

Assessment of Prediction Factors Causing Difficulties in Laparoscopic Cholecystectomy

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Abstract:

Background: Laparoscopic cholecystectomy (LC) is the gold standard treatment for symptomatic cholelithiasis. In LC, the surgeons encountered various difficulties depending on the difficulty faced during the surgery; the outcome of LC may vary from abandoning the procedure or partial cholecystectomy to conversion into open cholecystectomy.

Aim: Objective of present study is to identify various factors predict the difficult laparoscopic cholecystectomy so that an early conversion to open cholecystectomy can be considered.

Materials and Methods: This hospital-based observational study was conducted in the Department of General Surgery for a period of 3 years. 100 diagnosed cases of cholelithiasis undergoing for elective were included. The scores were given on history, clinical examination and sonological findings one day prior to surgery on admission.

Results: Majority of the patients (82%) were given score between 0-5, positive prediction value of this scoring system for easy procedure is 70.7% & for difficult procedure is 77.8%. Majority of the patients (68%) were in age group less than 50 years, most of them (75%) were females. Maximum patients (80%) having symptoms <6 months duration. Age, gender & duration of symptoms are not statistically significant pre-operative factors for predicting difficulty ($P>0.05$). BMI and Previous attacks of acute cholecystitis are the significant pre-operative factors for predicting difficulty ($P<0.05$). Gall bladder wall thickness, impacted stone and contracted gall bladder on USG findings are statistically significant pre-operative factors predicting difficulty ($P<0.05$), but Pericholecystic edema in USG findings is not a statistically significant pre-operative factor predicting difficulty ($P>0.05$).

Conclusion: The scoring system used as a protocol for predicting difficulty levels preoperatively in LC. It can help to decide the surgical approach, counsel the patients, and reduce the complication rate, rate of conversion, and overall medical cost.

Keywords: Cholelithiasis, Difficult Laparoscopic Cholecystectomy, Easy Laparoscopic Cholecystectomy, Prediction, Scoring System.

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Introduction

Laparoscopic cholecystectomy (LC) is the gold standard treatment for symptomatic cholelithiasis due to its effectiveness, and safety. Moreover, the benefits of laparoscopic cholecystectomy are; less postoperative pain, faster recovery, earlier return of bowel function, and shorter hospital stay when compared to conventional cholecystectomy [1-2].

It has rapidly replaced open cholecystectomy (OC) as the standard treatment of symptomatic uncomplicated gallstone disease [3]. It is estimated that approximately 20 million people in the United States have gallstones and that approximately 1 million new cases of cholelithiasis develop each

year. In India the prevalence is estimated to be around 4% [4]. The LC is the most common operation performed these days, some of the intended LC required conversion due to several factors. LC may be rendered difficult by various problems encountered during surgery, such as in accessing the peritoneal cavity, creating pneumoperitoneum, dissecting the gall bladder (GB) from its bed or extracting the excised GB [5].

Age, sex, obesity, duration of gallstone disease, number of attacks of cholecystitis, previous abdominal surgery and liver function tests with elevated alkaline phosphatase have been considered

as factors responsible for difficult LC. Similarly, intra-operative findings like adhesions, diseases of liver, abnormal anatomy of GB and biliary tract, complication during dissection like bleeding, bile duct injury, GB perforation, stone loss and also visceral injury may render laparoscopic surgery difficult. Hence in 2% to 15% of patients LC is converted to OC because of technical difficulty or intra-operative complications [6,7].

In case of laparoscopic cholecystectomy, preoperative complexity estimation helps surgeons deciding whether to proceed with a minimally invasive approach, perform an open procedure or make a referral to a more experienced surgeon. It may also be useful for explaining the various risks of laparoscopic and open procedures [8].

Although laparoscopic cholecystectomy has generally a low incidence of morbidity and mortality and of conversion rate to open surgery, its outcome is particularly affected by the presence and severity of inflammation. Pre-operative prediction of difficult LC may not only improve patient safety but also be useful in reducing the overall cost of therapy [9]. Thereby it is possible to reduce morbidity, complication, rate of conversion. Thus, this study aimed to determine predictors for difficult LC.

Material and Methods:

This cross sectional observational study was conducted in the department of general surgery in a tertiary care hospital India from August 2009 to August 2011 (03 years).

