

Assessment of Risk Factors for Conversion from Laparoscopic Cholecystectomy to Open Cholecystectomy

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ABSTRACT

Background: One of the most frequently performed surgical procedures worldwide is the laparoscopic cholecystectomy (LC). There is a need to assess numerous factors that may lead to conversion from laparoscopic to open surgery in the case of complicated laparoscopic cholecystectomy.

Objective: The aim of the current study was to evaluate the risk factors and predictive models for open surgery (CTO), and surgical quality outcome measures.

Patients and methods: This is a prospective observational study was conducted at General Surgery Department, Faculty of Medicine, Zagazig University. A total of 56 patients with symptomatic gall bladder disease were included. Surgical quality outcome were estimated.

Results: Male gender was found to be a highly significant factor for predicting of difficult laparoscopic cholecystectomy (DLC) ($P=0.026$). Also, older age was found to be a significant factor for predicting DLC. Obesity was found to be a significant predictive factor of difficulty in LC. History of previous ERCP was a significant factor for prediction of difficulty as history was positive in 7 (6.7%) patients and 6 (85.7%) patients of them had difficulty during operation. Preoperative ultrasonographic findings of thickened gallbladder wall; it was highly significant predictive factor for difficult LC ($P=0.005$). In this series presence of a thick GB wall may make grasping and manipulation of GB difficult gallstones size; it was a significant predictive factor for difficult LC ($P=0.001$). The duration of operation was found to be significant factor for predicting difficulty.

Conclusion: Pre-operative ultrasound is without a doubt a good predictor of DLC in the majority of instances and should be used as a screening tool, However to predict the challenging LC, greater attention must be given to demographic data, the patient's medical history, and the clinical evaluation.

Keywords: Open Cholecystectomy, Laparoscopic Cholecystectomy, Risk Factors.

INTRODUCTION

Before the advent of laparoscopic cholecystectomy, cholecystectomy was well-known as the surgical care for cholelithiasis in Langenbuch C and the preferred treatment for gallstone disease⁽¹⁾. In the contemporary era of limited access surgery, laparoscopic surgery has emerged and swiftly established itself as the gold standard in the treatment of symptomatic gall stone disease⁽²⁾. It not only benefits the patient by reducing postoperative discomfort, reducing intraabdominal adhesions, shortening hospital stays, and improving aesthetic results, but it also benefits the surgeon by improving vision and access to the Calot's triangle^(3,4).

LC is regarded as the "gold standard" surgical method for treating gall bladder (GB) disease. LC is converted to open surgery (CTO) to prevent intra-abdominal organ damage (IOI), examine the common bile duct (CBD), and repair IOI^(5,6).

On occasion, though, switching from LC to OC may be essential. It would be extremely reassuring to have a method for preoperative evaluation of the challenges of LC and the potential for conversion to CTO. In a certain circumstance, this conversion could be appropriate and necessary⁽¹⁾.

Every year, 1% to 2% of persons with silent gallstones have symptoms and require medical attention. Acute cholecystitis (AC) is present in 20% of

patients who arrive to the hospital with right upper quadrant discomfort and is linked to a mortality rate of 2-3% in older patients and those with significant comorbidities⁽⁷⁾.

Therefore, the current study aimed to evaluate the risk factors and predictive models for CTO, and surgical quality outcome measures.

PATIENTS AND METHODS

A prospective observational study was carried out at General Surgery Department, Faculty of Medicine, Zagazig University. Participants were patients with chronic calculous cholecystitis subjected to cholecystectomy.

Inclusion criteria: All patients were presented with symptomatic gallstone disease. Patients (18 years of age and older) were included in the study. Patients who are in good health and do not have any LC restrictions.

Exclusion criteria: Absolute LC contraindications include conditions that affect the heart, lungs, liver, or coagulation system.

