

## Evaluation of Risk Factors for Conversion to Open Surgery Among Patients with Acute Cholecystitis Undergoing Laparoscopic Cholecystectomy at the Tertiary Care Center

Prabhu Dayal<sup>1</sup>, Anil Kumar<sup>2</sup>, Parikshit Singh Chandawat<sup>3</sup>, Mangi Lal<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Surgery, Govt. Medical College, Pali

<sup>2</sup>Associate Professor, Department of Surgery, Govt. Medical College, Pali

<sup>3</sup>Assistant Professor, Department of Surgery, Govt. Medical College, Pali

<sup>4</sup>Senior Resident, Department of Surgery, Govt. Medical College, Pali

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Corresponding author: Dr. Mangi Lal

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### Abstract

**Background:** Laparoscopic cholecystectomy is becoming the gold standard operative procedure for cholelithiasis but still the conversion rate of open cholecystectomy from laparoscopic cholecystectomy is 5 to 10%. Laparoscopic cholecystectomy has also the benefits of preservation of the patients' immunity and reduction in the inflammatory reactions in comparison to open cholecystectomy.

**Material & Methods:** The 50 patients who had symptomatic cholelithiasis and gave consent to undergo laparoscopic cholecystectomy were enrolled by simple random sampling in the present study. Institutional Ethics Committee Clearance was obtained before the start of the study. Strict confidentiality was maintained with patient identity and data and not revealed, at any point in time.

**Results:** In the present study on the comparison of the ultrasonography findings and intraoperative findings we found a statistically non-significant association between i.e. p-value > 0.05 between intra-operative difficulty during laparoscopic cholecystectomy and number of gall stones (P-value > 0.05), gall bladder wall thickness (P-value > 0.05), size of gall stones (P-value > 0.05), position of impaction of gall stone at bladder neck (P-value > 0.05) and multiple gall stones (P-value > 0.05). Out of total study participants, 10 patients took more than 90 min of intra-operative duration to undergo the laparoscopic cholecystectomy, bleeding more than 100 ml was seen in 6 patients, difficult anatomy was found in 7 patients, adhesions with subsequent adhesiolysis was done in 9 patients, difficulty in gall bladder extraction was seen in 10 patients, intra-peritoneal gall bladder contents spillage seen in 13 patients (bile alone and stones along with bile were spilled in 10 and 3 patients respectively) and conversion to open surgery seen in 2 cases.

**Conclusion:** Increased gallbladder wall thickness, gall stones size >2 cm in diameter, gall stone impacted at gallbladder neck, biliary colic, palpable gall bladder, and BMI >30 kg/m<sup>2</sup> had a significant association with difficult laparoscopic cholecystectomy and should be considered as risk factors for conversion to open surgery among patients with acute cholecystitis undergoing laparoscopic cholecystectomy.

**Keywords:** Laparoscopic cholecystectomy, Cholelithiasis, Open cholecystectomy

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## Introduction

The incidence of gallstones is rare in the early two decades of life but it's gradually rising after the second decade of life and reaches its peak frequency after 50 years of life[1]. The prevalence is four times more among females than males. The estimated prevalence of cholelithiasis is approximately around 15% in our country, and the conversion rate from asymptomatic patients to symptomatic patients is approximately around 1-2% who required cholecystectomy as an intervention every year[2]. Cholelithiasis is among the commonest biliary pathology which required surgical intervention. A conference conducted by the national institute of health in the year 1992 had been focused on safe and effective treatment measures for symptomatic patients of cholelithiasis[3].

Nowadays laparoscopic cholecystectomy is widely and commonly performed and as well as the gold standard operative procedure for symptomatic cholelithiasis[4]. The benefits of laparoscopic cholecystectomy against the traditional open cholecystectomy are well documented and supported by various studies. In laparoscopic cholecystectomy there is better recovery of bowel functions, comparatively less postoperative pain, shorter duration of hospital stay, earlier return to normal life, informed cosmesis, and decreased the overall economic burden[5]. In our country since radiological investigations are readily available among higher treatment centers or even referral centers, hence laparoscopic cholecystectomy is performed commonly and provides a big coverage area across the country[6].

Laparoscopic cholecystectomy is becoming the gold standard operative procedure for cholelithiasis but still, the conversion rate of open cholecystectomy from laparoscopic cholecystectomy is 5 to 10% [7]. Laparoscopic cholecystectomy has also the

benefits of preservation of the patients' immunity and reduction in the inflammatory reactions in comparison to open cholecystectomy. There was also the very little incidence of postoperative infections reported among previous studies[8]. Therefore, it is mandatory to evaluate the risk factors that predict the conversion to open surgery among patients with acute cholecystitis undergoing laparoscopic cholecystectomy. Hence the present study was conducted to assess the predictive factors responsible for the conversion to open surgery among patients with acute cholecystitis undergoing laparoscopic cholecystectomy at our tertiary care center.

