ASSESSMENT OF PERIOPERATIVE PREDICTORS OF DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

By

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) is considerably performed world over. The entire number of patients suffering serious complications is noticeably high in spite of its low incidence rate, referring it a "rare but frequent" problem. Perioperative prediction of "difficult Laparoscopic cholecystectomy (LC) and operative grading system may not only improve patient safety but also be beneficial in lessening the overall cost of therapy and it may aid a surgeon in the decisive, most convenient approach (open /laparoscopic) for a particular patient, and advocating the patient about it, in that way, reducing the morbidity, complication.

Objective: To identify the pre-operative indicators for difficult laparoscopic cholecystectomy, identify the intra- operative indicators for difficult laparoscopic cholecystectomy, and develop predictive scoring system based on these factors.

Patients and methods: The present study was conducted over 50 patients aged between 23 to 59 years who underwent a laparoscopic cholecystectomy at Al-hussien Hospital and Bab-Alsharia Hospital of Al-Azhar University during the period of research from January 2020 to August 2020. Detailed clinical history was obtained that included demographic data consisting of age, sex and obesity, history of previous hospitalization for acute cholecystitis, history of endoscopic retrograde cholangiopancreatography (ERCP) and comorbid diseases (diabetes, or elevated liver enzymes etc). Diagnosis of cholelithiasis was confirmed in patients presenting with abdominal symptoms using an abdominal ultrasonography (USG).

Results: Two (4%) of cases were found to have been falling in the age group (20-30) years, 20 (40%) of them were falling in the age group (31-40), 22(44%) had an age ranged between (41-50) years, whereas 6 (12%) of patients were in the age group 51-60 years The mean age was 41.82±7.65 years. In this current work age wasn't found to be correlated with difficult operation. Regarding gender and BMI, the majority of included cases, 33 (66%), were females with the mean body mass index was 29.8± 5.129 and gender was not linked to difficult Laparoscopic cholecystectomy (LC) The net outcome of the present work showed that 33 (66%) cases had easy operation. Furthermore, 14 (28%) patients had difficult laparoscopic cholecystectomy and 3 (6%) were found to be very difficult on laparoscopic cholecystectomy. ROC curve analysis showed that a score above 4.5 was found to be associated with difficult cholecystectomy. As the score increases, difficulty level increases with sensitivity (50%) and specificity (93.9%) and AUROC curve 0.749; P= (0.007).

Conclusion: The difficult laparoscopic cholecystectomy and conversion to open surgery can be predicted preoperatively based on number of previous attacks of cholecystitis, gall bladder wall thickness, and presence or absence of pericholecystic collection and palpable gall bladder and/or impacted stones.

Keywords: Perioperative predictors of difficult, Laparoscopic cholecystectomy.

INTRODUCTION

Cholelithiasis is the most popular biliary illness and one of the extremely common causes of abdominal pain as it is present in 10–15% of the overall individuals. Though it is asymptomatic in most of them (>80%), virtually, 1–2% of asymptomatic patients will develop symptoms necessitating cholecystectomy annually, making cholecystectomy the furthermost common operation performed by general surgeons *(Abd-El-Aal and Abdallah, 2018* and *Bustos et al., 2019).*

Conventional open cholecystectomy (OC) has been dramatically switched to laparoscopic cholecystectomy (LC) since its inception in 1987 *(Hu et al., 2017).*

Laparoscopic cholecystectomy has promptly become the gold standard for monotonous gall bladder removal. Management of biliary tract disease has evolved from being a major procedure to a minimal invasiveness surgery concomitant with less pain relatively, safe tolerable day care procedure today, and earlier yield to full activity *(Vivek et al., 2014).* Likewise, the superiority of early LC over delayed LC was established in the treatment of acute cholecystitis (AC) *(Inoue et al., 2017).*

Laparoscopic cholecystectomy though safe and effective, it is deemed to be one of the most problematical laparoscopic surgery performed by surgeons worldwide as various problems may be encountered as difficulty in creating pneumoperitoneum, accessing peritoneal cavity, and releasing adhesions *(Vivek et al., 2014).*