Sample size estimation: Assuming that in the successful vs. conversion group, the percentage of severe adhesion was 35% vs. 75%, at 80 % power and 95 % confidence interval, sample size is estimated to be

56 cases. Sample size was calculated using OpenEpi software.

Pre-operative evaluation:

The data of all patients in this study was subjected to the following assessments:

1. Patients' characteristics as gender, age and body mass index BMI (kg/m²).
2. Clinical information included past history of acute cholecystitis hospitalization, length of symptoms, and date of last admission or attack; abdominal scar from prior abdominal surgery; post-ERCP (time between it and operation); palpable gallbladder; and comorbid conditions such as diabetes mellitus and liver cirrhosis. Recent acute cholecystitis attack.
3. Complete blood picture, coagulation profile, fasting blood sugar, liver function and kidney function tests, as well as alkaline phosphatase and GGT, were performed for the laboratory results.
4. Radiological investigations:

Examination with ultrasonography of the following: gallbladder shape depending on the transverse diameter, it may be constricted or distended. Transverse diameters larger than 5 cm were considered to be signs of distension. Gallbladder wall thickness, quantity of calculi, Common bile duct diameter, fatty infiltration, fibrosis, and normal liver parenchyma were estimated. Additionally, MRCP used for patients with increased bilirubin levels, and ultrasounds did not reveal stones in either normal or dilated CBD.

All patients who met the requirements for inclusion were set up for laparoscopic cholecystectomy. Third-generation cephalosporin ceftriaxone is administered intravenously in a single preoperative dose within an hour of making a skin incision. prevention of deep vein thrombosis in people with two or more risk factors To reduce the risk of operative bleeding, patients with certain risk factors (duration >1 hour, congestive heart failure, age >40, myocardial infarction, immobility, hormone replacement therapy, varicose veins, oral contraceptive use, cancer, multiparty, chronic renal failure, inflammatory bowel disease, obesity, severe infection, and peri-partum).

Operative details:

Laparoscopic cholecystectomy was achieved using a 3 CCD camera and 4 standard ports. Critical views allowed for the identification and clipping of the cystic duct and artery. When necessary, a tube drain was inserted in the right sub-hepatic space after the gall bladder was removed using an endobag. Sutures made of No. 1 polyglycolic acid were used to shut 10 mm openings. On the same day, the patient began receiving oral fluids, and the drain was withdrawn when the output was minimal, often by POD 2. The individual surgeon was free to choose whether or not to convert to

open surgery. The operating time was calculated as the amount of time from the first port's insertion to the last port's removal at the conclusion of the procedure or conversion to open surgery.

Surgical procedure:

Once the pneumoperitoneum had been achieved, the patients were operated on in the supine position with a steep head-up tilt during the usual 4-port laparoscopic cholecystectomy procedure; Employing the conventional method rather than the needle method to create pneumoperitoneum.

The American method was utilized for the insertion of ports, first inspection, and exposure of the triangle of Calot. Four ports were employed: a telescope (10 mm), two operating ports (5 mm and 10 mm), and one aiding port (5 mm). A single duct and one artery entering the gallbladder are identified, and the lower portion of the gallbladder is completely dissected off the liver bed using safe technique to ensure the "critical view" before dividing any structures.

The cystic duct and cystic artery were clipped independently (dual proximal, single distal clips) and then split by scissors to separate the anterior cystic duct from the posterior cystic artery. Dissection via the areolar tissue plane that connects the gallbladder to the Glisson's capsule allows the gallbladder to be separated from the liver. When necessary, aspirate and suction irrigation should be used to clean. Extraction of gallbladder: through the 10 mm operating port.

After final inspection, removal of ports while being monitored and healing of port wounds. In the wake of an elective laparoscopic cholecystectomy, drains are not typically required.

Post-operative evaluation:

After completing the procedure, the nasogastric tube was taken out. After four hours of surgery, patients were advised to begin oral fluids, starting with plain water and working their way up to a full liquid diet before switching to a semisolid meal. If a drain had been used, it was taken out 24 hours after the procedure, unless there was bile or 100 mL of blood in the drain bag.

