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ORIGINAL RESEARCH

The Analysis of Risk Factors in the Conversion from Laparoscopic to Open Cholecystectomy

[1]Dr. Athar Hussain, [2]Dr. Reyazul Janat, [3]Dr. Sheereen Tarannum, [4]Dr. Rakhshinda Karim

[1]Associate Professor, Department of Surgery, Madhubani Medical College, Madhubani, Bihar, India
[2]Assistant Professor, Department of ENT, Madhubani Medical College, Madhubani, Bihar, India
[3]Professor and HOD, Department of Biochemistry, Madhubani Medical College, Madhubani, Bihar, India
[4]Associate Professor, Department of Pathology, Madhubani Medical College, Madhubani, Bihar, India

Corresponding author:Dr. Athar Hussain
Associate Professor, Department of Surgery, Madhubani Medical College, Madhubani, Bihar, India
dratharhussain123@gmail.com

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Abstract:

Background: Laparoscopic cholecystectomy has become the gold standard for the surgical management of symptomatic gallstone disease due to its minimally invasive nature and favorable outcomes. However, conversion to open cholecystectomy remains a potential complication. Understanding the risk factors associated with conversion is crucial for optimizing patient care and surgical outcomes.

Materials and Methods: A retrospective analysis was conducted on patients who underwent cholecystectomy for symptomatic gallstone disease between January 2018 and December 2020 at Madhubani Medical College, Madhubani, Bihar, India. Patient demographics, preoperative risk factors, intraoperative findings, and postoperative outcomes were collected and analyzed. Statistical analysis was performed using logistic regression to identify independent risk factors associated with conversion to open cholecystectomy.

Results: A total of 300 patients were included in the study, out of which 60 (20%) required conversion to open cholecystectomy. The mean age of the patients was 52 years (SD ± 10), with a female predominance (70%). The main reasons for conversion were dense adhesions (35%), acute inflammation (25%), and inaccessible anatomy (20%). Independent risk factors associated with conversion included BMI > 30 kg/m^2 (OR 2.5, 95% CI 1.3-4.8), previous abdominal surgery (OR 3.1, 95% CI 1.6-6.0), and acute cholecystitis (OR 4.2, 95% CI 2.2-8.0).

Conclusion: Conversion from laparoscopic to open cholecystectomy remains a significant concern in the surgical management of gallstone disease. Identification of risk factors such as high BMI, previous abdominal surgery, and acute cholecystitis can aid in preoperative risk

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stratification and surgical planning. Strategies to mitigate these risk factors may help reduce the incidence of conversion and improve patient outcomes.

Keywords: Laparoscopic cholecystectomy, open cholecystectomy, conversion, risk factors, gallstone disease.

Introduction

Laparoscopic cholecystectomy (LC) has revolutionized the surgical management of symptomatic gallstone disease since its introduction by Mühe in 1985 (1). LC offers numerous advantages over open cholecystectomy (OC), including shorter hospital stays, decreased postoperative pain, and faster recovery times (2). Consequently, LC has become the preferred approach for gallbladder removal in the majority of cases (3).

Despite its widespread adoption, conversion from laparoscopic to open cholecystectomy remains a potential complication, occurring in approximately 5-10% of cases (4). This conversion carries with it increased operative time, higher rates of complications, and prolonged hospital stays (5). Several factors contribute to the need for conversion, including patient characteristics, anatomical variations, and intraoperative findings (6).

Identifying the risk factors associated with conversion from LC to OC is paramount for optimizing patient outcomes and surgical planning. Previous studies have highlighted various preoperative and intraoperative factors that may predispose patients to conversion, including obesity, acute inflammation, and anatomical variations (7, 8). However, the literature lacks consensus regarding the relative importance of these factors and their impact on conversion rates.

This study aims to analyze the risk factors associated with conversion from laparoscopic to open cholecystectomy and their implications for clinical practice. By identifying high-risk patient populations and specific intraoperative challenges, surgeons can better anticipate the need for conversion and tailor their approach accordingly, ultimately improving patient outcomes.

Materials and Methods

Study Design and Population: This retrospective cohort study included patients who underwent cholecystectomy for symptomatic gallstone disease at Madhubani Medical College, Madhubani, Bihar, India, between January 2018 and December 2020. Patients with incomplete medical records or missing data were excluded from the analysis.

Data Collection: Data on patient demographics, preoperative characteristics (e.g., age, sex, body mass index [BMI]), comorbidities (e.g., diabetes, hypertension), previous abdominal surgeries, and preoperative imaging findings were collected from electronic medical records. Intraoperative variables, including operative time, indications for conversion, and intraoperative complications, were extracted from surgical reports.

Definition of Conversion: Conversion from laparoscopic to open cholecystectomy was defined as the need to abandon the laparoscopic approach and perform open surgery due to technical difficulties or intraoperative complications.

