

Technical Problems of Laparoscopic Cholecystectomy and Incidence of Conversion to Open Cholecystectomy

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Abstract

Introduction: Laparoscopic cholecystectomy (LC) is the gold standard for treating symptomatic gallstone disease. However, technical challenges and the need for conversion to open cholecystectomy remain significant concerns, especially in resource-limited settings like Bangladesh. This study aimed to evaluate the technical problems, conversion rates, and associated factors in patients undergoing LC.

Methods: A cross-sectional descriptive study was conducted at the Department of Surgery, Mymensingh Medical College and Hospital, Bangladesh, from April 2018 to September 2018. A total of 73 patients aged ≥ 20 years with symptomatic gallstone disease confirmed by ultrasonography were included. Data were collected using a structured questionnaire and analyzed using SPSS version 20.0.

Results: The mean age of participants was 43.6 ± 12.9 years, with a female predominance (83.56%). No adhesions were observed in 78.08% of cases, while mild, moderate, and severe adhesions were noted in 13.70%, 5.48%, and 2.74%, respectively. Technical problems were encountered in 27.40% of cases, with gas loss (10.96%) being the most common issue. Conversion to open surgery occurred in 9.59% of cases, primarily due to dense adhesions (28.57%) and hemorrhage (28.57%). Liver injuries were the most frequent visceral injury (71.43%) among conversion cases.

Conclusion: The findings reveal that while LC is largely successful, technical challenges such as adhesions and bleeding significantly impact outcomes. Enhanced surgical training, preoperative planning, and resource investment are essential to minimize conversions and improve safety in resource-limited settings like Bangladesh.

Keywords: Laparoscopic cholecystectomy, conversion to open surgery, technical challenges, gallstone disease, resource-constrained settings, adhesions, Bangladesh.

I. INTRODUCTION

Gallbladder diseases, particularly cholelithiasis, remain significant public health challenges worldwide, with a rising prevalence attributed to increasing life expectancy, dietary changes, and sedentary lifestyles. The condition affects approximately 10–15% of the global population, with variations influenced by ethnicity, age, and gender (1). Laparoscopic cholecystectomy (LC) has emerged as the gold standard treatment for symptomatic gallstone disease, offering distinct advantages over open cholecystectomy (OC). These include reduced postoperative pain, shorter recovery times, lower complication rates, and improved cosmetic outcomes, which collectively enhance patient satisfaction (2,3). However, despite these benefits, the procedure is not without challenges, particularly in resource-constrained settings where technical complexities and surgeon expertise play critical roles in determining outcomes. Bangladesh, with its dense population and high burden of gallstone-related diseases, has seen a growing adoption of LC in recent years. The country, like many other developing nations, faces significant healthcare constraints, including limited access to advanced surgical equipment and a scarcity of adequately trained surgeons (4). These challenges are further compounded by a lack