Most patients are discharged the next day after coping with oral nutrition and, if necessary, drain removal. Uncomplicated LC patients may be sent home the same day of surgery. If diclofenac is not contraindicated, patients were sent home with a package of analgesics that included morphine, which was given intravenously as a rescue analgesic and parenterally as needed for shoulder and abdominal pain. Antibiotic used after surgery for those at high risk (age >60, diabetes, and acute cholecystitis).

Operative parameters and surgical difficulty:

Evaluation of surgical difficulty was according to **Iwashita et al.** ⁽⁸⁾ including surgical difficulty based on a list of significant, objective findings that might be

correlated with surgical difficulty during LC. Three groups were created from a total of 30 items. A total of 61 experienced LC surgeons from Japan, Korea, and Taiwan who took part in the survey graded each item on a seven-stage scale from 0 (easiest) to 6 (most difficult) as shown in the box-and-whisker diagrams on the right. The minimum and maximum responses are represented by the left and right ends of the whiskers, respectively. The interquartile range (IQR), which represents the middle 50% of the data, is indicated by the width of each box. Instead of using a seven stage scale, we used a two likert scale, with 0 and 1 stages for easy LC and 2, 3, 4, 5 and 6 stages for severe LC.

Factors related to inflammation of the gallbladder (8):

- (1) Appearance around GB such as oedematous change; partial or diffuse scarring adhesions around GB; and fibrotic adhesions around the gallbladder.
- (2) Appearance of the Calot’s triangle area such as oedematous change; sparse fibrotic change in the Calot’s triangle area; dense fibrotic change but no scarring in the area; and partial or diffuse scarring in the Calot’s triangle area.
- (3) Appearance of the GB bed such as oedematous change; sparse fibrotic change in the GB bed; dense fibrotic change but no scarring; partial or diffuse scarring in the GB bed
- (4) Additional findings of the gallbladder and its surroundings such as:
 1. Easy bleeding during dissection around GB; Calot’s triangle and the GB bed.
 2. Necrotic changes around GB; Calot’s triangle area or in GB bed.
 3. Perforated gallbladder wall and/or abscess formation towards the abdominal cavity noted during adhesiolysis around the gallbladder
 4. Cholecysto-enteric fistula or cholecysto-choledochal
 5. Impacted gallstone in the confluence of the cystic, common hepatic, and CBD.

Intra-abdominal factors unrelated to inflammation:

Including non-inflammatory adhesion around GB; collateral vein formation due to liver cirrhosis; excessive visceral fat; GB neck mounting on the CBD and anomalous bile duct.

Ethical Consideration:

This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Zagazig University. Written informed consent was obtained from all participants. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

Statistical Analysis

The collected data were introduced and statistically analyzed by utilizing the Statistical Package for Social Sciences (SPSS) version 20 for windows. Qualitative

data were defined as numbers and percentages. Chi-Square test and Fisher’s exact test were used for comparison between categorical variables as appropriate. Quantitative data were tested for normality by Kolmogorov-Smirnov test. Normal distribution of variables was described as mean and standard deviation (SD), and independent sample t-test was used for comparison between groups. P value ≤0.05 was considered to be statistically significant.

RESULTS

The obtained results showed 45 (80.4%) females and 11 (19.6%) males had mean age of 31.43 (SD 10.99) years (range 18 to 60 years). Gender was found to be a significant factor (P=0.026) for predicting difficulty of LC (Table 1).

Table (1): Relation between gender and operative difficulties.

Sex	Operative difficulties		Test	
	Difficult [N=29 (%)]	Easy [N=27 (%)]	χ ²	P-value
Male	9 (31%)	2 (7.4%)	4.945	0.026*
Female	20 (69%)	25 (92.6%)		

χ²: Chi square test. *P<0.05 is statistically significant.