Also, surgeons often face difficulties in performing LC due to their inability to precisely identify the anatomy of Calot's triangle as a result of severe inflammation. Therefore, in patients with severe acute cholicystities (AC) the rate of complications, such as bile leakage, common bile duct injury, and bowel injury, is high after LC, suggesting the importance of evaluation of inflammation severity *(Inoue et al., 2017).*

Furthermore, current literature suggests that the rate of intra-operative conversion from LC to OC is 1%-15%and that conversion is known to increase perioperative time, complication rates, perioperative costs, the length of hospital stay, and hospital charges. Conversion is also associated with complications including death, bile duct injury, bile leak, or bleeding, requiring reoperation or transfusion *(Hu et al., 2017).*

Thus, difficult laparoscopic cholecystectomy (DLC) is a primal problem which surgeons may encounter when treating AC. Precise prediction of DLC can help surgeons to prepare for perioperative challenges, optimize surgical procedures and reduce the postoperative complications. However, there are just a few scoring systems to assess the risk of LC to convert to open cholecystectomy for AC, but they offer no effective prediction of DLC *(Wu et al., 2019).*

Factors affecting the outcomes of LC have been heavily investigated over the past years. There are various pre or intraoperative factors that make LC a technically difficult procedure. These include acute cholecystitis, empyema gall bladder, gangrenous cholecystitis, fibrosed gallbladder, severe adhesions in calot"s triangle and intrahepatic gall

bladder. These problems are difficult to assess preoperatively but are usually encountered during LC and therefore responsible for major difficulty in performing the surgery *(Ghanem et al., 2017)*. Hence, operative grading system for laparoscopic cholecystectomy and scoring system "Operative classifications" was proposed classify the difficult Cholecystectomy from mild to extreme on the basis of intraoperative predicators *(Ahmed et al., 2018)*.

The present study aimed to identify the pre-operative indicators for difficult laparoscopic cholecystectomy, identify the intra- operative indicators for difficult laparoscopic cholecystectomy, and develop predictive scoring system based on these factors.

PATIENTS AND METHODS

This study was a prospective study that was conducted at Al-hussien and Bab Elsherria Hosptal of Al-Azhar University on a total of 50 patients who underwent laparoscopic cholecystectomy during the period from January 2020 to August 2020.

Inclusion criteria: Cases of acute or chronic cholecystitis with cholelithiasis who uunderwent laparoscopic cholecystectomy with informed consent for operative intervention during the research period.

Exclusion criteria:

The following were excluded from the study:

- Age below 18 years.
- Laparoscopic cholecystectomy performed with other laparoscopic intervention in the same setting.

- Laparoscopic cholecystectomy with Common Bile Duct (CBD) exploration.

- Viral marker positive patients (HBs Ag, HCV, HIV).

- Pregnancy.

- Patients with common bile duct (CBD) calculus, dilated CBD, features of obstructive jaundice.

- Patients who refused laparoscopic cholecystectomy.

- Patients who were not fit for general anesthesia due to various medical illnesses.

- Patient who didn't give informed consent.

- Contraindications to Laparoscopic cholecystectomy like: Cardiovascular and pulmonary disease, coagulopathies and end-stage liver disease (ESLD).

Ethical approval: The study was approved by the local ethics committee of the Ethical Committee of Faculty of Medicine, AL-Azhar University. An informed consent was taken from each individual participated in the present study after thorough explanation of the purpose and procedure of the study. Any participating patient had the right to withdraw from the study without being adversely impacted regarding the medical service he received.

Screening for patients with cholelithiasis presenting with abdominal symptoms, upper abdominal pain, or vomiting or dyspepsia or jaundice were done using an abdominal ultrasonography.

Eligible patients were subjected to:

- Thorough history taking including duration of illness, history of

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endoscopic retrograde cholangiopancreatography (ERCP), and previous history of acute cholecystitis.

- Abdominal examination and liver examination including liver span and presence or absence of ascites or splenomegaly, presence of palpable gall bladder.

- Presence of previous abdominal scar.

Anthropometric measurements:

Assessment of patients' weight, height then BMI was calculated using the formula: BMI weight (kg) / [height (m)]^2.

Routine preoperative investigations including CBC, liver and kidney function tests, coagulation profile, biochemical investigations and Abdominal Ultrasonography.

Statistical Analysis:

In the present study, statistical analyses of data were carried out using SPSS version 23. Numerical data were expressed as mean ± standard deviation. Qualitative variables were assessed by Chi square and Fisher exact test. P value < 0.05 was considered significant.