Inclusion Criteria

- Patients age ≥ 18 years with both gender
- Elective laparoscopic cholecystectomy for gall stone disease
- Patients who provided written informed consent for the study

Exclusion Criteria

- As a emergency laparoscopic cholecystectomy procedure
- Patient with common bile duct stone
- Equipment failure
- Patients who provided written informed consent for the study

A total of 100 cases fulfilled the inclusion criteria were enrolled. All the cases were studied prospectively.

The scores were given on history, clinical examination and sonological findings one day prior to surgery on admission (table below).

This scoring system was originally developed by Randhwa & Pujahari [10].

Table 1:

Parameters				Max. Score
Age		< 50 yrs (0)	>50 yrs (1)	1
Sex		Female (0)	Male (1)	1
history of previous attacks		N (0)	Y (4)	4
Clinical	BMI (kg/m ²)	< 25 (0)	25-27.5 (1) >27.5 (2)	2
	Abdominal scar	N (0)	Infra- umbilical (1) Supra-umbilical (2)	2
Sonography	Contracted G.B.	N (0)	Y (1)	1
	Wall thickness	Thin (0)	Thick > 4mm (2)	2
	Pericholecystic collection	N (0)	Y (1)	1
	Impacted stone	N (0)	Y (1)	1

*Total maximum score = 15, N= no, Y= yes

Score up to 5 was defined as easy, 6-10 as difficult, and 11-15 as very difficult. We pre-operatively defined easy, difficult & very difficult. (Table below)

Table 2:

Easy	- Time taken < or = 60 mins - no bile spillage - no injury to duct, artery
Difficult	- Time taken > 60 to <120 mins - Bile/stone spillage - Injury to duct - No conversion
Very Difficult	- Time taken > 120 mins - Conversion

All the intra-operative events were recorded. Possibility of common bile stone was excluded by normal serum bilirubin, normal value of alkaline phosphatase & normal common bile duct findings in ultrasonography.

Statistical Analysis: Statistical analysis was done by using SSPS version 25. Chi-square test & fisher

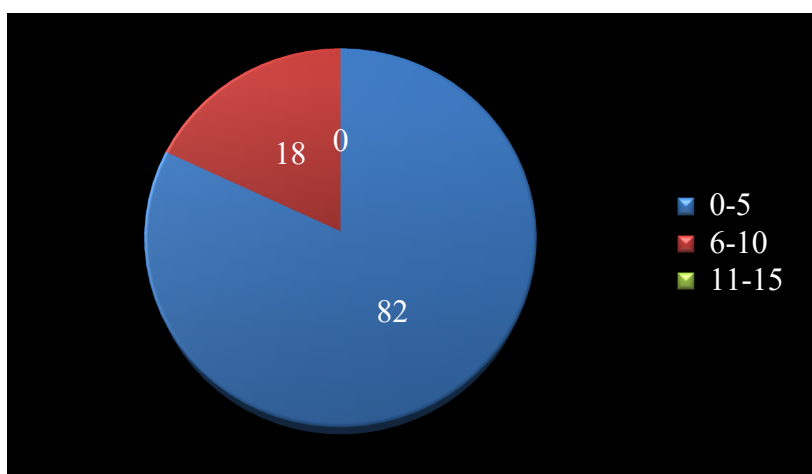
exact test were used for variables. P value is <0.05 considered as statistically significant.

Result

In this study, 100 cases of elective laparoscopic cholecystectomy were studied. The most common indication for surgery had biliary colic (78%) followed chronic calculous cholecystitis (16%)

Table 3: Indication for surgery among study participants

Indication	No. of patient (%)
Biliary colic	78 (78%)
Chronic calculous cholecystitis	16 (16%)
Diabetes mellitus	2 (2%)
Gall stone pancreatitis	2 (2%)
Mucocele of gall bladder	1 (1%)
Pediatric age group	1 (1%)



Graph 1: Pre – operative scores among LC patients

Majority of the patients (82%) were given score between 0-5, out of which 70.7% patients were having easy procedure and 77.8% patients were having difficulty procedure. It means the positive prediction value of this scoring system for easy procedure is 70.7% & for difficult procedure is 77.8% in this study.