As regards age; It was found to be statistically significant factor for predicting difficulty of LC (P=0.002). Concerning obesity; BMI range was 18.97-39.8 kg/m² with mean 27.79 (SD 5.67). A mean body mass index of 30.07 Kg/m² was found in the patients associated with difficulty while mean of 25.34 Kg/m in easy cases (P value <0.001) (Table 2).

Table (2): Relation between age, BMI and operative difficulties.

Variable	Operative difficulties		Test	
	Difficult (N=29)	Easy (N=27)	T test	P-value
	Mean ± SD	Mean ± SD		
Age (year)	35.76 ± 11.38	26.78 ± 8.53	3.323	0.002*
BMI (kg/m ²)	30.07 ± 5.12	25.34 ± 5.27	3.409	0.001**

*P<0.05 is statistically significant. **P≤0.001 is statistically highly significant. t independent sample test.

Hospitalization for repeated attacks of acute cholecystitis was found to be a significant factor for prediction of difficult laparoscopic cholecystectomy (P=0.02). We found that 7 (24.1%) of total 29 patients have difficult LC compared to 1 (3.7%) of total 27 patients with easy technique, Although the duration of symptoms of GB disease was found to have no significant statistical association with the operative

difficulties as the median for DLC was two years duration for each group (Figure 1).

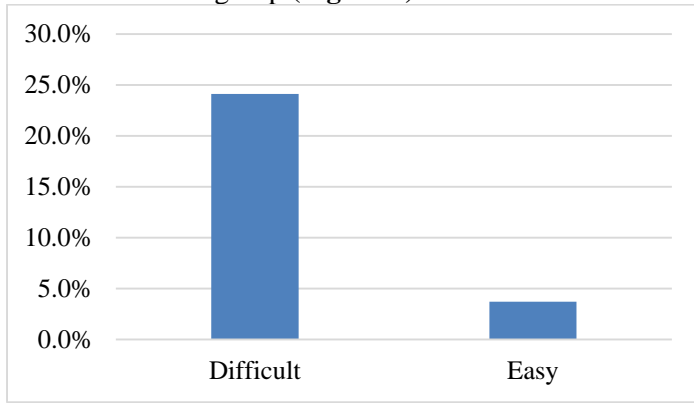


Figure (1): Simple bar chart showing relation between operative difficulties and history of hospitalization of acute cholecystitis.

History of previous ERCP was found to be a significant factor for prediction of difficulty as history was positive in 8 (12.5%) patients and 7 (24.1%) patients of them of those had difficulty during their operation had history of ERCP. Two (3.6%) patients had clinically palpable GB and both of them had difficulty during operation; one patient in each group. There was no significant statistical association between the clinically palpable GB and the final operative difficulties (P>0.999). Five (8.9%) patients were diabetic in our study; 3 (10.3%) patients with difficult LC and 2 (7.4%) patients with no difficulties were diabetics (P>0.999). As regards history of jaundice 4 (7.1%) patients had history of jaundice; 2 (6.9%) patients with difficult LC and 2 (7.4%) patients with no difficulties were diabetics (P>0.999). Both factors (history of DM and history of Jaundice) had no statistical significant association with final operation outcome (Table 3).

Table (3): Relation between history of ERCP, clinically palpable gall bladder, history of DM, history of jaundice and operative difficulties.

Variable	Operative difficulties		Test P-value
	Difficult [N=29 (%)]	Easy [N=27 (%)]	
History of ERCP			0.02*
No	22 (75.9%)	26 (96.3%)	
Yes	7 (24.1%)	1 (3.7%)	
Palpable GB			>0.999
No	28 (96.6%)	26 (96.3%)	
Yes	1 (3.4%)	1 (3.7%)	
Diabetes mellitus			>0.999
No	26 (89.7%)	25 (92.6%)	
Yes	3 (10.3%)	2 (7.4%)	
Jaundice			>0.999
No	27 (93.1%)	25 (92.7%)	
Yes	2 (6.9%)	2 (7.4%)	

Concerning history of previous abdominal surgery; it was found to be a significant predictive factor for DLC (P=0.024) the difficulties depend largely on the location of previous surgery especially in cases who had both upper and lower incisions as 13.8% of patients with difficult DLC compared to 6.9% and 10.3% for upper and lower abdominal incisions respectively (Figure 2).

