

Pre-Operative Predictors of Difficult Laparoscopic Cholecystectomy

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Abstract:

Background: Laparoscopic cholecystectomy (LC) is regarded as the gold standard therapy for the majority of gallbladder problems. There are several benefits, despite the fact that LC can occasionally be challenging. It is quite difficult to tell beforehand whether a surgery will be simple or complicated.

Methods: This is a prospective study conducted over a 12-month period on patients between the ages of 16 and 60 who presented with symptoms and signs of Cholelithiasis/Cholecystitis and were identified by USG examination. The purpose of the study was to evaluate several preoperative predictors (history/ clinical/ imaging) and establish a grading mechanism for challenging laparoscopic cholecystectomy.

Results: In a study of 150 patients to determine the pre-operative predictors of difficult laparoscopic cholecystectomy, 65.3% (n=98) of the patients were female. Higher BMI, GB thickness >4mm, hospitalization history, female gender, and pericholecystic collection are significantly correlated with difficult and extremely difficult grading of scores.

Conclusion: Numerous risk factors, including old age, male sex, attacks of acute cholecystitis and pancreatitis, obesity, prior abdominal surgery, palpable gall bladder, and certain ultrasonographic findings, such as thickened gall bladder wall, pericholecystic fluid collection, and impacted stone, make laparoscopic surgery challenging.

Keyword:Cholelithiasis; Laparoscopic cholecystectomy;Open cholecystectomy.

Introduction

Laparoscopic cholecystectomy is a minimally invasive surgical procedure for removal of a diseased gallbladder. This technique essentially has replaced the open technique for routine cholecystectomies since the early 1990s. At this time, laparoscopic cholecystectomy is indicated for the treatment of cholecystitis (acute/chronic), symptomatic cholelithiasis, biliary dyskinesia, acalculous cholecystitis, gallstone pancreatitis, and gallbladder masses/polyps. These indications

are the same for an open cholecystectomy. Cases of gallbladder cancers are usually best treated with open cholecystectomy¹⁻³. Approximately 20 million people in the United States have gallstones. Of these people, there are approximately 300,000 cholecystectomies performed annually. Ten percent to 15% of the population has asymptomatic gallstones. Of these, 20% are symptomatic (biliary colic). Of the 20% who are symptomatic approximately 1% to 4% will manifest complications (acute cholecystitis, gallstone pancreatitis, choledocholithiasis, gallstone ileus). The incidence of gallstones increases with an increase in age, with females more likely to form gallstones than males. Age 50 to 65 approximately 20% of women and 5% of men have gallstones. Overall, 75% of gallstones are composed of cholesterol, and the other 25% are pigmented. Despite the composition of gallstones the clinical signs and symptoms are the same⁴⁻⁶. Cholecystectomy was regarded as the surgical treatment for gallstone illness (cholelithiasis) in 1882, when its pioneer, Carl Johann August Langenbuch, conducted the first cholecystectomy on a patient with cholelithiasis. Laparoscopic cholecystectomy (LC) is the therapy of choice for the majority of gallbladder disorders. The benefits of LC include an earlier recovery of bowel function, less postoperative discomfort, a shorter hospital stay, and an earlier return to full activity⁵⁻⁷. At times, LC has been challenging. Even with bile/stone leakage, it takes longer, and occasionally conversion to open cholecystectomy is necessary (OC). It is quite difficult to tell beforehand whether a surgery will be simple or complicated. Again, the degree of difficulty in LC is unforeseeable⁸⁻⁹. Currently, there is no conventional grading method available to estimate preoperatively the degree of difficulty^{10,11}. This study seeks to evaluate several preoperative predictors (history/ clinical/ imaging), construct a grading mechanism for difficult laparoscopic cholecystectomy, and establish a correlation between preoperative predictive variables and intraoperative difficulties in lap cholecystectomy. Thus detects the elements that might indicate difficulty in LC, allowing for the prevention of issues ahead.