Table 2: Correlation of pre-operative score with pre-operative outcome

Pre op score	Easy	Difficult	Very difficult	Total
0-5	58 (70.7%)	18 (22%)	6(7.3%)	82
6-10	0 (0%)	14 (77.8%)	4 (22.2%)	18
11-15	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total	58	32	10	100

Majority of the patients (68%) were in age group less than 50 years, in which 64.7% patients having easy procedure, most of them (75%) were females, out of which 58.66% having easy procedure.

Maximum patients (80%) having symptoms <6 months duration, 58.75% had easy procedure. Age, gender & duration of symptoms are not statistically significant pre-operative factors for predicting difficulty (P>0.05). Seventeen patient having previous attacks of acute cholecystitis, out of which 88.23% were having either difficult or very difficult procedure, while those patients not having

history of previous attack, 67.46% had easy procedure, statistically significant (P< 0.05).

76 patients who were having no history of abdominal surgery, 63.2% were having easy procedure while those who were having previous abdominal surgery, 58.3% having either difficult/very difficult procedure, not significant statistically (P>0.05) Majority of the patients (76%) having BMI <25, out of that 65.79% were having easy procedure while those having BMI >25, 66.67% of patients were having either difficult or

very difficult procedure, statistically significant (P<0.05).

Table 3: correlations with clinical parameters & level of difficulty

Clinical parameter	Variable	Easy	Difficult + Very difficult	P value
Age	< 50	44 (64.70%)	24 (35.29%)	0.476
	> 50	14 (43.75%)	18 (56.25%)	
Gender	Male	14 (56%)	11 (44%)	0.815
	Female	44 (58.66%)	31 (41.33%)	
Duration of symptom	<6 months	47 (58.75%)	33 (41.2%)	0.761
	> 6 months	11 (55%)	9 (45%)	
Previous Attacks	No	56 (67.46%)	27 (32.53%)	0.001
	Yes	2 (11.76%)	15 (88.23%)	
Previous Surgery	No	48 (63.15%)	28 (36.84%)	0.629
	Yes	10 (41.66%)	14 (58.33%)	
BMI	< 25	50 (65.79%)	26 (34.21%)	0.004
	> 25	8 (33.33%)	16 (66.67%)	

On ultrasonography examination showing 48% patients had single stone, out of which 60.4% were having easy procedure while remaining patient having multiple stone, 55.7% had easy procedure, statistically not significant (P>0.05).

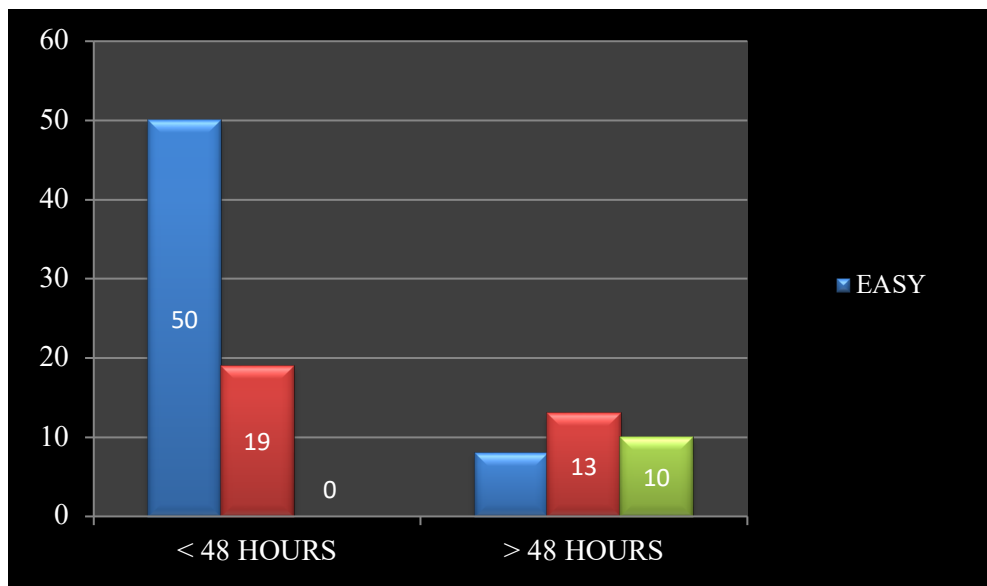
Gall bladder wall thickness was more than 4 mm in 10 patients, of which 90% patient had either difficult or very difficult procedure while gall bladder wall thickness \leq 4mm in 90 patients, out of that 63.3% had easy procedure. Seven patients having impacted stone on USG finding, 85.7%

were having either difficult or very difficult procedure while out of 93 patients who were not having impacted stone, 61.3% were having easy procedure.