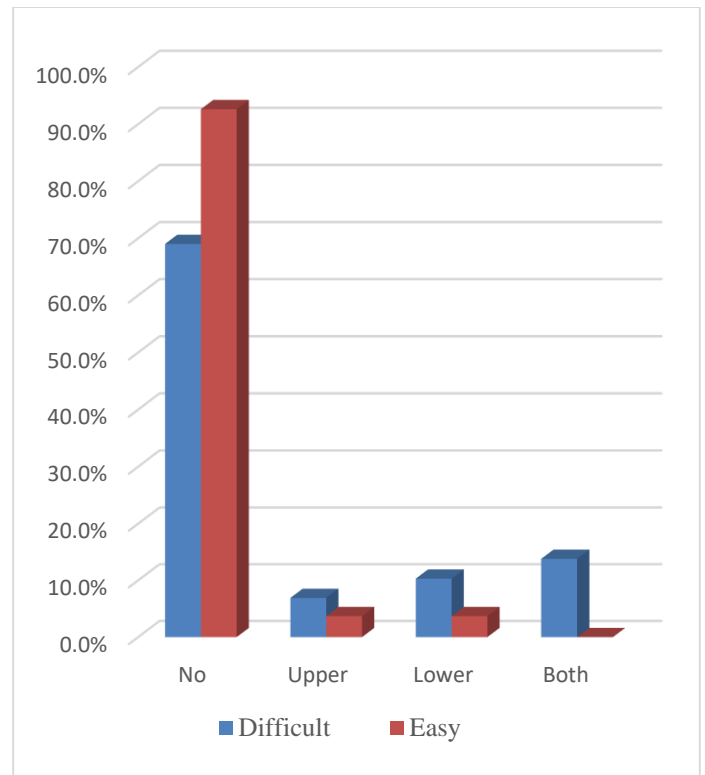


Figure (2): Multiple bar chart showing Relation between History of previous surgery and operative difficulties.

Ultrasonographically; gall bladder distention, pericholecystic fluid collection and thick wall of GB were found to be significant risk factors for prediction of DLC as 8 (27.6%), 7 (24.1%) and 14 (51.7%) of patients with DLC had GB distention, pericholecystic fluid collection and thick wall of GB respectively.

GB stone size and number were found to be significant factors for DLC prediction during laparoscopic cholecystectomy (P values 0.001 and 0.028, respectively) as 17 (58.6%) of patients with DLC had large stones 82(64%) patients of them had DLC, concerning the number of GB stones; it was found that 57(41.4%) of patients with DLC had single stone (Table 4).

Table (4): Relation between ultrasonography of GB and operative difficulties.

Variable	Operative difficulties		Test	
	Difficult [N=29 (%)]	Easy [N=27 (%)]	χ^2	P-value
Size, shape of GB				
Normal	21 (72.4%)	25 (92.6%)	3.881	0.049*
Distended	8 (27.6%)	2 (7.4%)		
Peri cystic collection:				
Absent	22 (75.9%)	26 (96.3%)	4.768	0.029*
Present	7 (24.1%)	1 (3.7%)		
GB wall thickness:				
Thick	15 (51.7%)	4 (14.8%)	8.497	0.005*
Normal	14 (48.3%)	23 (85.2%)		
GB stone size:				
Small	12 (41.4%)	23 (85.2%)	11.448	0.001**
Large	17 (58.6%)	4 (14.8%)		
GB stone number:				
Solitary	12 (41.4%)	4 (14.8%)	4.853	0.028*
Multiple	17 (58.6%)	23 (85.2%)		

*P<0.05 is statistically significant. **P<0.001 is statistically highly significant. χ^2 : Chi square test.

