

Preoperative Prediction of Difficult Laparoscopic Cholecystectomy: A Prospective Study

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Abstract:

Background: For the majority of gallbladder problems, laparoscopic cholecystectomy (LC) is regarded as the gold standard treatment. The benefits of LC include a quicker recovery from surgery, quicker return to full activity, fewer post-operative pain, and cosmetic benefits. LC has occasionally become challenging. Even with bile or stone spillage, it takes longer, and occasionally conversion to open cholecystectomy (OC) is necessary. The purpose of this study is to examine the challenges associated with laparoscopic cholecystectomy, including accessing the peritoneal cavity, producing pneumoperitoneum, dissecting the gallbladder, removing the gallbladder, and switching from laparoscopic to open cholecystectomy.

Methods: From October 2021 to March 2022, the Department of Surgical Gastroenterology at IGIMS, Patna, Bihar, conducted this prospective study. 52 people in all were enrolled in the trial. Prior to surgery, risk variables were assessed in all patients, and intraoperative observations were made. The strong correlation between preoperative score findings and surgical outcome was discovered using a chi-square test.

Results: A difficult laparoscopic cholecystectomy can be predicted preoperatively by a history of hospitalization for gallstone diseases, an ultrasound abdomen showing gall bladder wall thickness >4 mm, the presence of pericholecystic collection, and an impacted stone. Age >50 years, gender, BMI >25 kg/m², and history of supraumbilical surgery/scar are not individually considered to be favourable predictors of outcome.

Conclusions: Combining all of these variables will help build a consistent grading system that will be carefully examined in order to forecast a challenging laparoscopic cholecystectomy.

Keywords: Laparoscopic cholecystectomy, Difficult, Predictive factors, Gallstone diseases, Open cholecystectomy.

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Introduction

When its inventor Carl Johann Langenbuch performed the first open cholecystectomy for cholelithiasis in 1882, it was thought of as the surgical treatment for the therapy of symptomatic gall stone disease. Philippe Mouret carried out the first laparoscopic cholecystectomy in 1987. [1,2] The benefits of laparoscopic cholecystectomy include the following Cosmetics, a quicker recovery to normal bowel function, and reduced postoperative pain a shorter hospital stay, an earlier return to normal activity, a smaller total incision, and a lower overall cost. [3-5]

Although deemed safe and successful, laparoscopic cholecystectomy (LC) can occasionally be challenging due to a variety of issues encountered during a surgical treatment. Identifying anatomy

due to adhesions or inflammation, anatomical variation, forming pneumoperitoneum, entering the peritoneal cavity, releasing adhesions, a fibrotic and contracted gall bladder, and extracting the gall bladder are just a few of the issues that can arise. Preoperative diagnosis of "difficult laparoscopic cholecystectomy" may aid in enhancing patient safety, providing appropriate preoperative planning and counseling, choosing the technique (open vs. laparoscopic), lowering conversion rates, and lowering total difficulties and morbidity.

In order to reduce complications and provide improved patient outcomes, the current study is being conducted to determine the numerous characteristics that potentially indicate difficulty in laparoscopic cholecystectomy.

Material and Methods

This prospective observational study was carried out in Department of Surgical Gastroenterology, Indira Gandhi Institute of Medical Sciences, Patna, Bihar from October 2021 to March 2022.

In this study, patients with symptomatic cholelithiasis, gall bladder polyps, or acute or chronic calculous cholecystitis regardless of age or sex are included. Patients who had concomitant CBD calculi, gallbladder perforations, calculus cholecystitis, preoperatively diagnosed Mirizzi syndrome, suspected or confirmed gall bladder malignancy, altered LFT, and features of obstructive jaundice, and who are therefore unsuited for general anesthesia, have been excluded.

Preoperative evaluations of the patients included detailed histories, physical examinations, blood tests, and USG abdomen after an overnight fast.

Age, gender, prior hospitalizations for gall stone illnesses, prior supraumbilical surgery, body mass index, and USG findings such as gall bladder wall thickness, pericholecystic collection, and impacted stone at the neck of GB were all taken into account before surgery in this study. The variables used to evaluate each study element were all dichotomous.

