Original Article

Preoperative Predictors of Difficult Laparoscopic Cholecystectomy

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Abstract

Laparoscopic cholecystectomy (LC) is considered the treatment of choice for symptomatic cholelithiasis/cholecystitis. However, of all Laparoscopic cholecystectomy attempted, 1-13% requires conversion to open cholecystectomy. *Aims*: The present study was conducted to ascertain various patient related pre- operative risk factors for difficult laparoscopic cholecystectomy. *Methodology*: A prospective study was carried out at Karnataka Institute of Medical sciences, Hubballi, Karnataka. Forty-five cases diagnosed between 1st October 2013 to 31stJuly 2015 with gall stone diseases following exclusion criteria and undergoing laparoscopic cholecystectomy were considered for the study. They were evaluated with risk factors like age, sex, clinical findings, ultrasound imaging and hematological reports. *Results*: LC was successfully accomplished in 43 patients (95.5%). Moderate bleeding occurred in 12 patients (26.67%) from the liver bed during gall bladder bed dissection. Gall bladder bed dissection was difficult in 19 patients (42.2%). Gall bladder perforation occurred in 10 patients (22.2%) while stone spillage occurred in 7 patients (15.5%) and were all retrieved. Extraction of the excised gall bladder was difficult in 10 patients (22.2%). Conversion to open cholecystectomy occurred in 2 patients (4%). The preoperative parameters that significantly predicted difficult LC were based on the presence of local signs of cholecystitis in addition to the ultrasound criteria of liver cirrhosis, impacted stone at the neck of the gall bladder and thick walled gall bladder exceeding 4mm. *Conclusions*: Clinical and ultrasonographic findings may help predict a difficult LC. This information may be useful to both the patient and the treating surgeon.

Keywords: Laparoscopic Cholecystectomy; Difficult; Predictors.

Introduction

Gallstones are the most common biliary pathology. It is estimated that gallstones affect 10–15 per cent of the population in western societies [1]. Laparoscopic cholecystectomy (LC), one of the most commonly performed surgical procedures worldwide is accepted as the gold standard in the treatment of symptomatic gallstones [2].

In approximately 2-15% of the patients failure to achieve the desirous aim mandates the conversion of the procedure to Open Method [3], hence there is a need to evaluate various factors responsible for difficult laparoscopic cholecystectomy.

Preoperative assessment of complexity factors is needed for frequent procedures such as (LC) in order to avoid complications and delays and to guarantee an efficient course of surgery [4]. Also, these factors would be helpful to counsel patients undergoing laparoscopic cholecystectomy with regards to the probability of conversion to an open procedure and also allow for an earlier intra-operative decision to convert if difficulty was encountered [5].

Male gender, old age, previous upper abdominal surgery, acute cholecystitis, biliary

colic within the last 3 weeks, thickening of the gallbladder wall, shrunken gallbladder, pericholecystic fluid, and experience of the surgeon are cited factors [6-9].

The Aim of the Work

The aim of this study was to determine the correlation between preoperative clinical and abdominal sonographic findings in patients undergoing laparoscopic cholecystectomy for symptomatic cholecystitis and the technical difficulty at operation.

Materials & Methods

Patient's admitted in KIMS, Hubballi from December 2013 to October 2015 with signs and symptoms of cholelithiasis /cholecystitis who were clinically evaluated and confirmed by USG were included in the study. The patients were evaluated with following factors

Inclusion Criteria

- The patients aged between 16 to 60 years presenting with symptoms and signs of Cholelithiasis/ cholecystitis and diagnosed by USG examination in various surgical wards of KIMS, Hubballi.
- All patients admitted for elective LC for symptomatic cholelithiasis.
- All patients fit for general anesthesia.

Exclusion Criteria

- Patients below 15 years. age.
- Patients with CBD calculus, where CBD exploration was needed.
- LC done along with common bile duct exploration.
- LC with other intervention at the same setting.
- Patients with anesthetic complications.
- Patients with features of obstructive jaundice.