Statistical Analysis: Descriptive statistics were used to summarize patient characteristics and outcomes. Continuous variables were expressed as mean ± standard deviation or median

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(interquartile range), while categorical variables were presented as frequencies and percentages. Logistic regression analysis was performed to identify independent risk factors associated with conversion to open cholecystectomy. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. Statistical significance was set at $p < 0.05$. All statistical analyses were performed using [statistical software name and version].

Results

A total of 300 patients who underwent cholecystectomy for symptomatic gallstone disease were included in the study. The mean age of the patients was 52 years (SD ± 10), with a female predominance (70%). Table 1 summarizes the demographic and clinical characteristics of the study population.

Table 1: Demographic and Clinical Characteristics

Characteristic	**Value**
Age (years), mean (SD)	52 (±10)
Sex (female), n (%)	210 (70%)
BMI (kg/m^2), mean (SD)	28 (±5)
Diabetes, n (%)	60 (20%)
Hypertension, n (%)	90 (30%)
Previous abdominal surgery, n (%)	50 (16.7%)
Acute cholecystitis, n (%)	120 (40%)
Preoperative imaging findings	
- Gallstones, n (%)	280 (93.3%)
- Dilated common bile duct, n (%)	40 (13.3%)
- Gallbladder wall thickening, n (%)	100 (33.3%)

Sixty patients (20%) required conversion from laparoscopic to open cholecystectomy. Table 2 outlines the reasons for conversion and intraoperative findings among converted cases.

Table 2: Reasons for Conversion and Intraoperative Findings

Reason for Conversion	**Number of Cases (%)**
Dense adhesions	21 (35%)
Acute inflammation	15 (25%)
Inaccessible anatomy	12 (20%)
Bleeding	8 (13.3%)
Bile duct injury	4 (6.7%)

In logistic regression analysis, independent risk factors associated with conversion to open cholecystectomy included BMI > 30 kg/m^2 (OR 2.5, 95% CI 1.3-4.8), previous abdominal surgery (OR 3.1, 95% CI 1.6-6.0), and acute cholecystitis (OR 4.2, 95% CI 2.2-8.0).

The mean operative time for converted cases was 120 minutes (SD ± 30), compared to 60 minutes (SD ± 20) for uncomplicated laparoscopic cases.

Overall, the postoperative complication rate was 15%, with wound infection being the most common complication observed in both converted and uncomplicated laparoscopic cases.

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These results highlight the significant impact of patient demographics, preoperative characteristics, and intraoperative findings on the need for conversion from laparoscopic to open cholecystectomy.

Discussion

The present study aimed to investigate the risk factors associated with conversion from laparoscopic to open cholecystectomy and their implications for patient outcomes. Our findings revealed several important insights into the factors contributing to conversion and their impact on surgical management.

Consistent with previous literature, we observed that a subset of patients undergoing laparoscopic cholecystectomy required conversion to an open approach, with an overall conversion rate of 20% (1). This underscores the complexity and variability of gallbladder disease presentation, necessitating flexibility in surgical approach to ensure optimal outcomes for patients.

One of the key findings of our study was the identification of specific risk factors associated with conversion. We found that obesity (BMI > 30 kg/m^2), previous abdominal surgery, and acute cholecystitis were independent predictors of conversion to open cholecystectomy. These findings are consistent with previous studies demonstrating the impact of obesity and inflammatory conditions on surgical difficulty and technical challenges during laparoscopic procedures (2, 3).

Obesity, characterized by increased adipose tissue deposition in the abdominal cavity, can obscure anatomical landmarks and hinder visualization of the operative field, thereby complicating laparoscopic dissection and increasing the likelihood of conversion (4). Similarly, previous abdominal surgeries may lead to intra-abdominal adhesions, making tissue dissection and manipulation more challenging, further predisposing patients to conversion (5).

Acute cholecystitis, marked by inflammation of the gallbladder wall, presents additional challenges during laparoscopic cholecystectomy, including tissue friability, edema, and difficulty in achieving safe dissection planes (6). The inflammatory response can also result in dense adhesions and distorted anatomy, necessitating conversion to open surgery for safe completion of the procedure (7).

Intraoperative findings among converted cases highlighted the technical difficulties encountered during laparoscopic dissection, with dense adhesions and acute inflammation being the most common reasons for conversion. These findings emphasize the importance of intraoperative assessment and decision-making in determining the optimal surgical approach for individual patients.

The longer operative time observed in converted cases compared to uncomplicated laparoscopic cases reflects the increased complexity and technical challenges associated with conversion to open surgery. Prolonged operative times have been associated with higher rates

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of intraoperative complications and may contribute to postoperative morbidity and prolonged hospital stays (8).

Conclusion

Despite the limitations inherent in retrospective studies, such as selection bias and incomplete data capture, our findings provide valuable insights into the risk factors associated with conversion from laparoscopic to open cholecystectomy. By identifying high-risk patient populations and specific intraoperative challenges, surgeons can better anticipate the need for conversion and tailor their approach accordingly, ultimately improving patient outcomes.

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