# **Original Research Article**

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# Predicting difficulty in laparoscopic cholecystectomy by clinical, hematological and radiological evaluation

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#### **ABSTRACT**

**Background:** Laparoscopic cholecystectomy (LC) has become the gold standard in the treatment of symptomatic cholelithiasis. It has revolutionized minimally invasive procedures. Laparoscopic cholecystectomy may be rendered difficult by various problems encountered during surgery. The aim of this study was to predict difficulty of LC and possibility of conversion to open cholecystectomy (OC) before surgery using the clinical, haematological and ultrasonographic criteria.

**Methods:** This study was carried out on 50 patients with symptomatic cholelithiasis, non-dilated bile ducts. All patients underwent abdominal ultrasound examination. All cases underwent laparoscopic cholecystectomy with assessment of the difficulties encountered.

**Results:** LC was successfully accomplished in 49 patients (98%) with a mean operative time of  $65.122 \pm 26.87$  minutes. Adhesions present in 14 cases (28%). Gall bladder bed dissection was difficult in 4 patients (8%). Aberrant anatomy present in 4 cases (8 %) while stone spillage occurred in 3 patients (6%) and were all retrieved. Extraction of the excised gall bladder was difficult in 4 patients (8%). Conversion to laparotomy occurred in 1 patients (2%). The preoperative parameters that significantly predicted difficult LC were based on the presence of BMI >27.5, history of prior hospitalization, palpable gallbladder, ultrasonographic features of impacted stone and gall bladder wall thickening.

**Conclusions:** Preoperative evaluation may help predict a difficult LC. This information may be useful to both the patient and the treating surgeon.

Keywords: Cholecystectomy, Evaluation, Laparoscopy

#### **INTRODUCTION**

Laparoscopic cholecystectomy is established as the gold standard for the vast majority of patient with benign gall bladder disease, both in elective and emergency condition. The advantages of laparoscopic cholecystectomy over open cholecystectomy are earlier return of bowel functions, less post-operative pain, better cosmesis, shorter length of hospital stay, earlier return of full activity, and decreased overall cost. The rate of post-operative infection seems to be lower. <sup>1-3</sup>

However, the rate of conversion is 1.5-19%. There is a need to evaluate various factors responsible for difficult laparoscopic cholecystectomy. The ability to accurately identify an individual patient's risk for conversion based on preoperative information can result in more meaningful and accurate preoperative counseling, improved operating room scheduling and efficiency, stratification of risk for technical difficulty and appropriate assignment of resident assistance may improve patient safety by minimizing time to conversion, and helps to identify patients in whom a planned open

cholecystectomy is indicated.<sup>4</sup> The aim of this study was to predict difficulty of LC and the possibility of conversion to open cholecystectomy (OC) before surgery using the clinical and ultrasonographic criteria.

#### **METHODS**

Prospective study of all patients admitted from November 2012 to October 2014 for undergoing laparoscopic cholecystectomy was used. 50 cases of laparoscopic cholecystectomy was studied during the period.

#### Exclusion criteria

- Patients below 20 years of age.
- Patients with CBD calculus, raised ALP, dilated CBD, where CBD exploration is needed.
- Patients with features of obstructive jaundice.
- Suspected malignant gall bladder disease. Patient medically unfit for laparoscopic surgery.

#### Inclusion criteria

Every patient included in the study was subjected to the following assessments which were regarded as risk factors for laparoscopic cholecystectomy.

#### Preoperative (independent) variables

Patient's characteristics

- Gender
- Age was evaluated as continuous variable
- Body mass index (BMI).

Complaints, history and clinical examination

- Symptoms of pain, dyspepsia and vomiting
- History of jaundice
- Previous history of hospitalisation
- Previous abdominal surgery was categorized as supra umbilical or infra umbilical
- The clinical signs of cholecystitis: tender right hypochondrium, positive Murphy's sign and palpable gall bladder.

# Laboratory data

Complete blood picture, liver function test, coagulation profile, fasting blood sugar, serum urea and creatinine.

# Abdominal ultrasound

- Shape of gall bladderGall bladder was defined as contracted or distended depending on the shape and transverse diameter. It was defined as distended if the transverse diameter was greater than 5 cm
- Gall bladder wall thickness was estimated by using the maximal obtainable measurement and evaluated

- as a dichotomous variable (thick  $\geq 3$  mm versus normal <3 mm).
- The calculus size was evaluated as a dichotomous variable for the purpose of analysis (small < 1 cm versus large ≥ 1 cm)
- The number of calculi was classified as a dichotomous variable (solitary versus multiple)
- Common bile duct diameter was classified as a dichotomous variable (normal <8mm versus dilated ≥8 mm)
- Liver parenchyma (normal, fatty infiltration, liver fibrosis).