All consecutive patients with calculus cholecystitis undergoing laparoscopic cholecystectomy in the study period (45 patients) were reviewed. Parameters of difficulty at laparoscopic cholecystectomy were: severe adhesions inflammation around the gallbladder and the Calot's triangle that obscure the dissection planes, intra-

operative bleeding or injuries, prolonged operating time, difficulty in specimen extraction and conversion of laparoscopic to open cholecystectomy. The latter data were obtained from the operating surgeon. Indications for conversion included surgical difficulties during the laparoscopic procedure. In this study standard operative laparoscopic procedure was performed.

Statistical Analysis

Continuous variables are expressed as means ± standard deviation of the means (SD). Categorical data are presented as percent frequency and comparison between groups using Chi-square statistics. Factors predicting technical intra-operative difficulties were examined on the basis of preoperative clinical findings.

Multivariate analysis for measurement of dependent and independent predictors of a difficult laparoscopic cholecystectomy operation was used. The data were considered significant if p values were equal to or less than 0.05. Statistical analysis was performed with the aid of the SPSS computer program (version 6.0 windows).

Results

45 cases presented with symptomatic cholelithiasis. 11/45 of males (24.44%) and 34/45 of females (75.56%). Mean age of presentation was 44 yrs. Laparoscopic cholecystectomy was attempted in all patients. Intra-operative difficulties were met with in 18 cases (40.0%) of the patients

By statistical analysis of 25 variables in the patients undergoing laparoscopic cholecystectomy we found that the following 5 parameters independently predict a difficult operation: acute cholecystitis, thickening of the gallbladder wall, shrunken/over distended gallbladder, evidence of impacted stone at the neck of the gallbladder and cirrhotic liver as shown above. Those who underwent conversion to open cholecystectomy were found to have preoperative diagnosis of acute cholecystitis with pericholecystic fluid, thickened gallbladder wall and impaction of stone at the neck of the gallbladder.

Discussion

This single institution based observational study

Table 1: Different preoperative variables

Clinical	Haematological and Biochemical	Ultrasonography
Age	TLC	GB status (contracted, normal or distended)
Sex	Serum Amylase	Wall thickness (mm)
BMI	Serum ALP	Peri cholecystitic edema (Y/N)
Parity (in female)	Serum LDH	CBD diameter (mm)
Duration from last attack	Serum TG	CBD stones (present or absent)
Total duration of symptoms	Serum LDL	Stone impaction at the neck of the GB
History of fever at the time of attack		IHBR status
Previous history of acute attack		
History of DM		
Pulse Rate		
Temperature		
Tenderness		
Palpable GB		

Table 2: Preoperative clinical and laboratory data of all patients

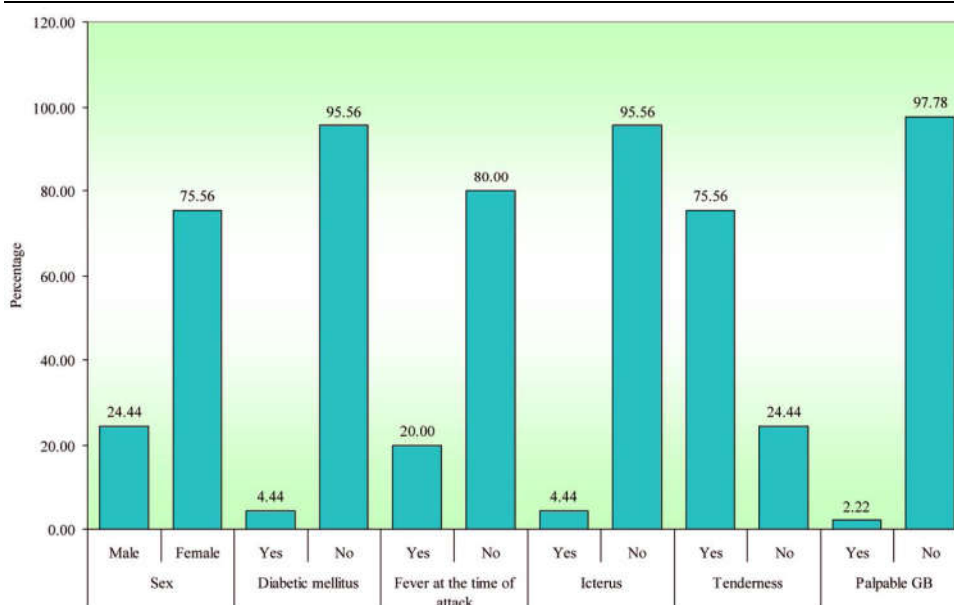| Parameters	No of patients	% Of patients
Sex		
Male	11	24.44
Female	34	75.56
Diabetic mellitus		
Yes	2	4.44
No	43	95.56
Fever at the time of attack		
Yes	9	20.00
No	36	80.00
Icterus		
Yes	2	4.44
No	43	95.56
Tenderness		
Yes	34	75.56
No	11	24.44
Palpable GB		
Yes	1	2.22
No	44	97.78
Total	48	100.00

