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To study the conversion rate of laparoscopic cholecystectomy to open cholecystectomy and its causes

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Abstract

Background: Laparoscopic cholecystectomy has replaced open cholecystectomy as the preferred treatment for symptomatic gallbladder stones. However, a certain percentage of laparoscopic cases require conversion to open surgery. This study aimed to evaluate the conversion rate and identify the factors associated with this conversion.

Methods: A retrospective analysis was conducted on patients who underwent laparoscopic cholecystectomy for cholelithiasis at a medical college and hospital over a 12 month period. Demographic data, clinical details, laboratory investigations, surgical indications, and intraoperative findings were collected and analyzed. Statistical analysis was performed using SPSS software.

Results: A total of 50 patients were included in the study. The mean age was 44.26 years, with the majority in the 41-50 age group. Females constituted 70% of the cases. Higher BMI, male gender, the presence of diabetes, and a thickened gallbladder wall were identified as factors associated with an increased risk of conversion to open cholecystectomy. The overall conversion rate was 10%, with adhesions and bleeding being the main reasons for conversion.

Conclusion: This retrospective study provides insights into the conversion rate and associated factors in laparoscopic cholecystectomy. Male gender, higher BMI, the presence of diabetes, and a thickened gallbladder wall were found to increase the likelihood of conversion to open surgery. These findings highlight the importance of careful patient selection, preoperative assessment, and informed consent discussions to optimize surgical outcomes and minimize the need for open procedures. Further research with larger sample sizes is recommended to validate these findings.

Keywords: Cholecystectomy, gallstones, laparoscopy

Introduction

Gallstones are a common disease that has been increasing in incidence over the years. The traditional treatment for symptomatic gallbladder stones was open cholecystectomy, which had high morbidity rates. This procedure involved incising and resuturing layers of abdominal wall muscles, leading to a long recovery period and potential complications^[1].

In recent years, there has been a significant shift in the treatment of gallstones, especially symptomatic ones, with the introduction of minimally invasive surgeries such as laparoscopic surgery, single-incision laparoscopy, multiport laparoscopy, and robotic surgery. These procedures have greatly reduced the popularity and mortality associated with open surgery^[2]. Improved training facilities and a better understanding of these techniques have also decreased the learning curve and associated risks^[3].

Laparoscopic cholecystectomy has become the procedure of choice for symptomatic biliary disease, with approximately 75% of all cholecystectomies being performed laparoscopically worldwide. The conversion rate from laparoscopic to open procedure ranges from 5% to 10%^[4].

Initially, studies showed that laparoscopic cholecystectomy had a higher complication rate compared to the open method, with common injuries to the common bile duct (CBD). However, over the years, the rates of CBD injury have significantly reduced, ranging from 0.25% to 0.5%, due to the judicious use of cholangiography during the surgery and increasing experience with laparoscopic anatomy^[5].

One of the significant advantages of laparoscopic cholecystectomy is the reduction in post-operative recovery period and pain, which allows for quicker return to work and improved patient outcomes. This also contributes to a decrease in disability-adjusted life years (DALY) and improves the overall economy for the patient.

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In this study, the researchers aimed to assess their experience with laparoscopic cholecystectomy, specifically focusing on patient-specific factors that may be associated with a higher rate of conversion to open cholecystectomy. The goal was to thoroughly evaluate these factors and reduce the conversion rate, ultimately decreasing the morbidity associated with open surgeries [6].

In summary, the introduction of laparoscopic cholecystectomy has revolutionized the treatment of gallstones, offering a less invasive approach with reduced morbidity. Ongoing research and evaluation of factors affecting the conversion rate will help further improve patient outcomes and minimize the need for open procedures.

Materials and Methods

Study Design: This study was designed as a retrospective study.

Study Subjects: All patients who presented with cholelithiasis without choledocholithiasis and had no contraindications during the study period were included in the study. The researchers reviewed the medical records of all patients who underwent laparoscopic cholecystectomy during the study period.

Data Collection: Demographic information, past medical history, indication for operation, duration of operation, reason for conversion, and postoperative complications were recorded.

Source of Data: This study was conducted at the Department of General Surgery, Yenepoya Medical College and Hospital, Mangalore. Data was collected from patients who underwent laparoscopic cholecystectomy from October 2016 to October 2017, over a 12 month period.

Sampling Method and Sample Size: Anonymity was achieved by assigning random computer-generated numbers to the patients. The estimated sample size for the study was 50 patients based on previous studies.