Material AndMethods

This study was conducted in the Department of General Surgery, Government Medical College for a period of 12 months.

Study Design: Observational study

Study Location: This was a tertiary care teaching hospital-based study done in the Department of General Surgery.

Study Duration: JANUARY 2020 TO DECEMBER 2020 for a period of 12 months.

Sample size: 150 patients.

Sample size calculation: The study population was drawn from consecutive patients who presented

to the Department of General Surgery presenting with symptoms and signs of Cholelithiasis /Cholecystitis and were diagnosed by USG examination. 150 cases were selected after applying inclusion and exclusion criteria

Inclusion criteria:

Patients aged between 16 and 60 years presenting with symptoms and signs of Cholelithiasis / Cholecystitis, diagnosed by USG examination and undergoing laparoscopic cholecystectomy in a single unit during the study period were included.

Exclusion criteria:

Patients with obstructive jaundice, CBD calculus, dilated CBD, where CBD exploration was needed and those not willing to be part of the study were excluded.

Procedure methodology

Preoperative risk factors assessed were history (age, sex, previous hospitalization for abdominal surgeries/ cholecystitis/ pancreatitis), clinical (BMI, Abdominal scar- infraumbilical or supraumbilical, palpable gall bladder) and radiological (Gall bladder wall thickness, pericholecystic collection, impacted stone) as shown in table 1.

FACTORS			SCORE (MAX=15)
AGE	<50(0)	>50(1)	1
SEX	FEMALE(0)	MALE(1)	1
H/O HOSPITALISATION	NO(0)	YES(4)	4
BMI	<25(0)	>25-27.5(1), >27.5(2)	2
ABDOMINAL SCAR	NO(0)	INFRAUMBILICAL(1) , SUPRAUMBILICAL(2)	2
PALPABLE GB	NO(0)	YES((1)	1
GB WALL THICKNESS	THIN(<4mm) (0)	THICK(>4mm)(2)	2
PERICHOLECYSTIC COLLECTION	NO(0)	YES (1)	1
IMPACTED STONE	NO(0)	YES (1)	1

Table 1: Variables used for preoperative scoring

TOTAL SCORE:

GRADING: EASY(<5)

DIFFICULT (6-10)

VERYDIFFICULT(11-15)

Following an evaluation, the patient will be subjected to laparoscopic cholecystectomy with attention on the operative time taken from incision to port closure, bile /stone spillage, bleeding during surgery, injury to duct/artery and need for conversion regarding upon the difficulty of the case. Based upon these factors the study population will be graded as easy, difficult and very difficult.

Easy:

- Time taken <60min
- No bile spillage
- No injury to duct, artery

Difficult:

- Time taken 60–120min
- Bile/stone spillage
- Injury to duct
- No conversion

Very difficult:

- Time taken >120min
- Conversion

Statistical analysis

Data recording was done in a predesigned proforma. All the data was entered into Microsoft Excel. For analysis purposes, all predictors were stratified into two groups i.e. age <50yrs and >50yrs, BMI <25, 25-27.5 and >27.5. A chi-square test was used to derive the p-value of the difference between two strata of predictors. A p-value of <0.05 was taken as significant. The correlation coefficient along with the p-value was calculated to find the relationship between risk factor and type of intraoperative difficulty.

Result

AGE

76 out of 150 patients in the study were in the age group of <50 years (50.6%) and the remaining 74 were above 50 years (figure 1)

GENDER

In the present study of 150 patients, the majority of them were females (65.7%). Among the 98 females 62 were less than 50 years of age group. Of the 52 male patients, 38 belong to >50 years age group.

HISTORY OF HOSPITALISATION

Only 9.8% of them had a history of hospitalization

ABDOMINAL SCAR

The abdominal scar was noticed in 90 patients. Among these, 86 had infraumbilical scar and 4 of them supraumbilical scar. The majority of the patients with infraumbilical scars were females (84 out of 86).