The duration of operation had a statistical significant association with the operative difficulties; a mean of 86.45 (SD 17.63) minutes was found in the patients associated with difficulty while mean of 41.93 (SD 8.19) minutes in easy cases (P value 0.001) (**Figure 3**).

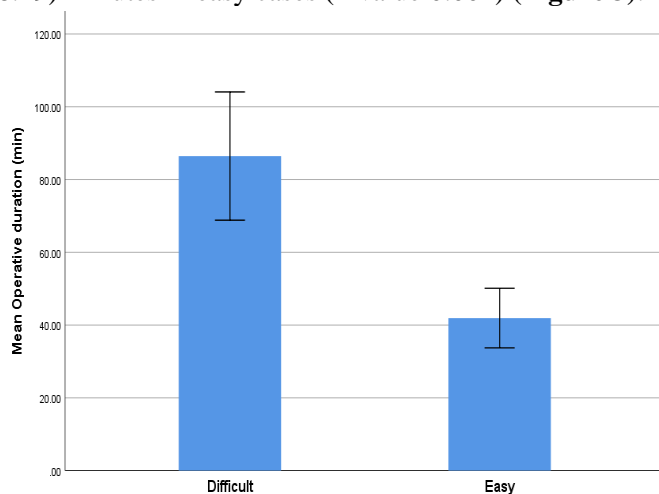


Figure (3): Simple bar chart showing relation between operative difficulties and operative duration.

DISCUSSION

In the case of a difficult laparoscopic cholecystectomy, it is necessary to evaluate a number of

criteria that might result in the conversion from laparoscopic to open surgery. The ability to precisely assess a patient's conversion risk based on preoperative data can result in more accurate and meaningful preoperative counselling, improved scheduling and operating room efficiency, stratification of risk for technical difficulty and proper 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 (9).

Concerning patient's gender; was found to be a highly significant factor for predicting of DLC (P=0.026) in our study. It might be because men are more likely than women to have pericholecystic fibrosis, which is linked to eosinophils, mast cells, and macrophages. Men generate more collagen in both the pericholecystic tissue and the submucosal region of the GB wall, and they wait a very long time to seek medical attention for their GSD. Numerous researchers have noted that male patients have higher rates of problematic LC and conversion. In this regard **Alqahtani et al.** (10) and **Solmaz et al.** (11) revealed that male gender as an independent risk factor affects the outcomes of LC.

As regard patient's age; we found it to be a significant factor for predicting DLC in our study; a mean of 35.76 (SD 11.38) years was found in the patients associated with difficulty while mean of 26.78 (SD 8.53) years in easy cases (P=0.002). The longer history of gallstones and greater frequency of acute cholecystitis attacks, which can alter the biliary anatomy and cause fibrosis, adhesions, and GB wall thickening that may prevent successful LC, are the main causes of older age being at risk. A complex biliary disease is also more likely in elderly people. **Kidwai et al.** (12) found that age >50 years as predictor of difficult cholecystectomy. They also reported that DLC was seen in 4 (33.3%) patients and conversion rate was 16.7% in patients >50 years of age as compared to 9.8% in patients <50 years of age.

In our study, obesity showed a significant predictive factor of difficulty in LC (P=0.001). BMI Range was 18.97 - 39.8 kg/m² with mean 27.79 (SD 5.67). BMI of 30.07 (SD 5.12) Kg/m² was found in the patients associated with difficulty while BMI was 25.34 (SD 5.27) Kg/m² in easy cases. Due to their thick abdominal walls, extensive intraperitoneal fat, and enlarged fatty livers, obese patients present numerous challenges while trying to reach the peritoneal cavity, manipulate instruments, retract the liver, identify the anatomy, and extract the GB. Also **Chandrashekhara and Kailas** (9) demonstrated the mean BMI was 24 kg/m² and 4 patients were considered obese and all 4 cases were difficult (P<0.001). **Lowndes et al.** (13) had claimed the obesity for the risk factor of DLC.