Criteria for Selection: Inclusion Criteria:

- Patients with symptomatic cholelithiasis (including acute cholecystitis).
- Patients presenting with acalculous cholecystitis.
- Age > 18 years.

Exclusion Criteria

- Carcinoma of the gallbladder
- Perforated gallbladder
- Patients unfit for general anesthesia
- Previous upper abdominal surgeries
- Age < 18 years

Detailed Methodology: After obtaining informed consent, the researchers recorded various details including name, age, sex, random number, address, religion, date of admission, date of surgery, date of discharge, chief complaints, history of presenting illness, past history, family history, general physical examination, and systemic examination.

Investigations: A range of investigations was conducted including complete blood count, blood sugar, renal function test, liver function test, hepatitis status, chest X-ray, and ultrasound of the abdomen. The ultrasound of the abdomen included recording the number and size of calculi, gallbladder wall

thickness, presence of pericholecystic collection, CBD calculi, and dilatation of CBD.

Surgery: The researchers recorded the date of surgery, age of the patient, intraoperative findings, duration of surgery, and cause of conversion (adhesion, hemorrhage, organ injury, or other causes).

Data and Statistical Analysis: Statistical analysis was performed using SPSS software version 23.0. The collected information was summarized as percentages and proportions. Frequency and percentage were used to study the prevalence of demographic data. Mean and mode were used for demographic data, while frequency, percentage, mean, standard deviation, paired and unpaired t-tests, and chi-square tests were used for the analysis of clinical data. A 'p' value less than 0.05 ($p < 0.05$) was considered significant.

Results

This study was conducted at the Department of General Surgery, Yenepoya Medical College and Hospital, Mangalore, on patients who underwent laparoscopic cholecystectomy between October 2016 and October 2017, over a period of 12 months.

The demographic data showed that the mean age of the cases studied was 44.26 years, with the most common age group being 41-50 years, accounting for 28% of the cases. The female gender was more prevalent, comprising 70% of the cases. Regarding body mass index (BMI), 86% of the cases had a BMI within the normal range, while 14% had an elevated BMI.

In terms of clinical details, all 50 cases (100%) presented with abdominal pain in the right upper abdomen. Vomiting was observed in 80% of the cases, while nausea was reported in 8% of the cases. Fever was present in only 2% of the cases. Seven cases (14%) exhibited jaundice, and all 50 cases (100%) had tenderness in the right upper abdomen.

Investigations revealed that 52% of the cases had mild anemia, while 8% had moderate anemia. The total leucocyte count was within the normal range for 86% of the cases, with 12% showing leucocytosis. Fasting blood sugar levels were normal in 86% of the cases, while 10% had elevated levels. Post-prandial blood sugar levels were normal in 90% of the cases, with 10% exhibiting elevated levels. Total bilirubin, urea, and creatinine levels were all within the normal range for all 50 cases.

The primary indication for surgery in all 50 cases (100%) was cholelithiasis. Ultrasound findings confirmed cholelithiasis in all cases, with 10% showing wall thickening of more than 4 mm, and 12% having a solitary calculus. Laparoscopic cholecystectomy was planned for all cases, but 10% were converted to open surgery. The main reasons for conversion were adhesions in 6% of cases and bleeding in 4% of cases.

No complications were observed during the intraoperative period for any of the 50 cases. Intraoperative findings revealed gall bladder wall thickening and adhesions in 14% of cases, while intraoperative bleeding, gall bladder perforation, bile leak, and stone slippage were relatively rare or not observed.

In conclusion, this study provides insights into the demographic profile, clinical presentation, laboratory investigations, surgical indications, and intraoperative findings of patients who underwent laparoscopic cholecystectomy for cholelithiasis. The majority of cases had favorable outcomes without significant complications, highlighting the effectiveness of laparoscopic surgery in the management of cholelithiasis.

