

**ORIGINAL RESEARCH****To investigate the progression of predictive variables that determine conversion to open cholecystectomy from laparoscopic cholecystectomy****Dr. Jagdeep Singh<sup>1</sup>, Dr. Kiranjeet Kaur<sup>2</sup>**<sup>1</sup>Assistant professor, Department of Surgery, Government Medical college Amritsar, Punjab, India<sup>2</sup>Assistant Professor, Department of Gynaecology and Obstetrics, Government Medical College Amritsar, Punjab, India**Corresponding author**

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**ABSTRACT**

**Aim:** The purpose of this study was to investigate the progression of predictive variables that determine conversion to open cholecystectomy in patients who were having laparoscopic cholecystectomy.

**Material and methods:** A preoperative ultrasound was performed on each and every patient. A comprehensive proforma was designed in order to record information on demographics, previous history, history of the current disease, physical findings, laboratory tests, and ultrasound results. Patients over the age of 18 who volunteered to have elective laparoscopic cholecystectomy procedures were considered for participation in the trial. For the purpose of the research, the following aspects were analysed: age, gender, the reason for laparoscopic cholecystectomy (LC), preoperative tests of liver function, the rate of conversion to open cholecystectomy, and the reason for conversion.

**Results:** Throughout the course of the trial, a laparoscopic cholecystectomy was performed on 220 different individuals. There were 132 females, which constitutes 60%, and 88 males, which constitutes 40%, with an average age of 45.85 years. A total of 20 people ended up converting, yielding a conversion rate of 9.09% overall. In all, there were 11 men (representing 55% of the group) and 9 girls (representing 45%). Since inflammatory alterations made it impossible to identify the anatomy accurately, conversion to laparotomy was done in 55% of patients who had frozen Calot's triangle. This was done because of the frozen Calot's triangle. Seven of these 11 individuals had a history of acute cholecystitis prior to their current condition. Because to the significant intra-abdominal adhesions that four patients presented with as a result of earlier abdominal procedures, they were converted. Two (10%) of the conversions occurred as a result of the existence of cholecystoduodenal or cholecystocolic fistula. One (5%) of the conversions occurred as a result of a damage to the CBD that was detected and corrected on the operating table. Patients who had had a preoperative ERCP experienced two (10%) of the conversions.

**Conclusion:** The authors of the current research discovered that the existence of a history of acute cholecystitis, a gall bladder wall thickness of more than 5mm on preoperative ultrasonography, and being a male were independent predictor variables for converting a laparoscopic cholecystectomy to an open procedure.

**Keywords:** laparoscopic cholecystectomy, open cholecystectomy, conversion.

**Introduction**

In the modern day, laparoscopic cholecystectomy (LC) is the therapy of choice for symptomatic gallstones. This is due to the reduced morbidity, less post operation discomfort and hospital stay, improved cosmesis, and quicker return to usual activities that this procedure offers.<sup>1</sup> The presence of gallstones is often cited as one of the most frequent reasons for stomach discomfort. Cholecystectomy is the only treatment for symptomatic gallstones that is shown to be successful. Laparoscopic cholecystectomy has largely taken the role of the more invasive open cholecystectomy (OC) (LC).

Throughout the process of obtaining patients' informed permission for laparoscopic cholecystectomy, it is important to discuss with them the potential for the operation to be converted to an open surgery (OC).<sup>2,3</sup> According to the available research, the conversion rate might be anything from 2% to 15%.<sup>4,5</sup> It is well known that conversion may increase perioperative time, the risk of complications, the duration of a patient's stay in the hospital, and the cost incurred by the hospital. The identification of risk variables for conversion is thus very necessary in order to provide safer treatments and improved surgical planning. It is possible that variables relating to the patient, factors related to the surgeon, or equipment failure led to the conversion. Although if the conversion of the surgery from laparoscopic to open is related with an increased operating time, length of hospital stay, and morbidity, it should not be seen as a failure but rather as a required precaution to avert severe biliovascular complications. In order to gain an appropriate informed consent prior to surgery, it is required to identify the predictive criteria that may result in the treatment being converted to an open procedure. The purpose of this research was to identify both preoperative and intraoperative causes for conversion in patients having laparoscopic cholecystectomy at a tertiary care hospital. The study was aimed to detect both preoperative and intraoperative factors for conversion.