However, **Solmaz et al.** (11) suggested obese and non-obese patients do not differ in any way, and it was still up for debate. They discovered that the scores for entrance to the abdomen, the severity of adhesion

dissection, and the extraction of GB from the abdomen were not substantially different. However, ratings for separating the GB from the liver and dissecting Calot's triangle were much higher in the fat group. This might be because the pericholecystic area has more fatty tissue, which facilitates dissection.

In our study; hospitalization of patients for repeated attacks of acute cholecystitis and was a significant factor for prediction of DLC (P=0.02) although duration of symptoms was not found to be a significant factor for predicting difficulty (P=0.22). According to our hypothesis, each recurrence of cholecystitis enhanced the adhesion between the GB and the omentum, the calot's triangle, and the GB to the fossa. **Ahmed et al.** ⁽¹⁴⁾ found that history of acute attacks was a significant predictive factor for difficulty in predicting dense adhesions at Calot's triangle (P=0.032). However, there was no significant predictive factor for access to the peritoneal cavity, dissection of the GB from its bed, or difficult extraction (P values 0.236, 0.22 and 0.311, respectively). **Chandrashekhar and Kailas** ⁽⁹⁾ found that According to the clinical criterion of having previously been hospitalized for acute cholecystitis, one of the preoperative variables substantially predicted DLC (P<0.005).

Concerning history of previous ERCP was found to be a significant factor for prediction of difficulty as history was positive in 7 (6.7%) patients and 6 (85.7%) patients of them had difficulty during operation. **Mok et al.** ⁽¹⁵⁾ revealed a significant association between conversion and prior ERCP compared to CBD stones, and it can be used as a covariate in logistic regression models to predict difficult dissection and conversion to open surgery (P<0.001). However, **Solmaz et al.** ⁽¹¹⁾ evaluated the parameters increasing intraoperative difficulty scores of elective laparoscopic cholecystectomy, and they found that ERCP was a significant predictive factor for DLC.

In our study, history of jaundice was found to be non-significant predictive factor for LC as we found that 4 patients had history of jaundice; 2 patients of them had difficulties and 2 patients had easy LC (P=0.5). Similarly; **Ahmed et al.** ⁽¹⁴⁾ reported that history of jaundice was not found to had any predictive significance for difficult access to peritoneal cavity, dense adhesions at Calot's triangle, dissection of the GB bed or difficult extraction (P values 0.236, 0.521, 0.41 and 0.652, respectively). In contrast, **Abdulhussein et al.** ⁽¹⁶⁾ found that history of jaundice was a significant predictive factor associated with conversion to OC (P<0.001).

History of diabetes was found to be non-significant factor (P=0.6) in preoperative prediction of DLC in our study. **Rothman et al.** ⁽¹⁷⁾ evaluated diabetes mellitus as a risk factor and they found it a significant factor. However, **Lowndes et al.** ⁽¹³⁾ revealed that diabetes was not a significant predictor for prolonged operative duration. As regards history of previous abdominal surgery; **Ko-iam et al.** ⁽¹⁸⁾ discovered that it was not a

significant (P=0.716) predictor of a prolonged hospital stay in individuals receiving LC. An open cholecystectomy will be performed due to a previous abdominal scar (supraumbilical) ⁽¹⁹⁾.

Agrawal et al. ⁽²⁰⁾ also established that upper abdominal scars (signs of prior upper abdominal surgeries) might result in the creation of intraperitoneal adhesions, which can increase the risk of bleeding and damage during the insertion of an umbilical port. In their investigation, it was discovered to be a statistically significant factor.

