteristics, the equipment utilised, or the expertise of the surgeon.⁵

A study by Yaqub et al. revealed that 8.77% of patients undergoing LC required conversion to an open procedure.

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The reasons contributing to this conversion included common bile duct (CBD) injury in 6.7% patients, fibrosis at Calot's triangle in 20%, adhesions resulting from inflammation in 26.7%, and a combination of fibrosis and adhesions at Calot's triangle in 40% of the patients.⁶

Similarly, a study by Ummair et al. indicated that 10.20% of patients undergoing LC required conversion to an open approach. The primary reasons leading to this conversion included adhesions in 3.7% patients, gallbladder empyema in 2.8%, challenging anatomical structures in 1.8%, and gallbladder perforation in 0.94% of the patients.⁷

The current study was planned to determine the rate of conversion from LC to open cholecystectomy, and to identify intraoperative reasons contributing to such a conversion.

Patients and Methods

The descriptive, cross-sectional study was conducted at the Department of Surgery, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from October 28, 2022, to April 28, 2023. After approval from the institutional ethics review board, the sample size was determined based on an earlier study, while using the formula $N = Z^2 \times P(1-P) / d^2$, where P was the anticipated conversion rate (8.77%), Z was 1.96, and margin of error (d) was 5%.⁶ The sample was raised using non-probability, consecutive sampling method, and written, informed consent was obtained from all the participants. Those included were patients of either gender

aged 20-60 years who were scheduled to undergo LC, and were assessed to have American Society of Anaesthesiologists (ASA) physical status I–III.⁷ Patients with a history of prior abdominal surgery, those suffering from gallbladder empyema, or those who did not provide informed consent were excluded.

LC was performed by consultant general surgeons with at least three years of LC experience. Conversion to open cholecystectomy was decided intraoperatively by the operating consultant based on standard surgical judgment. The intraoperative reasons leading to conversion were recorded by the operating surgeon using a pre-designed proforma with predefined categories, including adhesions, fibrosis at Calot's triangle, bleeding, and unclear anatomy. To minimise reporting bias, all data was recorded immediately after the procedure using a structured proforma.

Data was analysed using SPSS 23. Mean and standard deviation were calculated for age, height, weight and body mass index (BMI). Data normality was assessed using the Shapiro-Wilk test and visual inspection of Q-Q plots. Frequencies and percentages were computed for categorical variables, including gender, conversion to open cholecystectomy, and intraoperative reasons leading to conversion. Associations of categorical variables with conversion to open cholecystectomy were assessed using cross-tabulation as well as chi-square and Fisher's exact tests. $P < 0.05$ was considered statistically significant.

Results

Of the 123 patients with mean age 37.2 ± 7.4 years, 77 (62.6%) were female and 46 (37.4%) were male. The mean body weight was 73.4 ± 12.3 kg, the mean height was 163.7 ± 11.8 cm, and the mean BMI was 26.2 ± 2.3 kg/m² (Table 1).

Conversion to open cholecystectomy was done in 15 (12.2%) cases. The reason for conversion was adhesions 5 (33.3%), fibrosis at Calot's triangle 4 (26.7%), CBD injury 3 (20.4%), difficult anatomy 2 (13.3%) and gallbladder perforation 1 (6.7%) (Table 2).

No significant association of age and gender was found with conversion to open cholecystectomy ($p > 0.05$). BMI < 26 kg/m² and fibrosis at Calot's triangle showed higher

Table-1: Baseline characteristics of the patients (n=123).

Variable	Mean $\pm$ SD	Minimum	Maximum
Mean Age (years)	37.2 $\pm$ 7.4	25	55
Weight (kg)	73.4 $\pm$ 12.3	49	115
Height (cm)	163.7 $\pm$ 11.8	97	188
BMI (kg/m ²)	26.2 $\pm$ 2.3	18.3	34.0

BMI: Body mass index, SD: Standard deviation.

Table-2: Reasons for conversion to open cholecystectomy (n=15).

Intraoperative Reason	n (%)
Adhesions	5 (33.3)
Fibrosis at Calot's triangle	4 (26.7)
Common bile duct injury	3 (20.4)
Difficult anatomy	2 (13.3)
Gallbladder perforation	1 (6.7)
Total	15 (100)

Table-3: Association of BMI with conversion to open cholecystectomy and intraoperative factors.

Variable	BMI 18–26 (n=64) [n(%)]	BMI 26.1–34 (n=59) [n(%)]	p-value
Conversion to open cholecystectomy – Yes	10 (15.6)	5 (8.5%)	0.226
Conversion to open cholecystectomy – No	54 (84.4)	54 (91.5%)	
Intraoperative factor	BMI 18–26 (n=6) [n(%)]	BMI 26.1–34 (n=9) [n(%)]	p-value
CBD injury	2 (33.3)	1 (11.1)	0.292
Fibrosis at Calot's triangle	0 (0)	4 (44.4)	0.057
Adhesions	3 (50.0)	2 (22.2)	0.264
Difficult anatomy	1 (16.7)	2 (22.2)	0.792
Gallbladder perforation	0 (0)	1 (11.1)	0.398

BMI: Body mass index, CBD: Common bile duct.

frequencies among the converted cases, but these associations were not statistically significant (Table 3).