of robust data on gallbladder disease epidemiology and LC outcomes within the region. Local studies have reported conversion rates from LC to OC ranging from 4.6% to 7%, with factors such as severe adhesions, unclear anatomy, and acute inflammation frequently necessitating conversion (5,6). These findings underscore the importance of understanding regional challenges and outcomes to improve surgical training and healthcare infrastructure. Technical difficulties in LC, including dense adhesions, distorted anatomy, and bleeding, present significant hurdles during surgery. These challenges often necessitate conversion to OC, which serves as a marker of procedural complexity and surgical judgment. Studies have highlighted the critical role of surgeon expertise in reducing conversion rates and managing complications. For example, Maitra et al. noted that conversion rates in tertiary care hospitals in Dhaka were primarily influenced by surgeon experience and preoperative patient assessments (6). Similarly, Kamruzzaman et al. identified dense adhesions and aberrant anatomy as leading causes of conversion in a cohort study conducted at Bangabandhu Sheikh Mujib Medical University, Dhaka (5). These findings emphasize the need for comprehensive preoperative evaluations and advanced training programs tailored to local healthcare settings. Conversion from LC to OC is not only a technical challenge but also a key indicator of surgical outcomes. Global conversion rates range between 5–15%, with regional variations influenced by factors such as acute cholecystitis, obesity, male gender, and advanced age (7,8). In Bangladesh, conversion rates have been reported at the lower end of this spectrum, attributed to the growing familiarity of surgeons with laparoscopic techniques (9). However, these conversions often result in longer hospital stays, increased patient morbidity, and higher healthcare costs, which can be particularly burdensome in resource-limited settings (4). Addressing these challenges requires a multifaceted approach that includes improving surgical training, enhancing access to advanced equipment, and conducting further research to identify modifiable risk factors. Despite its widespread adoption, LC remains under-researched in Bangladesh compared to developed nations. The lack of extensive data on local technical challenges, conversion rates, and patient outcomes limits the ability of healthcare providers to make evidence-based decisions. Chowdhury demonstrated that mini-laparoscopic cholecystectomy, a modified approach using smaller instruments, could significantly reduce complication rates and enhance patient satisfaction in Bangladesh (10). Such innovative solutions highlight the potential for tailoring surgical techniques to meet local needs while maintaining global standards of care. Additionally, Biswas et al. emphasized that conversion to open surgery should not be viewed as a surgical failure but rather as a decision prioritizing patient safety (9). This study aims to address the critical gap in understanding the technical problems of LC and the incidence of conversion to OC in Bangladesh. By systematically evaluating the challenges and outcomes associated with LC, this research seeks to provide valuable insights into local surgical practices. The findings are expected to inform training programs, guide resource allocation, and ultimately improve patient care. Given the increasing prevalence of gallbladder disease and the growing reliance on minimally invasive techniques, this study holds significant relevance for surgeons, policymakers, and healthcare providers working in resource-limited settings.

II. METHODS

This cross-sectional descriptive study was conducted in the Department of Surgery at Mymensingh Medical College and Hospital, Mymensingh, Bangladesh, over six months from April 2018 to September 2018. The study population comprised patients aged 20 years and above admitted to various surgical units with symptomatic gallstones. Exclusion criteria included patients with a dilated common bile duct (CBD) greater than 8 mm, jaundice, or positive hepatitis B or C virology. Preoperative evaluations included complete blood count, random blood sugar, liver and renal function tests, and screening for hepatitis B and C. Abdominal ultrasonography was used to confirm gallstones, assess CBD diameter, and exclude ineligible cases. For patients over 40 years old, chest X-rays and ECGs were performed as additional assessments. The study employed purposive sampling, resulting in a total sample size of 73 patients. Data were collected using a structured and pretested questionnaire designed to capture all relevant variables. Data collection occurred during the patients' hospital stays in different surgical units. Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 20.0 (SPSS Inc., Chicago, IL, USA). Results were reported as frequencies, percentages, means, and standard deviations, with significance tested using the Chi-square test. To ensure high data quality, rigorous adherence to inclusion and exclusion criteria was maintained. Ethical approval was obtained from the local ethical committee before the study commenced. The objectives, procedures, and potential risks and benefits of the study were explained to participants in their native language, and informed written consent was obtained. Participants were assured of confidentiality, and their right to withdraw from the study at any time without consequences was respected. The study adhered to ethical principles to ensure participant safety and the integrity of the data collected.

III. RESULTS

Table 1: Distribution of baseline characteristics among the participants (N=73)

Variables	Frequency	Percentage
Age in Years		
20-29	11	15.07%
30-39	20	27.40%
40-49	15	20.55%
50-59	19	26.03%
60-69	6	8.22%
70-79	2	2.74%
Mean±SD	43.6±12.9 years	
Gender		
Male	12	16.44%
Female	61	83.56%
Marital Status		
Married	59	80.82%
Unmarried	14	19.18%
Socioeconomic Status		
Lower Class	22	30.14%
Middle Class	39	53.42%
Upper Class	12	16.44%
Body Weight		
Normal Weight	53	72.60%
Overweight	20	27.40%

The baseline characteristics of the study participants (N=73) revealed that the mean age of the participants was 43.6 ± 12.9 years, with the majority aged between 30–39 years (27.4%) and 50–59 years (26.03%). Female participants predominated, accounting for 83.56% of the total, while males constituted 16.44%. Most participants were married (80.82%), and a substantial proportion belonged to the middle socioeconomic class (53.42%), followed by the lower class (30.14%). In terms of body weight, 72.60% of the participants were classified as having normal weight, while 27.40% were overweight.