#### The dependent variables (outcomes)

All cases underwent LC with assessment of the difficulties encountered in terms of

- Duration of surgery (in minutes): Duration of surgery included the time from insertion of Veress needle to closure of the trocar insertion site and was evaluated as a continuous variable
- Access to peritoneal cavity: The operating surgeon described the access to peritoneal cavity as "easy" or difficult"
- Gall bladder bed dissection: The operating surgeon described GB bed dissection as "easy" or "difficult".
- Difficult extraction: Extension of incision for extraction. The operating surgeon described GB extraction as "easy" or "difficult"
- Conversion to open cholecystectomy (OC).

Analysis of preoperative risk factors, their relation to the dependent factors was performed using t-test, Chi squared test and significance was demonstrated in every case ( $P \le 0.05$ ).

#### **RESULTS**

This study included 50 patients, 34 of them were females (68 %) and 16 were males (32 %). Their age ranged from 26-59 years with majority of patients between 41-50 years.

**Table 1: Sex distribution of the sample.** 

Parameter	No. of patients	Percentage
Sex		
Male	16	32.0
Female	34	68.0

**Table 2: Age distribution of the sample.** 

Age in year	S	
21 - 30	5	10.0
31 - 40	14	28.0
41 - 50	24	48.0
Above 51	7	14.0

The body mass index ranged from 17.4 to 29.2 with a mean of  $24\text{kg/m}^2$ . The most common complaint was pain present in all patients (100 %), vomitting in 27 (54%), Fatty dyspepsia in 14 (28%). Four patients had a history of jaundice (10%), 8 patients gave history of acute cholecystitis and were treated medically. 17 patients had abdominal operations (13- Infra umbilical, 4- supra umbilical).

Table 3: Distribution based on Pain.

Pain		No. of patients	Percentage
Location	Rhc	38	76
Location	EPI	12	24
Character	Colicky	26	52
	Gripping	10	20
	Dull	14	28
Radiating	Back	11	22
	NO	39	78

**Table 4: Clinical features.** 

Clinical features		No. of patients	Percentage
Vomiting	Yes	27	54
	No	23	46
Г	Present	8	16
Fever	Absent	42	84
Dyspepsia	Present	14	28
	Absent	36	72

Table 5: Distribution based on past history.

Past H/O		No. of patients	Percentage
Jaundice	Yes	4	8
Jaundice	No	46	92
	Tubectomy	8	16
Company	Laparotomy	4	8
Surgery	Appendectomy	2	4
	LSCS	3	6
Prior	Yes	8	16
hospitalization	No	42	84

Table 6: Per abdomen findings.

P/A palpation		No. of patients	Percentage
Tenderness	RHC	38	76.00
Tenderness	EPI	12	24.00
Mari	Present	8	16.00
Mass	Absent	42	84.00
Maranhara	Present	14	28.00
Murphys	Absent	36	72.00

On clinical examination 38 patients had tenderness in the right hypochondrium, 14 of them showed positive Murphy's sign but 8 had palpable gall bladder. Abdominal ultrasound was done to all patients and showed gall stones in all. Multiple stones in 27 cases, Impacted stones in 7, GB wall thickness in 10, Pericholecystic collection seen in 9 cases.

**Table 7: Distribution based on USG findings.** 

USG		No. of patients	Percentage
Number	Multiple	27	54.00
Nullibei	Solitary	23	46.00
Impacted stone	Present	7	14
Impacted stone	Absent	43	86
Gb wall	Present	10	20.00
thickness	Absent	40	80.00
Pericholecystic	Present	9	18
collection	Absent	41	82

In the current study, the total operative time ranged from 40-150 minutes with a mean of 65.122±26.87 minutes. Prolonged operative time was statistically significant in cases with local signs of cholecystitis, single large stones, thick walled gall bladder and cases with liver fibrosis (P<0.05).

Access to peritoneal cavity was difficult in 4 cases mainly due to previous laparotomies. Gall bladder bed dissection was difficult in 8 cases (16 %). Gall bladder extraction was difficult in 6 cases (12%) and extension of incision was attempted in 2 cases. Bleeding occurred in only 6 cases (12%) from the liver bed and was minimal in all. Conversion to laparotomy was resorted to in 1 case (2%) owing to inability to identify anatomy and dense adhesions. Gall bladder perforation occurred in 5 patients (10%) and stone spillage occurred in 3 patients (6%) and were all retrieved.

**Table 8: Laparoscopic findings.** 

Laparoscopic surgical details		No. of patients	Percentage
Adhesions present		14	28.00
Aberrant anatomy		4	8.00
Time taken (mean + sd)		$65.122 \pm 2$	26.87
B/s	Present	3	6.00
spillage	Absent	47	94.00

Table 9: Distribution based on assessment.