PALPABLE GALLBLADDER Only two patients had palpable gallbladder

RADIOLOGY

Radiological evaluation showed gallbladder wall thickness of >4 mm in 20 patients (13%), pericholecystic collection in 12 patients and impacted stone in two cases.

BMI

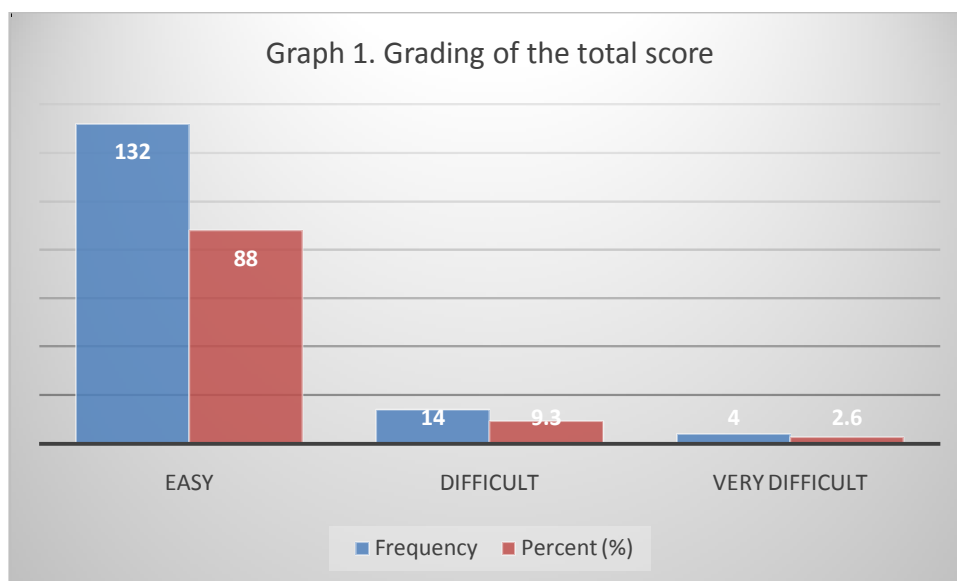
The majority (50.7%) had a BMI of <25.

GRADING OF TOTAL SCORE

Preoperatively, based on the total score it went on to predict easy for 132 cases, difficult for 14, and very difficult for 4 cases respectively.

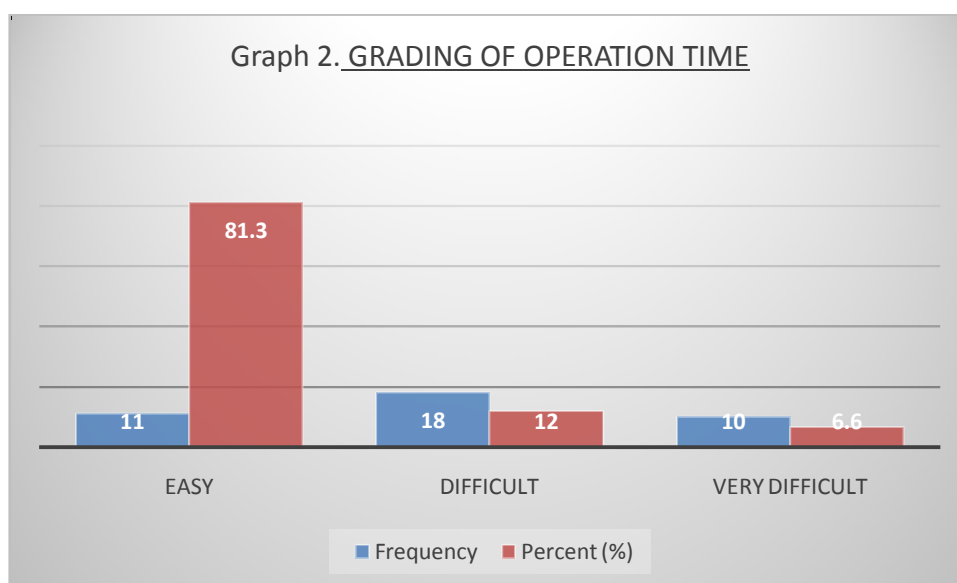
Grading	Frequency	Percent(%)
Easy	132	88
Difficult	14	9.3
Very Difficult	4	2.6

Table 1: Grading of the total score



GRADING OF OPERATION TIME

During laparoscopic cholecystectomy time taken from port incision to closure is considered. It was easy for 11 cases, difficult for 18 cases, and very difficult for 10 cases.