## Materials & Methods

The present was a prospective and cross-sectional study conducted at the department of general surgery of our tertiary care center. The study duration was of one year, from June 2018 to July 2019. The sample size was calculated from the epi info software version 7.0 at the acceptable margin of error of 10% and confidence interval of 95% with the 90% power of the study. The calculated sample size was 50 which also includes a loss to follow-up cases. The patients who had symptomatic cholelithiasis and gave consent to undergo laparoscopic cholecystectomy were enrolled by simple random sampling in the present study. Institutional Ethics Committee Clearance was obtained before the start of the study and written and informed consent for the procedure was obtained from all the patients. Strict confidentiality was maintained with patient identity and data and not revealed, at any point in time. All the patients were subjected to a pretested proforma and socio-demographic data were recorded along with detailed general physical and clinical examination. Patients who had choledocholithiasis, Patients who had surgical jaundice or any contraindication

for general anesthesia were excluded from the present study.

The study participants were evaluated by investigations before the laparoscopic cholecystectomy and CBC, LFT, KFT, blood sugar, serum electrolytes, coagulation profile, ECG, chest x-ray, and USG abdomen were carried out. History of biliary colic, lump in right hypochondrium, gallbladder wall thickness ( $\geq 3$ mm versus  $\leq 3$ mm), size ( $< 2$  cm versus  $> 2$  cm), and numbers of stones with their location were recorded. Intra-operative recording of the difficulty was done in each case. The criteria for operative difficulty were insertion of veress needle to removal of last trocar and cannula (more or less than 90 minutes), anatomy of calot's triangle (clear/unclear), amount of bleeding (mild, moderate or severe), adhesions (partial/dense), spillage of bile or stones in the peritoneal cavity (present/absent) and difficulty in extracting the gallbladder (present/absent). All the data was recorded on a Microsoft Excel spreadsheet and data analysis was done at 10% alpha and 90%

confidence interval using SPSS v22 software. Test of significance was applied on collected and organized data and a p-value less than 0.05 was considered as a statistically significant association between study variables.

### Results:

In the present study, a total of 50 patients undergoing laparoscopic cholecystectomy were enrolled after taking consent. The numbers of male and female patients in our study group were 36 % and 64% respectively. The age distribution in the present was from the youngest to the oldest subject was 17 and 67 years respectively. The most common age group in the present study was 20-40 years and the mean age of study participants was  $31 \pm 4.9$  years. The preoperative factors were recorded and evaluated in the present study. There was no significant association was reported among the age, sex, and history of previous surgery with the intra-operative difficulty during laparoscopic cholecystectomy in the present study. (Table 1)

**Table 1: preoperative variables wise distribution of study participants.**

Preoperative parameters	Number of patients
Mean age	$31 \pm 4.9$ years
Females	64%
BMI ( $> 30$ kg/m <sup>2</sup> )	38%
H/O previous abdominal surgery	12%
H/O previous attack of acute cholecystitis	14%
Single attack	76%
Multiple attacks	24%
H/O biliary colic ( $> 10$ attacks)	6%
Lump in right hypochondrium	4%
GB wall thickness ( $> 3$ mm)	22%
Size of largest stone ( $> 2$ cms)	24%
Impacted stone at the neck of gall bladder	10%
Multiple calculi on USG	84%

We found a statistically significant association between acute cholecystitis and the intra-operative difficulty during laparoscopic cholecystectomy in the present study and the P-value was less than

0.05. We also found a statistically significant association between multiple episodes of acute cholecystitis and the intra-operative difficulty during laparoscopic cholecystectomy in the present study and the P-value was less than

0.05. There was no significant association was found for a solitary episode of acute cholecystitis and the intra-operative

difficulty during laparoscopic cholecystectomy in the present study (P-value > 0.05).

**Table 2: Comparison between ultrasonographic findings and intraoperative findings of the study participants.**

Findings		Ultrasonographic	Operative	P-value
Gall bladder wall thickness	≥3 mm	26%	28%	> 0.05
	<3 mm	74%	72%	
Size of largest calculi	>2 cm	28%	26%	> 0.05
	≤2 cm	72%	74%	
Location of GB stone	Impacted	14%	16%	> 0.05
	Unimpacted	86%	84%	
Multiple calculi	Present	84%	86%	> 0.05
	Absent	16%	14%	

In the present study, we found a statistically significant association between pre-operative palpable gall bladder lump and the intra-operative difficulty during laparoscopic cholecystectomy in the present study and the P-value was less than 0.05. We also found a statistically significant association i.e. P-value < 0.05 between intra-operative difficulty during laparoscopic cholecystectomy and biliary colic and BMI of the patient.