Table 2: Laparoscopic findings of presence of adhesion in study population (N=73)

Laparoscopic findings	Frequency	Percentage
No Adhesion	57	78.08%
Mild Adhesion	10	13.70%
Moderate Adhesion	4	5.48%
Severe Adhesion	2	2.74%

Laparoscopic findings revealed that the majority of the study population (78.08%) had no adhesions, while 13.70% exhibited mild adhesions. Moderate adhesions were observed in 5.48% of participants, and severe adhesions were identified in 2.74%.

Table 3: Distribution of laparoscopic findings among the participants (N=73)

Technical Problem	Frequency	Percentage
No Technical Problem	53	72.60%
Gas Loss	8	10.96%
Port Site Bleeding	5	6.85%
Evacuation of Blood Clot	4	5.48%
Clip Loss	2	2.74%
Stone Loss	1	1.37%

The laparoscopic findings revealed that 72.60% of participants experienced no technical problems during the procedure. Among those with issues, gas loss was the most common technical problem, occurring in 10.96% of cases. Port site bleeding was observed in 6.85% of participants, followed by the need for evacuation of blood clots in 5.48%. Less frequent issues included clip loss (2.74%) and stone loss (1.37%), highlighting that the majority of procedures were performed without significant technical difficulties.

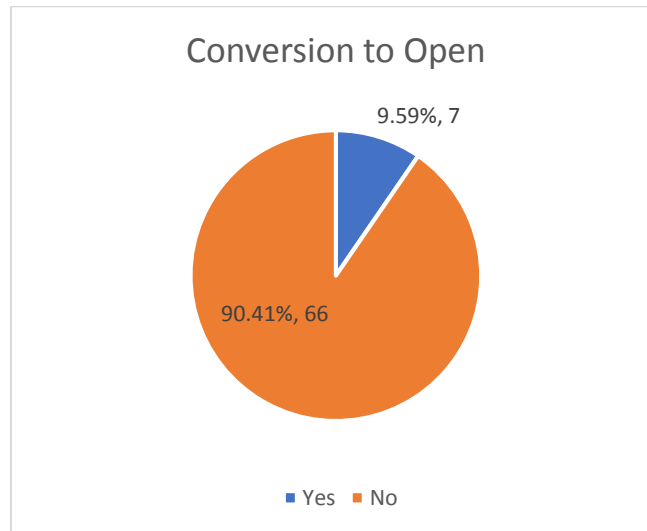


Figure 1: Incidence of conversion to open laparoscopy among the participants (N=73)

Of the 73 cases, 90.41% (66 participants) successfully underwent laparoscopic cholecystectomy without conversion. However, 9.59% (7 participants) required conversion to open surgery due to technical or procedural challenges.

Table 4: Distribution of Visceral injuries among the conversion cases (n=7)

Visceral Injury	n	%
Bile duct injury	1	14.29%
Liver	5	71.43%
Omentum	1	14.29%

Among the seven cases that required conversion to open surgery, visceral injuries were predominantly observed in the liver, accounting for 71.43% of cases. Bile duct injury and omental injury were less frequent, each occurring in 14.29% of cases.

Table 5: Causes of conversion of laparoscopic cholecystectomy in study population (n=7)

Cause	Frequency	Percentage
Dense Adhesion	2	28.57%
Hemorrhage	2	28.57%
Bile duct Injury	1	14.29%
Empyema of Gallbladder	1	14.29%
Gallbladder Mass	1	14.29%

The causes of conversion to open surgery among the seven cases were primarily dense adhesions and hemorrhage, each accounting for 28.57% of the conversions. Other reasons included bile duct injury (14.29%), empyema of the gallbladder (14.29%), and the presence of a gallbladder mass (14.29%).