Fig. 1: Preoperative clinical data of all patients

Table 3: Pre-operative radiological findings of all patients.

Parameters	No of patients	% of patients
GB status		
Collapsed	7	15.56
Distended	36	80.00
Over distended	2	4.44
GB wall thickness		
Normal	38	84.44
Thickened	7	15.56
Evidence of impacted stone in the neck		
Yes	8	17.78
No	37	82.22
Pericholecystic fluid and GB wall oedema		
Yes	3	6.67
No	42	93.33
Total	45	100.00
CBD Diameter (in mm)		
Min	1.00	
Max	9.00	
Range	8.00	
Mean	3.32	
Median	3.00	
SD	2.02	

The intraoperative variables and their values in this study can be tabulated as under.

Table 4: Intra-operative parameters of all patients

| Intra op parameters	No of patients	% of patients
Total time duration of surgery		
<90mins	33	73.33
>90mins	12	26.67
Bleeding at Calot's triangle/ GB bed		
Minimal	33	73.33
Moderate	12	26.67
Access to peritoneal cavity		
Easy	41	91.11
Difficult	4	8.89
GB bed dissections		
Easy	29	64.44
Difficult	16	35.56
Anatomical aberrations		
Present	9	20.00
Absent	36	80.00
GB wall injury		
Occurred	10	22.22
Didn't occur	35	77.78
Stone spillage		
Yes	7	15.56
No	38	84.44
Difficult extraction		
Yes	10	22.22
No	35	77.78
Extension of incision for extraction		
Yes	8	17.78
No	37	82.22
Conversion to OC		
Yes	2	4.44
No	43	95.56
Total	45	100.00
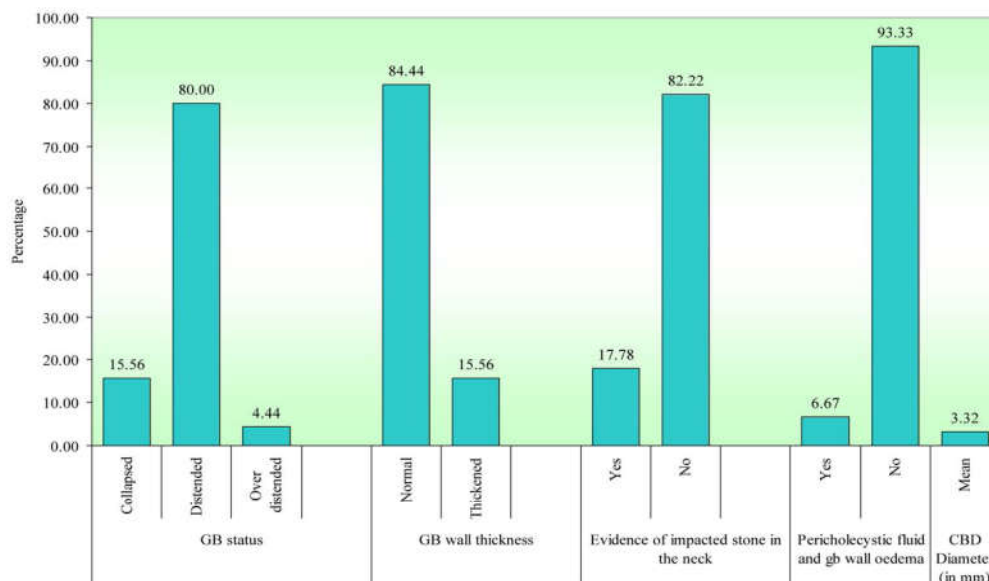
Fig. 2: Pre-operative ultrasonographical findings of all patients