In the present study on the comparison of the ultrasonography findings and intraoperative findings, we found a statistically non-significant association between i.e. p-value > 0.05 between intra-operative difficulty during laparoscopic cholecystectomy and number of gall stones (P-value > 0.05), gall bladder wall thickness (P-value > 0.05), size of gall stones (P-value > 0.05), position of impaction of gall stone at bladder neck (P-value > 0.05) and multiple gall stones (P-value > 0.05). Out of total study participants, 10 patients took more than 90 min of intra-operative duration to undergo the laparoscopic cholecystectomy, bleeding more than 100 ml was seen in 6 patients, difficult anatomy was found in 7 patients, adhesions with subsequent adhesiolysis was done in 9 patients, difficulty in gall

bladder extraction was seen in 10 patients, intra-peritoneal gall bladder contents spillage seen in 13 patients (bile alone and stones along with bile were spilled in 10 and 3 patients respectively) and conversion to open surgery seen in 2 cases. (Table 2).

#### Discussion:

Various differentiating criteria had been reported in previous researches which can predict the factors responsible for difficult laparoscopic cholecystectomy like male sex, old age patients, high BMI, recurrent episodes of acute cholecystitis, contracted gall bladder, and >3mm thick walled gall bladder[9]. Therefore, it is mandatory to evaluate the factors that predict the difficult laparoscopic cholecystectomy. Hence the present study was conducted to assess the predictive factors responsible for difficult laparoscopic cholecystectomy. In the present study, a total of 50 patients undergoing laparoscopic cholecystectomy were selected after taking consent. The response rate was 100% and there was no dropout in the present study.

The numbers of male and female patients in our study group were 36 % and 64% respectively. The age distribution in the present was from the youngest to the oldest subject was 17 and 67 years respectively. The most common age group in the present

study was 20-40 years and the mean age of study participants was  $31 \pm 4.9$  years. The preoperative factors were recorded and evaluated in the present study. There was no significant association was reported among the age, sex, and history of previous surgery with the intra-operative difficulty during laparoscopic cholecystectomy in the present study. Similar results reported in a study conducted by Gupta et al found no statistically significant association between age and sex of the patient with the intra-operative difficulty during laparoscopic cholecystectomy[10]. Similar results were also reported in a study conducted by Kanaan et al found no statistically significant association between history of previous surgery with the intra-operative difficulty during laparoscopic cholecystectomy[11].

In the present study, we found a statistically significant association between pre-operative palpable gall bladder lump and the intra-operative difficulty during laparoscopic cholecystectomy in the present study and the P-value was less than 0.05. We also found a statistically significant association i.e. P-value < 0.05 between intra-operative difficulty during laparoscopic cholecystectomy and biliary colic and BMI of the patient. Similar results were reported in a study conducted by Kama et al found that statistically significant association between pre-operative palpable gall bladder lump and the intra-operative difficulty during laparoscopic cholecystectomy[12]. Similar results were also reported in a study conducted by Fried et al found that statistically significant association i.e. p-value < 0.05 between intra-operative difficulty during laparoscopic cholecystectomy and biliary colic and BMI of the study participants[13].

Out of total study participants, 10 patients took more than 90 min of intra-operative duration to undergo the laparoscopic cholecystectomy, bleeding more than 100

ml was seen in 6 patients, difficult anatomy was found in 7 patients, adhesions with subsequent adhesiolysis was done in 9 patients, difficulty in gall bladder extraction was seen in 10 patients, intra-peritoneal gall bladder contents spillage seen in 13 patients (bile alone and stones along with bile were spilled in 10 and 3 patients respectively) and conversion to open surgery seen in 2 cases. Similar results were also reported in a study conducted by Randhawa et al found that statistically significant association i.e. p-value < 0.05 between intra-operative difficulty during laparoscopic cholecystectomy and high BMI, thick-walled gall bladder, palpable gall bladder, and previous hospitalization[14]. Similar results were also reported in a study conducted by Lal P et al found that preoperative ultrasonography is of key importance in categorizing patients preoperatively suitable for laparoscopic cholecystectomy or not and also reducing complications and decreasing the conversion to the open procedure[15].

### Conclusion:

We concluded from the present study that acute cholecystitis increased gallbladder wall thickness, gall stones size >2 cm in diameter, gall stone impacted at gallbladder neck, biliary colic, palpable gall bladder, and BMI >30 kg/m<sup>2</sup> had a significant association with difficult laparoscopic cholecystectomy and should be considered as risk factors for conversion to open surgery among patients with acute cholecystitis undergoing laparoscopic cholecystectomy. Since it is a small study with a relatively less sample size hence, the results of the present study can't be generalized to the general population. therefore, further elaborative research will be needed to formulate a score-based system based on variables to predict a difficult laparoscopic cholecystectomy.

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