The statistical software namely statistical package for social sciences (SPSS) 20 was used for the analysis of the data and Microsoft word and Excel have been used to generate tables. Categorical data

represented in frequencies and proportions. Chi-square test has been used to find the significant association of findings of preoperative score with post-operative outcome. $P < 0.05$ is considered as statistically significant value.

Results

A total of 54 individuals were participated in this trial, however 2 patients were excluded because one had Mirizzi syndrome and the other had a gallbladder perforation that occurred after surgery. Therefore, the remaining 52 patients were enrolled in our study, with a sex ratio of 1:2.05. Of these, 17 were male and 35 were female. Participants range in age from 15 to 80 years old, with a mean age of 38.8 years. Participants' average ages were 38.35 for men and 39.03 for women. Ages 31 to 40 account for the largest proportion of cases (17, or 32.7%).

In our study group, women made up 35 out of 52 patients (67.3%), despite the literature's evidence for women's greater risk of gallstone disease.

Six patients (11.5%) experienced bile spillage, which was treated with irrigation and suction; none of these patients underwent open cholecystectomy.

The conversion rate mentioned in the literature ranges from 7 to 35%. It is 7.69% in our study. (4 out of 52). Heavy bleeding in one case, tight adhesions between the gall bladder and the omentum, and frozen Calot's triangles in the other three cases were the causes of conversion.

Table 1: Pre-operative scoring parameters

Variables	No. of patients	Percentage
Age (years)		
• <50	37	71.15%
• >50	15	28.85%
Sex		
• Male	17	32.70%
• Female	35	67.30%
History of previous hospitalization for gall bladder diseases		
• No	40	76.93%
• Yes	12	23.07%
BMI (kg/m ²)		
• <25	32	61.54%
• >25	20	38.46%
Abdominal scar		
• No	46	88.47%
• Yes	6	11.53%
GB wall thickness (mm)		
• <4 mm	43	82.69%
• >4 mm	9	17.31%
Pericholecystic collection		
• No	42	80.76%
• Yes	10	19.24%
Impacted stone		
• No	37	71.15%
• Yes	15	28.85%

Age >50 years (p-0.265), male gender (p-0.569), BMI >25 kg/m² (p-0.865), history of prior supraumbilical surgery (p-0.254), and intraoperative difficulty during laparoscopic cholecystectomy were not significantly associated with each other. We discovered a significant correlation between the following factors:

pericholecystic collection (p-0.0065), impacted stone at the neck of the gall bladder (p-0.036), gall bladder wall thickness >4 mm, and history of hospitalization for gall stone disorders (p-0.045). 19 of the 52 patients required less than 60 minutes, and 29 required between 60 and 120 minutes. In 4 cases, an open cholecystectomy was performed.

Table 2: Intraoperative outcome

Variables	Easy	Difficult	Very difficult	p-value
Age (years)				
• <50	15	18	4	0.265
• >50	3	11	1	
Sex				
• Male	6	9	2	0.596
• Female	13	20	2	
BMI (kg/m ²)				
• <25	15	14	3	0.865
• >25	4	15	1	
Abdominal scar				
• Yes	1	4	1	0.254
• No	21	23	2	
History of hospitalization				
• Yes	2	9	1	0.045
• No	23	15	2	
GB wall thickness				
• <4 mm	25	16	2	0.036
• >4 mm	1	7	1	
Pericholecystic collection				
• Yes	1	7	2	0.0065
• No	27	13	2	
Impacted stone				
• Yes	4	10	1	0.0267
• No	25	11	1	

Discussion

In general, LC becomes more challenging as you become older due to cholecystitis attacks that happen more frequently as you age and the likelihood that you've had surgery in the past as you age. [6,7] The findings of the current study regarding age greater than 50 years as a predictive factor for challenging LC and age as a criteria found to be non-significant (p-0.265) and it is comparable with previous studies but not comparable to Husain et al, primarily because the age selection criteria of the study group of was 34 to 65 years and is different from the present study. [5,8-11]

Male gender is seen as a predictor factor for challenging LC because men with symptomatic gall stone disease are more susceptible to inflammation and fibrosis with the same disease intensity as compared to women. Since the male to female ratio in Vijay Kassa et al.'s study is very high, our findings showing the male gender is an unimportant factor for predicting a problematic LC (p-0.596) are consistent with previous studies but do not apply to their findings. [5,8-11] Obesity

makes it harder to properly position the umbilical port because the umbilicus is shifted downward and it is challenging to see the umbilical fascia. And it becomes more challenging to distinguish anatomy due to an abundance of fat.