### **Material and methods**

Following receiving approval from the Institutional Ethics Committee and Review Board, the Department of Surgical conducted a retrospective analysis of all of the patients who had had laparoscopic cholecystectomy (LC) during that time period. A preoperative ultrasound was performed on each and every patient. A comprehensive proforma was designed in order to record information on demographics, previous history, history of the current disease, physical findings, laboratory tests, and ultrasound results. Documentation was kept for each patient on the reasons for conversion, which might include challenging anatomy or dissection, perioperative cholangiographic discoveries of stones, or perioperative problems. Symptomatic gallstones, elective cholecystectomy following an incident of acute cholecystitis, chronic cholecystitis, biliary pancreatitis, and choledocholithiasis treated with ERCP were some of the justifications for cholecystectomy. Other indications were choledocholithiasis. Patients over the age of 18 who volunteered to have elective laparoscopic cholecystectomy procedures were considered for participation in the trial. Those who presented with acute cholecystitis or a prior suspicion of gallbladder malignancy were not included in the study. Clinically, acute cholecystitis was determined to be present when there was a temperature of more than 38 degrees Celsius, discomfort in the right hypochondrium, and radiological evidence of inflammation on an ultrasound or computed tomography scan. Experienced laparoscopic surgeons were responsible for performing the cholecystectomies that were done laparoscopically. A systematic approach including the use of four ports was used throughout the surgical procedure. The critical perspective of safety (also known as CVS) was proven in every single one of the examples. For the purpose of the research, the following aspects were analysed: age, gender, the reason for laparoscopic cholecystectomy (LC), preoperative tests of liver function, the rate of conversion to open cholecystectomy, and the reason for conversion. In order to do the statistical analysis, continuous variables had to be converted into categorical forms by segmenting the patients into different subgroups. The subgroups were distinguished on the basis of age (less than 60 years old and older than 60 years), aspartate aminotransferase (AST) value (less than 40 IU/L and above 40 IU/L), alanine aminotransferase (ALT) value (less than 40 IU/L, and above 40 IU/L), and alkaline phosphatase (ALP) value (less than 140 IU/L and above 140 IU/L).

### **Statistical analysis**

For the univariate analysis as well as the multivariate analysis, each patient was first assigned to one of two groups: the laparoscopic group or the conversion to laparotomy group. The chi-square test was used in the conduct of the statistical study that was univariate. A statistically significant result was regarded to have a p-value of less than 0.05. In the multivariate statistical analysis, the decision to convert to a laparotomy was taken into consideration as the dependant variable. After the completion of the univariate study, the factors that were discovered to have a statistically significant impact were subjected to a multivariate analysis, specifically a multivariate logistic regression analysis. The statistical analyses were carried out with the help of the SPSS programme.

## RESULTS

Throughout the course of the trial, a laparoscopic cholecystectomy was performed on 220 different individuals. There were 132 females, which constitutes 60%, and 88 males, which constitutes 40%, with an average age of 45.85 years. Symptomatic cholelithiasis was the primary reason for surgery in the vast majority of cases. Patients diagnosed with acute cholecystitis received conservative treatment in accordance with the protocol of our centre, and elective surgery was performed between 6 and 8 weeks later. Throughout the course of our research, a total of 20 people ended up converting, yielding a conversion rate of 9.09% overall. In all, there were 11 men (representing 55% of the group) and 9 girls (representing 45%). Since inflammatory alterations made it impossible to identify the anatomy accurately, conversion to laparotomy was done in 55% of patients who had frozen Calot's triangle. This was done because of the frozen Calot's triangle. Seven of these 11 individuals had a history of acute cholecystitis prior to their current condition. Because to the significant intra-abdominal adhesions that four patients presented with as a result of earlier abdominal procedures, they were converted. Two (10%) of the conversions occurred as a result of the existence of cholecystoduodenal or cholecystocolic fistula. One (5%) of the conversions occurred as a result of a damage to the CBD that was detected and corrected on the operating table. Patients who had had a preoperative ERCP experienced two (10%) of the conversions. There was a statistically significant association between gall bladder wall thickness more than 5 mm and higher conversion rates (p 0.001). Table 1 outlines the many different factors that contribute to conversions.

In order to identify risk factors for conversion, a univariate analysis was carried out. This analysis looked at the following factors: increased age, gender, previous abdominal surgery, gall bladder wall thickness greater than 5mm on ultrasonography, preoperative ERCP, previous attack of acute cholecystitis, and increased serum levels of AST and ALT. There was a statistically significant correlation between male gender, gall bladder wall thickness of more than 5 mm, and the presence of a history of previously documented acute cholecystitis and higher rates of conversion. This was confirmed on multivariate analysis (p 0.05), as shown in Tables 2 and 3.

Table 1: Cause for conversion from laparoscopic to open cholecystectomy

Cause for conversion	Patient number	%
Frozen/Inflamed Calot's triangle	11	55
Extensive intra-abdominal adhesions	4	20
Post ERCP status	2	10
Cholecystoduodenal/colic fistula	2	10
Bile duct injury	1	5

Table 2: Relationship between clinical characteristics and risk factors for conversion from laparoscopic (LC) to open cholecystectomy (OC)

Variable	LC (n=200)	%	LC-OC (n=20)	%	p value
Age					
<60 yrs	120	60	12	60	
>60 yrs	80	40	8	40	0.564
Sex					
Male	76	38	11	55	0.006
Female	124	62	9	45	
Previous abdominal surgery	20	10	3	15	0.937
Post ERCP status	20	10	2	10	0.161
Gall bladder wall thickness > 5mm	14	7	10	50	<0.001
Previous acute cholecystitis	10	5	8	40	<0.001
AST					
<40IU/L	190	95	18	90	