Table 5: Preoperative data of the patients with and without technical difficulty at LC

Parameters	Conversion (n=2) Mean	SD	Difficulty (16) Mean	SD	Easy (27) Mean	SD	F-value	p-value
Age	64.00	1.41	44.50	11.22	42.30	13.92	2.673	0.080
BMI	27.34	5.54	25.81	3.73	24.90	5.07	0.385	0.682
Interval between attack and presentation to hospital (in months)	0.11	0.06	1.03	0.94	1.70	2.33	1.090	0.345
Total duration of symptoms (in months)	6.03	8.44	8.48	8.50	9.99	17.52	0.103	0.902
Pulse	88.00	11.31	80.88	8.61	81.26	7.11	0.757	0.475
Temperature	37.00	0.28	36.96	0.60	37.23	0.44	1.576	0.218
Serum TLC	1001	2524.	8816.	2135.	8627.	2587.	0.310	0.735
Serum ALP	85.00	55.15	77.63	32.88	82.37	55.00	0.056	0.945
Serum amylase	58.50	7.78	49.75	18.99	77.07	45.88	2.663	0.081
Serum LDH	511.5	334.4	559.6	227.1	533.5	243.3	0.076	0.926
Serum TG	82.50	38.89	163.2	77.49	130.1	55.26	2.192	0.124
LDL	95.50	62.93	110.9	55.90	93.02	29.90	0.920	0.407
CBD Diam (in mm)	2.50	0.71	4.13	2.61	2.90	1.51	2.121	0.133

*p<0.05, Diam- Diameter

Table 6: Table comparing similar studies with the present study

Studies	Statistically Significant Variable Clinical	Hematological	Radiological
Magdy MA Elsebaeet. al.[25]	Male sex, the presence of acute cholecystitis	No association found	Thickening of the gallbladder wall, shrunken gallbladder, mucocele of the gallbladder and enlarged liver or Liver cirrhosis
Vyas et. al.[29]	Male sex, history of attacks of acute cholecystitis, obesity	No association found	Increased GB wall thickness, contracted GB
Nadir Mehmood et al.[30]	Male gender, Pain in last 3 months	WBC count	Multiple calculi, gall bladder wall
Randhawa et al.[17]	BMI > 27.5, previous hospitalization, palpable	Not appilicable	Thick-walled GB
PRESENT STUDY	Raised temperature	No association found	GB status (distended), GB wall thickness, Evidence of impacted stone in the neck, Pericholecystic fluid and GB wall oedema

was done to determine factors for prediction of difficult laparoscopic cholecystectomy. It excels in providing more consistency in the selection of the study group patients, standardized surgical practices and post follow-up. The study does not have any observer related bias as done by a single observer.

The majority of the population in this study was young to middle-aged group with the majority of patients falling under the 31-40 year age group; which is in accordance with Bingener-Casey et. al [10]. Whose study depicted a mean age of study subjects as 40 years. In the present study, we too observed a higher chance of difficult cholecystectomy with advancing age as published by Hari et al [25]. Our study statistics did not show male gender as significant factor for difficult laparoscopic cholecystectomy as reported by Dhanke [28] whereas according to Hugh et. al. [11] and Brodsky et. al. [12], age and gender have been found significant. The discrepancies could be because we had more chronic cases than acute.