Table 1: Compiled distribution of parameters

Findings	Frequency	Percent
Age of the cases studied		
Mean age	44.26	
Standard deviation	12.68	
Gender of the cases studied		
Female	35	70%
Male	15	30%
BMI		
19-24.9	43	86%
25-29.9	7	14%
Incidence of Abdominal Pain		
Yes	50	100%
No	0	0%
Incidence of Vomiting		
Yes	40	80%
No	10	20%
Incidence of Nausea		
Yes	4	8%
No	46	92%
Incidence of Fever		
Yes	1	2%
No	49	98%
Incidence of Jaundice		
Yes	7	14%
No	43	86%
Incidence of Abdominal Tenderness		
All 50 cases		100%
Hemoglobin Levels		
Less than 8.5 gm/dl	0	0%
8.6-10 gm/dl	4	8%
10.01-12 gm/dl	26	52%
12.01-14 gm/dl	16	32%
> 14.1 gm/dl	4	8%
Total Leucocyte Count Levels		
Leucocytosis TC < 4000 cells / mm ³	1	2%
TC 4000-11000 cells / mm ³	43	86%
Leucopenia TC > 11000 cells / mm ³	6	12%
Fasting Blood Sugar Levels		
Less than 100 mg/dl	26	52%
100-126 mg/dl	19	38%
> 126 mg/dl	5	10%

Table 2: Surgical parameters

Indication for Surgery		
Cholelithiasis	50	100%
USG Findings		
Cholelithiasis	50	100%
Planned Surgery		
Laparoscopic Cholecystectomy	50	100%
Number of Cases Converted to Open		
No	45	90%
Yes	5	10%
Reasons for Conversion to Open Surgery		
Adhesions	3	6%
Bleeding	2	4%
Complications		
Nil	50	100%
Intra-operative Findings		
Gall bladder wall thickening	7	14%
Adhesions	7	14%
Intra-operative bleeding	2	4%
Gall bladder perforation	2	4%
Bile leak	2	4%
Duration of Surgery (minutes)		
Converted Group		
Mean	89.4	

Standard Deviation	8.91	
Laparoscopy Group		
Mean	64.6	
Standard Deviation	8.2	

Discussion

The aim of this study was to investigate the conversion rate from laparoscopic to open cholecystectomy and its associated factors. The mean age of the cases included in the study was 44.26 years, with the most common age range being 41-50 years. This finding is consistent with previous studies conducted by Hutchinson *et al.*, Liu *et al.*, and Ibrahim *et al.*, which reported that the incidence of cholecystectomy tends to peak in the middle-aged population [7-9]. Additionally, the study identified a significant association between gender and the need for conversion to open cholecystectomy. Females comprised the majority of cases (70%), while males had a higher risk of conversion. This finding aligns with the observations made by Hutchinson *et al.*, Liu *et al.*, and Jeremy, who all identified male gender as a predictor for conversion [10-12].

The study also explored the relationship between body mass index (BMI) and the conversion rate. It revealed a significant difference in BMI, with higher BMI values associated with an increased risk of conversion. Hutchinson *et al.*, Liu *et al.*, and Gaurav Thami G *et al.* reported similar findings, suggesting that patients with higher BMI have a higher likelihood of requiring conversion to open cholecystectomy [13]. These results highlight the importance of considering BMI as a potential risk factor during the decision-making process for cholecystectomy.

Regarding the presence of diabetes, the study observed elevated postprandial blood sugar levels in 10% of cases. Cornelia reported that type 2 diabetes carries a relative risk of 1.42 for the need to convert to open surgery, supporting the findings of this study. Mudavatu Bhagavan Naik *et al.*, however, did not find an association between increased total leukocyte counts, thick gall bladder wall, and the conversion rate in their study, which contrasts with the present study's results [14, 15].

Ultrasonography findings played a significant role in predicting the need for conversion. The study identified cholelithiasis in all cases, with 10% of them exhibiting a gallbladder wall thickening of more than 4 mm.

The overall conversion rate in this study was found to be 10%. This rate falls within the range reported in previous studies.

In comparison with other studies, this study provides valuable insights into the factors associated with the conversion rate from laparoscopic to open cholecystectomy. The findings align with existing literature, emphasizing the importance of gender, BMI, diabetes, and ultrasonography findings as significant predictors of conversion. The results can aid surgeons in preoperative decision-making, patient selection, and informed consent discussions. Nonetheless, further studies with larger sample sizes are warranted to validate these findings and improve the understanding of conversion factors in laparoscopic cholecystectomy.

Conclusion

In conclusion, this study highlights the significance of age, gender, BMI, diabetes, and ultrasonography findings in predicting the conversion rate from laparoscopic to open cholecystectomy. Male gender, higher BMI, the presence of diabetes, and a thickened gallbladder wall were identified as key factors associated with an increased risk of conversion. These findings emphasize the importance of careful patient selection and preoperative assessment to optimize surgical outcomes.

Conflict of Interest

Not available

Financial Support

Not available

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