IV. DISCUSSION

This study aimed to evaluate the technical challenges, conversion rates, and related outcomes of laparoscopic cholecystectomy (LC) in a cohort of patients treated at Mymensingh Medical College and Hospital, Bangladesh. The findings align with existing literature while highlighting specific regional trends and

challenges. The demographic analysis revealed that the majority of participants were female (83.56%), with a mean age of 43.6 ± 12.9 years. This predominance of females undergoing LC is consistent with global patterns, where females are disproportionately affected by gallstone disease due to hormonal and metabolic factors (11). Studies by Katoch et al. and Rosenmüller et al. similarly reported higher female participation in LC, with mean ages ranging from 42 to 54 years, aligning closely with the findings of this study (12,13). Furthermore, most participants in the current study belonged to the middle socioeconomic class, suggesting that access to LC is gradually becoming feasible in low- and middle-income populations. Intraoperative findings revealed that most patients (78.08%) had no adhesions, while mild adhesions were observed in 13.70%. Moderate and severe adhesions were less frequent, at 5.48% and 2.74%, respectively. These results align with studies by Imaralu et al., who reported a 26.6% prevalence of adhesions, and Nabil et al., who identified mild to moderate adhesions as common intraoperative challenges (14,15). Adhesions are a known predictor of operative complexity, with severe cases often increasing conversion rates and operative times (16). Technical problems during LC were encountered in 27.40% of cases, with gas loss (10.96%), port site bleeding (6.85%), and evacuation of blood clots (5.48%) being the most frequent issues. Similar findings were reported by Kaushik, who highlighted intraoperative bleeding as a key complication in up to 10% of cases (17). Additionally, Attri et al. noted that technical difficulties, such as clip loss and stone spillage, could significantly impact outcomes and necessitate improved surgical techniques (18). Notably, clip loss (2.74%) and stone loss (1.37%) were infrequent in this study, underscoring the importance of meticulous surgical practices to minimize these events (19). The incidence of conversion to open surgery was 9.59%, higher than rates reported in some developed countries (3.4–7.7%) (20). Dense adhesions (28.57%) and hemorrhage (28.57%) were the leading causes of conversion, consistent with studies by Ashfaq et al., who identified adhesions and bleeding as common contributors (21). Other factors, such as bile duct injury (14.29%), empyema of the gallbladder (14.29%), and gallbladder masses (14.29%), also played significant roles, reflecting the complexity of managing high-risk cases in this setting. Visceral injuries among converted cases predominantly involved the liver (71.43%), with bile duct and omental injuries accounting for 14.29% each. These findings are supported by studies such as those by Martin et al. and Parrilla et al., who emphasized that bile duct injuries, although infrequent, remain among the most severe complications of LC (22,23). The predominance of liver injuries in this study highlights the need for enhanced training in dissecting complex anatomy safely. In conclusion, this study provides a comprehensive analysis of the challenges and outcomes of LC in a resource-constrained setting. While most procedures were successfully completed without conversion, the findings underscore the importance of addressing technical challenges, minimizing adhesion-related complications, and enhancing surgeon training to reduce conversion rates and improve patient outcomes. Future efforts should focus on building local capacity, optimizing preoperative assessments, and adopting innovative techniques to ensure safer and more effective laparoscopic procedures.

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

V. CONCLUSION

This study highlights the technical challenges, conversion rates, and outcomes associated with laparoscopic cholecystectomy in a resource-constrained setting in Bangladesh. While the majority of cases were completed successfully without conversion, dense adhesions and hemorrhage emerged as the leading causes of conversion to open surgery. Liver injuries were the most common visceral complications, underscoring the importance of advanced surgical training and meticulous preoperative planning. The findings emphasize the need for targeted efforts to minimize technical difficulties and improve procedural outcomes, including investments in surgeon training and enhanced infrastructure. This research provides valuable insights for optimizing laparoscopic cholecystectomy practices in developing regions, ultimately contributing to improved patient safety and surgical success rates.

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