Obesity is known to make access to the peritoneal cavity difficult, thus necessitating conversion to open laparotomy. BMI >30Kg/m2 was found to be associated with higher risk of conversion in the study by J Supe et al [26]. In our study mean BMI was 25.33 Kg/m^2 and was not found to be associated with prediction of difficulty in laparoscopic cholecystectomy.

In our study, ultrasonography has proven to be a reliable and accurate diagnostic examination for biliary tract disease. In our study, we found a good correlation between gallbladder wall thickness with difficult laparoscopic cholecystectomy in accord with Lal et. al. [13], Alponat et. al. [14], Strasberg SM et al. [15] and Daradkeh et. al. [16].

Conversion from a LC to an OC is an intra-operative decision by the laparoscopic surgeon when visualization and identification of the operative anatomy is impaired by increased vascularity from the inflammatory response, dense adhesions, edema, fibrosis, or abnormal anatomy, such as short cystic duct or an intra- hepatic GB.

When a gallstone gets impacted on Hartmann's pouch, or is passed into the biliary tract (cystic duct or common bile duct), it may cause obstruction, inflammation or distortion of anatomy at Calot's triangle. Stone impaction at the neck or Hartman's pouch results in hindrance in holding of the gallbladder during dissection.

In this study difficulty was found to be related to stone impaction at the neck of the gall bladder in

correlation with the findings of Lim et al [24] and Rizvi et al [27].

In this study, patients with local signs of cholecystitis had significantly longer operative time. This might be due to the firm adhesions that made dissection difficult and lack of plane of cleavage between GB and the liver. This result is in coherence with the study reported byAbdelBakiet al [23].

Significantly prolonged operative time (>90 mins) (P=0.004) was demonstrated in patients with GB wall thickness greater than 3mm (5 cases); this may be due to difficulty during grasping the gall bladder, difficult GB bed dissection and higher incidence of bleeding. Hutchinson et al [21] andLiuet al [22] considered GB wall thickness to be the most important sonographic risk factor of conversion to OC.

The most important patient- related risk factors of operative bleeding are acute cholecystitis, liver cirrhosis, peritoneal adhesion and anatomical abnormalities [18-20]. Our data of operative bleeding are higher as we observed that moderate operative bleeding was 26.66% in the study group with significant association with acute cholecystitis, deranged liver functions, anatomical aberration and extensive peritoneal adhesions.

Conversion to open cholecystectomy in our study was resorted to in 2 patients (4%) undergoing LC. The need for conversion was due to inability to identify anatomy and embedded gall bladder in 1 case and the presence of perforated gangrenous gall bladder in another one. No common bile duct injury was occurred or detected during our studied period.

The main aim of this study was to evaluate some preoperative factors, which can reliably predict the chances of conversion to the open procedure and the complications during laparoscopic cholecystectomy. On the part of patients benefit, they can be informed of possibility of complications and conversion to the open procedure. The patient can be mentally prepared better and can adjust his or her expectations accordingly. For surgeons, patients with a high-predicted risk of conversion could be operated on either by or under the supervision of a more experienced surgeon. Surgeons in the early phase of their training could operate on patients with low risk of conversion, especially if they are not operating under the supervision of an experienced laparoscopic surgeon. Also, a high predicted risk of conversion might allow the surgeon to take an early decision to convert to OC when difficulty is encountered during dissection; this may shorten the duration of surgery and decrease the associated morbidity.

Conclusion

This study identifies the preoperative risk factors for difficult laparoscopic cholecystectomy as well as conversion from laparoscopic to open cholecystectomy in our setting. Patient factors, presentation, and preoperative ultrasonographic findings can all contribute to the prediction of difficulty and need for conversion. Thus, in elective laparoscopic cholecystectomy, it would help counsel patients undergoing laparoscopic cholecystectomy with regards to probability of conversion to an open procedure. It would also help to assemble more experience surgical team if difficulty is preoperatively anticipated.

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