Therefore, a body mass index of over 25 kg/m² is seen to be a reliable indicator of a challenging LC. We discovered that BMI >25 kg/m² is an unimportant factor for predicting a challenging LC (p-0.865), which is in line with earlier research but not with the Bunkar et al. study because their study criterion was >30 kg/m², which definitely indicates obesity. [5,8-10,12] Adhesions may result from prior surgical surgery. Adhesions, particularly umbilical and supraumbilical adhesions have been shown to be indicators of problematic LC, limiting the scope of the assessment to the gall bladder. [13]

Therefore, the existence of a supraumbilical scar is thought to be a predictor of a challenging LC. We discovered that having had upper abdominal surgery or having a suprapubic scar is not a reliable indicator of a challenging LC. (p-0.254) and is consistent with earlier research, but not with the findings by Agrawal et al. because there were

fewer patients in that study and about one-third of the 30 participants had supraumbilical scars. [5,8-10,12] Gall bladder becomes fibrosed and constricted after numerous cholecystitis bouts, making it difficult to hold the GB. In light of this, a risk factor for problematic LC is a history of hospitalization for gallstone disorders.

In the current study, we discovered in line with other research—that a history of hospitalization for gall stone disorders is a significant predictor of a challenging LC (p-0.045). Gall bladder inflammation makes it challenging to grasp the gallbladder with delicate laparoscopic tools, increasing the length of the procedure and making it difficult to manipulate the gallbladder, according to studies. [5,8,10–12] In the current investigation, GB wall thickness less than 4 mm was thought to be a factor in easy LC prediction, and GB wall thickness greater than 4 mm was thought to be a role in difficult LC prediction. We discovered that a major predictor for predicting a challenging LC (p-0.036) is GB wall thickness more than 4 mm. and is in line with earlier research. [5, 8-10]

Due to inflammation and anatomical distortion, the presence of inflammatory fluid beyond the gall bladder is more frequently associated with extensive adhesions and difficulty detecting the calot's triangle. As a result, the presence of pericholecystic collection on USG is thought to be a factor in predicting a difficult LC, while the absence of pericholecystic collection is thought to be a factor in predicting an easy LC.

According to the results of the current investigation, the presence of pericardiocystic collection is a significant predictor of a challenging LC (p-0.0065). and is in line with earlier research. [9,10,12] Impacted stones in the gall bladder neck make LC challenging during calot's dissection and duct identification and cutting. Additionally, the presence of big stones in the gall bladder neck causes distention and makes grabbing challenging. In the current study, an impacted stone at the neck of the GB was thought to be a predictor of a difficult LC, while a movable stone or a stone elsewhere in the GB was seen to be a predictor of an easy LC. In line with earlier studies, we discovered that an impacted stone near the neck of the GB is a significant predictor of a challenging LC (p-0.0267). [5,9,10,12]

The present study did not include other characteristics, such as adhesions and anatomical variations, which are crucial factors to cause difficulty in laparoscopic cholecystectomy and typically cannot be recognized in standard abdominal sonography. The operating surgeon's surgical expertise is a key element that affects the procedure's time requirements.

Conclusion

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Gall bladder wall thickness >4 mm on an abdominal ultrasound, the presence of pericholecystic collection, and an impacted stone at the neck of the gall bladder can all be thought of as individually significant positive factors to predict a challenging laparoscopic cholecystectomy preoperatively.

Age greater than 50, being a man, having a body mass index greater than 25 kg/m², having undergone supraumbilical surgery previously, or having a supraumbilical scar cannot be regarded as individual positive prognostic indicators for a challenging laparoscopic cholecystectomy. Combining all of these variables will help build a consistent grading system that will be carefully examined in order to forecast a challenging laparoscopic cholecystectomy.

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