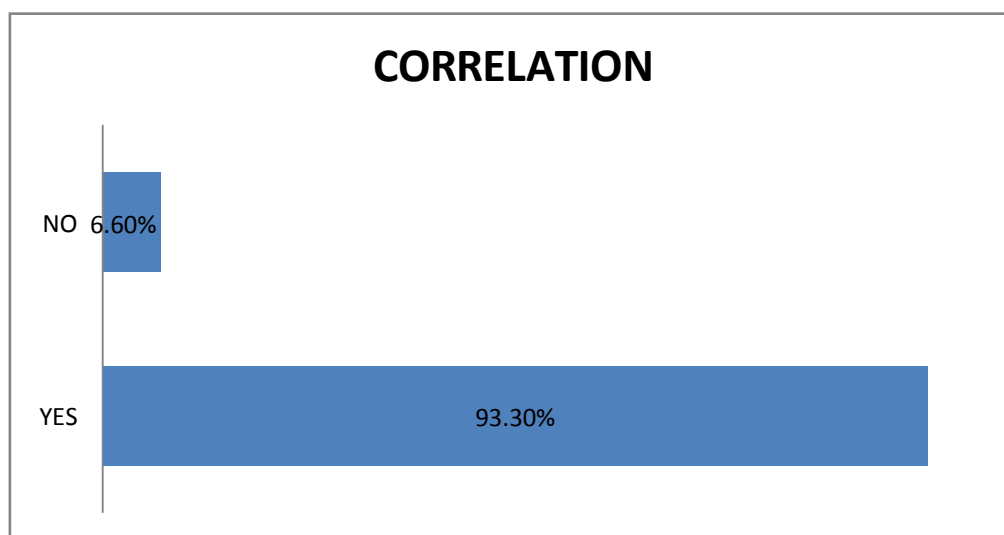
Operation Time in Minute	Frequency	Percent (%)
Grade		
Easy	11	81.3
Difficult	18	12
Very Difficult	10	6.6

Table 2: Grading of operation time

Among the 10 very difficult cases, 8 had been converted into open cholecystectomy and two surgery got prolonged for >120 minutes.

CORRELATION BETWEEN TOTAL SCORE AND OPERATION TIME

The total score is correlating with operation time in 93.3% of cases (140 cases) as shown in Graph 3.



Graph 3: Correlation between total score and operation time

Outlier case analysis

Ten cases did not fall into the correct prediction of outcome from scoring.

- 1) 4 cases predicted as easy and 2 cases with supraumbilical incision suspected to be difficult turned out to be very difficult and all 6 cases converted to open cholecystectomy due to adhesions and frozen calots
- 2) Two 66 years old males with infraumbilical incision and two other patients with previous acute cholecystitis were predicted as easy but turned out to be difficult as both surgeries took time beyond 60 minutes.

Discussion

Cholecystectomy is one of the most commonly performed abdominal surgical procedures, and in developed countries many are performed laparoscopically. As an example, 90 percent of cholecystectomies in the United States are performed laparoscopically. Laparoscopic cholecystectomy is considered the "gold standard" for the surgical treatment of gallstone disease. This procedure results in less postoperative pain, better cosmesis, and shorter hospital stays and disability from work than open cholecystectomy. However, the overall serious complication rate in laparoscopic cholecystectomy remains higher than that seen in open cholecystectomy

Laparoscopic cholecystectomy is the gold standard therapy for gallbladder problems, particularly

symptomatic cholelithiasis. However, this procedure is not free of risks and the surgeon must exercise caution. The primary objective of the present study was to evaluate the various preoperative predictors (history/ clinical/ imaging) and to develop a scoring system for difficult laparoscopic cholecystectomy. The secondary objective was to correlate preoperative predictive factors with intraoperative difficulty in lap cholecystectomy.