Concerning clinically palpable GB in our study; two patients only had clinically palpable gallbladder and both of them had difficulty during operation so it was not a significant factor (P=0.5) for predicting difficulty. Palpable GB could be due to a distended GB, mucocele GB, thick walled or due to the adhesions between the GB and the omentum.

Kumar et al. ⁽²¹⁾ found clinically palpable GB to be significant clinical predictive factor (P=0.021) in LC. Also, **Agrawal et al.** ⁽²⁰⁾ published that clinically palpable GB was a predictor factor of DLC. In their study, only 10 patients had clinically palpable GB and out of them 90% (9 out of 10) had DLC.

Ghanem et al. ⁽¹⁹⁾ mentioned that palpating the gall bladder would be challenging because there might still be adhesion and irritation.

Elhady and Esmail ⁽²²⁾ found that patients undergoing laparoscopic cholecystectomy for acute cholecystitis were at risk for difficulty, complications, and poor operational and postoperative outcomes if they had a palpable sore right hypochondrial mass.

As regards preoperative ultrasonographic findings; we found that it was highly significant predictive factor for difficult LC (P=0.005). In this series as presence of a thick GB wall may make grasping and manipulation of GB difficult which makes the dissection at the Calot's triangle and the GB bed to be difficult and limits the extent of anatomical definition.

Ghanem et al. ⁽¹⁹⁾ found sonographically gall bladder wall thickness >4 mm would have more chance of DLC. **Chandrashekhar and Kailas** ⁽⁹⁾ revealed that patients with GB wall thickness larger than 3 mm (10 cases) showed significantly more intraoperative difficulty (P<0.001); this could be because it was difficult to hold GB, the GB bed was difficult to dissect, or there was more bleeding. Moreover, **Agrawal et al.** ⁽²⁰⁾ showed that pericholecystic collection was a predictor of DLC as they found 90.9% of those patients (10 out of 11) having difficulty in LC. Hence, there was a strong correlation between pericholecystic collection and DLC. **Sandhu et al.**, ⁽²³⁾ found that pericholecystic collection was an ultrasonography indicator of features of acute cholecystitis and has a significant association (P=0.004) with DLC.

In addition, **Kidwai et al.** ⁽¹²⁾ Found stone impacted at Hartmann's pouch in 10 patients, of whom 7 (70) had difficulty during the surgery and 2 (20) were converted to OC. Impacted stones at Hartmann's pouch makes

dissection difficult because of difficulty in holding GB at Hartmann's pouch. **Husain et al.** ⁽²⁴⁾ found that stone size more than 1 cm was a significant factor for difficult and very difficult LC with P value <0.05.

The duration of operation was found to be significant factor for predicting difficulty in our series; a mean of 86.45 (SD 17.63) minutes was found in the patients associated with difficulty while mean of 41.93 (SD 13.1) minutes in easy cases (P=0.001) and it was found to be one of predictors (independent variables) of difficulty of LC in logistic regression analysis (P<0.001), **Sandhu and Rana** ⁽²³⁾ found the patient-related factors, the operating surgeon's surgical experience, and the surgical facility all have a significant impact on how long the procedure takes.

Ko-iam et al. ⁽¹⁸⁾ found that operative duration more than 60 min was a significant predictive factor for a long hospital stay in patients undergoing LC (P=0.011).

CONCLUSION

Pre-operative US is no doubt good predictor of DLC in majority of cases and should be used as a screening procedure but more attention should be given to demographic data, history and clinical examination to predict the difficult LC because: (1) Obese patients are more prone to have a difficult LC; (2) History of previous abdominal surgery has high risk of DLC.; (3) GB wall thickness and GB stone size by ultrasonographic imaging are predictive factors for DLC; (4) Elderly patients are more prone to have a difficult LC; and Male tend to have higher number of difficult cases. **Supporting and sponsoring financially:** Nil.

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