	Assessment	No. of patients	Percentage
Surgeons opinion	Easy	39	78.0
	Difficult	7	14.0
	Very difficult	4	8.0

Table: 10: Distribution based on determinants.

Parameters		Easy n = 38	Difficult n = 12	Statistical analysis
Age	< 50 years	34	9	1.59, NS
Age	> 50 years	4	3	1.39, 113
Sex	Male	10	6	— 2.34, NS
SCA	Female	28	6	2.34, 143
P/H	Hospitalization	0	8	P< 0.005, S
	< 25	37	3	
BMI	25 - 27.5	1	5	$X_2 = 30.22, p < 0.000$
	> 27.5	0	4	
	I/u scar	11	4	
p/A inspection	S/u scar	2	0	1.48, NS
	Nad	25	8	
	Impacted stone	0	7	21.05,p <0.000
USG	Gb wall thickness	0	10	39.58, p < 0.000
	Pericholecystic collection	3	6	1.18, NS
Lanaragaania	Adhesions	12	6	2.86, NS
Laparoscopic details	Time taken	51.74 8.38	107.5 20.06	T=13.92, p <0.000
uctaris	B/s spilage	0	3	3.16, NS
	Tenderness	30	8	0.75
P/A palpation	Mass	1	7	$X_2 = 21.05, p < 0.000$
	Murphys	11	3	0.07, NS

#### **DISCUSSION**

Several studies have been published in the past years trying to assess risk factors for laparoscopic cholecystectomy. This study is a further continuation of these studies using only clinical criteria of the patient and ultrasonographic criteria of the gall bladder and biliary system in many aspects. The current study has shown that 34 patients were females (68 %). Lein et al concluded that male gender is a risk factor for severe symptomatic cholelithiasis. In our study, gender had little influence on the course of surgery which may be due to small sample size. <sup>5</sup>

The present study demonstrated that the mean BMI was  $24 \text{ kg/m}^2$  and 4 of our patients were considered obese. And all 4 cases were difficult. In contrary to Simopoulos et al, studies showed that LC is effective and safe in patients with morbid obesity.<sup>6</sup>

In this study, patients with local signs of cholecystitis had significantly difficult intra operative course. This might be due to the firmly adhesions that made dissection difficult and lack of plane of cleavage between GB and the liver. Alponat et al studied several predictive factors for conversion of laparoscopic cholecystectomy and showed these signs to be significant predictors for conversion to OC.<sup>7</sup>

In our study, patients with impacted stones inside the GB (7 cases) were associated with significant intraoperative difficulty (P < 0.000) due to difficulty in grasping the

distended gall bladder. Significantly intraoperative difficulty (P <0.000) was demonstrated in patients with GB wall thickness greater than 3 mm (10 cases); this may be due to difficulty during grasping the gall bladder, difficult GB bed dissection and higher incidence of bleeding. Hutchinson et al, Liu et al and Kama et al considered GB wall thickness to be the most important sonographic risk factor of conversion to OC.  $^{8\text{-}10}$ 

Pericholecystic collection was not statistically significant (9 cases) in predicting difficulty (P=1.18). Conversion to open cholecystectomy in our study was resorted to in 1 patient (2 %) undergoing LC. The need for conversion was due to inability to identify anatomy due to dense adhesions. Failure to identify the anatomy during dissection was encountered in patients with previous acute cholecystitis. Prior acute cholecystitis results in a scarred and fibrosed gall bladder, and in dense fibrotic adhesions that render laparoscopic dissection difficult.  $^{11,12}$ 

Livingstone et al showed that acute cholecystitis was associated with a conversion rate of 25 %.<sup>13</sup> Prediction of a difficult LC and of conversion to OC may be helpful. Patients with a high predicted risk of conversion could be operated on either by or under the supervision of a more experienced surgeon.<sup>14</sup>

Also, a high predicted risk of conversion may 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. <sup>10,15</sup>

So, in the present study, the preoperative parameters that significantly predicted difficult LC were based on the clinical criterion of presence of previous hospitalisation for acute cholecystitis, BMI > 27.5, Mass on palpation, ultrasonographic criteria of impacted stones and thick wall GB.

It is so important to state that prior history and ultrasonographic criteria was the most prominent predictor of difficult LC in our study. However patient's gender, age, previous lower abdominal surgery, past history of jaundice, shape of GB and number of stones, Peri cholecystic collection had no significant effect on the course of surgery.

It was concluded that the clinical and ultrasonographic findings may help predict difficult LC. This information may be useful to both the patient and the treating surgeon.

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institutional ethics committee

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