In a study of 150 patients to determine the pre-operative predictors of difficult laparoscopic cholecystectomy, the majority of patients were female (65.3%) and the age of presentation was not significantly different. In our study, a grading system was developed to preoperatively assess the severity of laparoscopic cholecystectomy based on clinical observations, medical history, and imaging. The grades were designated as easy (5), difficult (5-10), and extremely difficult (10). (11-15). The grading method accurately predicted the outcomes for 93.3% of the cases under evaluation. Similar findings were published by Randhawa JS et al.¹ in 2009 (88-92%, easy to difficult) and Dhanke PS et al.² in 2014 (94.05-100%, easy to difficult). Due to adhesions, only ten cases did not correspond with the score.

In this study, greater BMI (>30), gallbladder thickness >4mm, hospitalisation history, female gender, and pericholecystic collection are related with difficult and very difficult grading of score with a strong positive connection between total score and operation time. This conclusion is consistent with a 2014 research by Dhanke PS et al.², which found that a history of hospitalisation, a high BMI, and the presence of a pericholecystic collection are all predictors of a difficult laparoscopic cholecystectomy.

Due to omental adhesions and abnormal calots architecture, 6.7% in this research were converted to open. This is significantly different from the findings of studies conducted by Randhawa JS et al.¹ in 2009, Lal P et al. in 2014, Nachnani J et al.⁵ in 2005, and Vivek et al.⁴ in 2008. This heterogeneity can be attributed to differences in sample size, underlying prognostic factors of the person, surgeon-to-surgeon variability, and the absence of a standard assessing system. The low rate of complications can be achieved by the refinement of surgical procedures and the doctors' expertise.

In this study, there is a significant positive correlation between operation time and total score ($r=0.8, p<.001$), positive significant relationship between total score and abdominal scar, positive significant relationship between operation time and abdominal scar ($r=0.558, p<0.001$), positive significant relationship between total score and GB wall thickness ($r=0.845, p<0.001$), positive significant relationship between operation time and GB wall thickness ($r=0.873, p<0.001$), positive significant relationship between total score and Pericholecystic collection ($r=0.855, p<0.001$), positive

significant relationship between operation time and Pericholecystic collection ($r=0.862, p<0.001$), positive significant relationship between total score and history of hospitalisation ($r=0.813, p<0.001$), and positive significant relationship between operation time and history of hospitalization ($r=0.771, p<0.001$).

The current scoring system used in this study is very effective in predicting the difficulty of the laparoscopic cholecystectomy with very high sensitivity.

Conclusion

Cholecystectomy via laparoscopy is a less invasive procedure. What appears easy may not always be straightforward, and in such cases the results might be catastrophic. Consequently, there must be a means through which complications may be anticipated prior to surgery. From the study, the following findings may be derived;

- Obstacles arise when there are thick adhesions in the Calot's triangle, fibrotic and constricted GB, intensely inflammatory GB, gangrenous gall bladder and cholecystoenteric fistula, etc.
- A statistical study revealed that female sex, a previous episode of cholecystitis, a history of upper abdominal surgery, a sonographically determined thick gallbladder wall, age >50 years, and a preoperative diagnosis of acute cholecystitis have a substantial impact on the likelihood of conversion.
- Preoperative prediction of the risk of conversion or operation difficulties is a crucial part of laparoscopic surgery planning. In the last several years, numerous research and grading systems have been developed for preoperative prediction of difficulties.
- This study combines preoperative clinical and radiographic factors for a more accurate prediction of complicated laparoscopic cholecystectomy. This offers a foundation for future research to evaluate this element and also facilitates the development of an effective grading system for predicting difficult laparoscopic cholecystectomy and decreasing the occurrence of complications.

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