>40IU/L	10	5	2	10	0.438
ALT					
<40IU/L	186	93	19	95	0.562
>40IU/L	14	7	1	5	
ALP					
<140IU/L	180	90	18	90	
>140IU/L	20	10	2	10	

**Table 3: Univariate and multivariate analyses in relation to conversion to open cholecystectomy.**

Variable	Univariate			Multivariate		
	P value	HR	95% CI	P value	HR	95% CI
Age (<60/>60 years)	0.85	0.87	0.58-1.36			
Gender (Male/Female)	0.007	1.74	1.62-2.67	0.001	2.01	1.31-3.11
Previous abdominal surgery (Yes/No)	0.74	0.88	0.87-1.47			
Post ERCP status (Yes/No)	0.21	0.52	0.57-1.69			
Gall bladder wall thickness (<5mm/>5mm)	<0.001	3.69	2.98-6.34	<0.001	3.21	1.54-2.99
Previous acute cholecystitis (Yes/No)	<0.001	3.85	3.87-7.14	<0.001	3.14	1.78-3.99

## DISCUSSION

Since Mouret P originally conducted the first laparoscopic cholecystectomy, it has become the gold standard for the treatment of symptomatic gall stone disease and has been frequently practised around the globe.<sup>6,7</sup> The proportion of patients who need an open cholecystectomy after undergoing a laparoscopic cholecystectomy ranges from 2 to 15%, according to the findings of a number of studies.<sup>4,5</sup> According to the research that has been done, the following factors can lead to conversion: unclear anatomy of the Calot's triangle as a result of inflammation or adhesions, bleeding during dissection, contracted gallbladder, biliovascular injuries, cholecystoenteric fistula, gallbladder cancer, Mirizzi syndrome, technical issues, and bowel injury.<sup>8-10</sup> In our series, the most common reason for conversion was an inability to identify the anatomy of the Calot's triangle and establish the crucial perspective of safety owing to inflammation and/or fibrosis. This finding is consistent with what has been reported in other studies as well.<sup>11-13</sup> Acute cholecystitis is one of the common characteristics that has been highlighted in prior research. It is also one of the factors that is highly predictive of conversion, which was shown in patients in our study who had a previous episode of acute cholecystitis.<sup>14,15</sup> The existence of substantial intra-abdominal adhesions, which made it impossible to execute a dissection in a safe manner, was the second factor that contributed to conversion in our research. It is well known that the presence of adhesions is a factor that increases the likelihood of conversion in elective LC. Previous surgery of the upper abdomen has been identified in a number of studies as a condition that increases the likelihood of requiring an open cholecystectomy.<sup>16,17</sup> Yet, the results of our research do not suggest that this is a factor that is likely to lead to conversion. Preoperative endoscopic retrograde cholangiopancreatography (ERCP) has been shown in many trials to be an independent predictor of conversion.<sup>18,19</sup> The inflammation of CBD and pericholedochal tissues that results from the operation is most likely to blame. Despite the fact that a small number of studies have demonstrated that early laparoscopic cholecystectomy after ERCP is associated with a lower conversion rate than delayed LC, there is still some debate regarding the optimal timing of surgery.<sup>20</sup> In our series, choledocholithiasis was discovered preoperatively in 20 cases, all of whom underwent ERCP clearance prior to laparoscopic cholecystectomy. The percentage of conversion among these individuals was 9.09%, which was comparable to the rate seen in the LC group. In the univariate study, preoperative ERCP did not seem to be a reliable predictor of conversion. Our research revealed that there is a significantly different rate of sexual orientation change in men and females, with the difference being statistically significant ( $p=0.006$ ). Few authors have shown that older age is an independent risk factor for conversion while others have failed to demonstrate a clear

correlation.<sup>4,12,17</sup> The present study did not demonstrate a correlation between older age and conversion, which is in accordance with other studies that show the male gender to be a risk factor for conversion. This is probably due to the more frequent association with severe disease, and the presence of more intra- abdominal and visceral adipose tissue than women. Several investigations found that a gallbladder wall thickness of more than 4–5 mm as measured by preoperative ultrasonography was a risk factor for conversion, and the results of the current research were similar with those of these other studies.

## CONCLUSION

The authors of the current research observed that the existence of a history of acute cholecystitis, a gall bladder wall thickness of more than 5mm on preoperative ultrasonography, and being a male were independent predictor variables for converting a laparoscopic cholecystectomy to an open procedure. Patients who have these characteristics should be given the appropriate counselling regarding the increased risk for conversion, and they should only be operated on by surgeons who are experienced in laparoscopic procedures. This will help reduce the rate of conversion as well as operative complications.

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