Discussion

During the initial stages of the LC era, the frequency of transitioning to an open procedure ranged 2-15%. As surgeons honed their skills and familiarity with laparoscopic techniques grew over time, this rate decreased to around 1-6%.^{8,9} The current study was designed to assess the rate of such transitions, and aimed at analysing the determinants of LC conversion to open cholecystectomy in a government-operated tertiary care hospital in Pakistan. The study revealed a transition rate of 12.2%, which aligns closely with the findings of Vandersteeg et al., who reported a 12% transition rate in their retrospective analysis on 972 patients in the Netherlands.¹⁰ In contrast, Witwit et al. documented a much lower transition rate of 2.7% in their prospective study conducted at a teaching hospital in Iraq.¹⁰ This result is consistent with other studies as well.^{9,12} Such discrepancies in results underscore the potential impact of variables like age, gender and BMI.

In the current study, the primary reason for conversion was adhesions, affecting 4.1% patients. Yaqub et al. also found similar results (8.77%).⁶ Ummair et al. reported a conversion rate of 10.20%, with adhesions being the reason in 3.70% of the patients, gall-bladder empyema in 2.80%, difficult anatomy in 1.80%, and gall bladder perforation in 0.94% of the patients.⁸

The primary reason leading to conversion in the Iraqi study was dense adhesion, which hindered the visualisation of the anatomy, specifically that of Calot's triangle.¹⁰ This finding is consistent with the current study as well as literature at large.^{9,13,14} In such situations, the choice to convert should be viewed as a demonstration of surgical expertise rather than a setback, and it should be made upon recognising the challenges of dissection rather than waiting for complications to arise.¹²

Understanding the reasons associated with challenging LCs and the potential need for conversion to an open procedure is crucial not only for patient education, but also for allowing surgeons to adequately prepare for potential intraoperative complexities. Age has been identified in the literature as a significant risk factor for challenging LC,^{5,9,15} with reasons attributed to prolonged disease duration leading to thickening and increased contractility of the gall bladder wall. However, in a two-year prospective study involving patients with symptomatic gallstones who were prepared for LC, researchers did not find a significant correlation between patient age and the likelihood of conversion to open surgery ($p=0.08$),¹¹ a finding consistent with the current observations. A retrospective analysis on a cohort of 972 consecutive patients who underwent LC indicated that age >65 years (odds ratio [OR]: 2.10, 95% confidence interval [CI]: 1.32-3.34) served as an independent predictive factor for conversion to open surgery.¹⁰ This discrepancy could potentially be explained by the fact that the current patient cohort had a mean age of 38, which is notably younger compared to the mean ages reported in the earlier studies, ranging from the 40s to 50s, potentially masking the impact of age on conversion rates.

Furthermore, several reports have highlighted male gender as a risk factor for conversion to open cholecystectomy.^{14,15} While the exact rationale behind this observation remains unclear, it has been hypothesised that men may exhibit higher pain tolerance levels or be less inclined to seek medical attention due to various reasons which delays the diagnosis.⁵ Interestingly, the current study revealed a higher rate of conversion to open cholecystectomy among female patients, which was in contrast to the findings of a study in which the male gender was not identified as an independent risk factor for conversion, and no significant gender-based differences were noted ($p=0.3$).¹¹

The current results are consistent with the conclusions drawn by recent studies.^{16,17} However, in a 2021 retrospective study conducted at a tertiary centre in Saudi Arabia, male patients were found to have a significantly higher likelihood of both intraoperative and postoperative complications compared to females (24.4% vs. 6.5%;

$p<0.001$). Furthermore, conversion from LC to open cholecystectomy was more frequent in males ($n=5$) than in females ($n=1$; $p=0.004$). Even after multivariate regression analysis, the male gender remained an independent predictor of both intraoperative ($p=0.005$, 95%CI: 0.2-0.75) and postoperative complications ($p=0.045$, 95%CI: 0.28-0.99).¹⁸ This suggests that the male gender may be an important risk factor contributing to conversion and adverse outcomes following laparoscopic cholecystectomy.

The current study noted that a higher BMI was more frequently observed among patients requiring conversion, although this association did not reach the level of statistical significance. Goonawardena J et al. reported a significant association between BMI and conversion potential.¹⁹ Although the reasons for conversion observed in the current study were similar to those reported in other regional series, the persistence of these findings highlights ongoing operative challenges, and underscores the need for context-specific surgical planning and early decision-making.

The current study has limitations as it was conducted at a single centre, which may affect the generalisability of the results. In addition, the descriptive design precluded assessment of causal relationships or identification of independent predictors of conversion, as multivariable modelling was not appropriate, given the absence of significant univariate associations and the limited number of conversion events. Only a limited number of variables were explored through stratification, and other potential confounders, such as disease severity, duration of symptoms, and variability in surgeon experience, were not assessed. The modest sample size may also have reduced the statistical power to detect significant associations. As intraoperative findings were recorded by the operating surgeons, the assessment may be subject to observer bias, and inter-observer reliability was not formally evaluated. Further research with larger and more diverse sample sizes is needed to build upon the current findings and strengthen the evidence base in this area.

Conclusion

The rate of conversion to open cholecystectomy was 12.2%. The primary reason necessitating the transition from LC to open cholecystectomy was the presence of adhesions, with fibrosis at Calot's triangle and CBD also playing significant roles.

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Author Contribution:

HA: Concept, study design, methodology, data collection, writing, drafting, critical revision, final approval and agreement to be accountable for all aspects of the work.

SR: Methodology, supervision, review, editing and final approval.

RW & MA: Data collection, literature review, review, editing and final approval.

RA & CE: Formal analysis, drafting, review, editing and final approval.