Gall bladder wall thickness, impacted stone and contracted gall bladder on USG findings are statistically significant pre-operative factors predicting difficulty (P< 0.05), but pericholecystic edema in USG findings is not a statistically significant pre-operative factor predicting difficulty.

Table 4: Correlation of ultrasonography findings & level of difficulty

USG finding	Variable	Easy	Difficult + Very difficult	P value
No. of stone	Single	29 (60.41%)	19 (39.58%)	0.638
	Multiple	29 (55.77%)	23 (44.23%)	
G.B.Wall Thickness	< or = 4mm	57 (63.33%)	33 (36.67%)	0.001
	> 4 mm	1 (10%)	9 (90.00%)	
Impacted Stones	No	57 (61.30%)	36 (38.70%)	0.015
	Yes	1 (14.28%)	6 (85.71%)	
Contracted Gall bladder	No	57 (62.63%)	34 (37.36%)	0.002
	Yes	1 (11.11%)	8 (88.88%)	
Pericholecystic Edema	No	58 (59.18%)	40 (40.81%)	0.33
	Yes	0 (0)	2 (100%)	



Graph 2: Length of hospital stay & level of difficulty

Discussion

Laparoscopic cholecystectomy (LC) has become the procedure of choice for the management of symptomatic gall stone disease. At times it is easy and can be done quickly. Occasionally it is difficult and takes longer time. But there is no scoring system available to predict the difficulty of LC preoperatively.

Our study found cholelithiasis most common in less than 50 years age group predominantly females, age and gender are not significant pre-operative factors for predicting difficulty in this study, similar finding seen by Nidoni R et al [11] and Agarwal et al [12], in contrast to this study Kankala V et al [13] found male gender as significant risk factor for conversion of LC to open surgery. The positive prediction value of scoring system for difficult procedure was more than easy procedure in current study, in agreement with the Bhandaria, et al [14].

In this study BMI is a statistically significant pre-operative factor for predicting LC difficulty, our finding correlates with the Dhanke PS, et al [15]. Previous attack of acute cholecystitis is statistically significant pre-operative factor for predicting difficulty in this study, accordance to the Akyurek N et al [16]. History of previous hospitalizations due to acute cholecystitis attack, to make LC difficult and hence increasing the chances of conversion. In present study history of previous surgeries was not found to be significant, our results are comparable with the Karim ST et al [17]. This may be possibly due to increasing experience on adhesiolysis and advanced laparoscopic skills and better instrumentation.

The present study found that thickened Gall bladder, impacted stone and contracted gall bladder on USG findings are statistically significant pre-

operative factors predicting difficulty, our findings were similar with the many other studies; R Nidoni, et al [18], Vivek MA, et al [19] and MM Hasan, et al [20]. While performing LC, stone impacted at neck of GB poses few technical problems due to distension of the GB as it is with thick-walled GB. It is difficult to grasp the GB neck and we did not get adequate retraction for performing dissection at the Calot's triangle. Pericholecystic edema in USG is not a significant pre-operative factor predicting difficulty in LC in the current research, discordance to that Raza M, et al [21] and Shivam, et al [22] observed Pericholecystic edema was a significant predicting factor in their study. In cases of Pericholecystic fluid presence, there is an inflamed field with adhesions.

Conclusion

Pre-operative factors like past history of attack of acute cholecystitis, Body mass index, gall bladder wall thickness, impacted stones, contracted gall bladder can effectively predict difficulty in laparoscopic cholecystectomy. Scoring system can help surgeon for predicting difficulty & prepare him for the same. It will also help informing patient pre operatively regarding the possibility of conversion to open surgery & other possible complication so that patient can plan for absence from the work & other socio economic factors

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