RESULTS

The present study was conducted over 50 patients aged between 23 to 59 years who underwent a laparoscopic cholecystectomy At (Al-hussien and Bab Elsherria) of Al-Azhar University during the period of research from January 2020 to August 2020. Detailed clinical history was obtained that included demographic data consisting of age, sex and obesity, history of previous hospitalization for acute cholecystitis, history of ERCP and comorbid diseases (diabetes,or elevated liver enzymes etc). Diagnosis of cholelithiasis was confirmed in patients presenting with abdominal symptoms using an abdominal ultrasonography (USG) **(Table 1)**.

Table (1): Demographic data of studied cases

Mean± SD	Patients (N = 50)
Age (years)	41.82±7.65
Gender (Male/ Female)	17/33
Percentage of male (%)	34%
Body Mass index (BMI) (kg/m^2)	29.8± 5.129

Out of 50 patients included in this study 9 patients had dense adhesions in the Calot's triangle <50% and 2 patients had adhesion burying the gall bladder. Also, 4 (8.3%) cases had distended gall bladder, 6(12.5%) cases suffered from stone ≥1cm impacted in Hartman's pouch, eight patients had difficulty in access to peritoneal cavity. Injury in bile duct was happened in 7 patients. In addition, one patient had pus outside gallbladder, 3 had pus collection, and nine patients had more 120 min to identify cystic artery. Laparoscopic cholecystectomy surgery consumed 60-120 min in 14 patients, and more than 120 min in three patients. Out of 50 patients, 10 patients had spilled stones, 11 patients had cystic artery injury, and 3 cases were converted to open cholecystectomy **(Table 2)**.

Table (2): Intra-operative parameters among studied cases

Value	Frequency	Percent
Appearance		
No adhesion	39	78%
Adhesion <50%	9	18%
Adhesion burying the gall bladder	2	4%
GB (contraction/ distention)		
No	35	72.9%
Distended	4	8.3%
Stone ≥ 1 cm impacted in Hartman's pouch	6	12.5%
Unable to grasp with atraumatic laproscopic forceps	3	6.3%
Access to peritoneal cavity		
No	42	84%
Adhesion pervious surgery limiting access	8	16%
Complications		
Bile injury	7	14%
Pus outside GB	1	2%
Pus collection	3	6%
Time taken for surgery		
<60 nim	33	66%
60-120 min	14	28%
>120 min	3	6%
Cystic artery injury	11	22%
Conversion to open	3	6%

Thirty three (66%) cases had easy operation. Furthermore, 14 (28%) patients had difficult laparoscopic cholecystectomy and 3 (6%) were found to be very difficult on laparoscopic cholecystectomy **(Table 3)**.

Table (3): Outcome of the operation among studied cases.

	Frequency	Percent
Surgical outcome		
Easy	33	66%
Difficult	14	28%
Very difficult	3	6%

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Pre-operative, and USG findings against the endpoint of difficult cholecystectomy:

The present study showed that among 4 patients with history of acute cholecystitis, 3 patients had difficult extraction of GB without statistical significant (p = 0.091).

In addition, 2 out of 33 cases (6.1%) with easy outcome had history of ERCP, whereas 1 out of 13 patients with difficult outcome had history of ERCP. There was no statistically significant difference between history of ERCP and outcome of operation (P=0.894).

Moreover out of 14 patients with difficult outcome, four (28.6%) had history of DM while 14 out of 33 cases with easy outcome and one of 3 patients with very difficult outcome had history of DM. Furthermore, there was no statistically significant difference between distention of CBD and outcome of operation (P=0.263).

This study showed that pericholecystic collection was significantly association with difficult laparoscopic cholecystectomy (P=0.004) as 4 cases with pericholecystic collection had difficult cholecystectomy and one case had very difficult outcome.

In our study palpable GB was significantly associated with difficult cholecystectomy (P=0.028). Two out of 33 who fall in easy cholecystectomy category (6.1%) had palpable GB, 5 out of 14 cases in difficult cholecystectomy category (35.7%) had palpable GB, and 1 out of three cases (33.3%) of very difficult cholecystectomy category had palpable GB.

Also, impacted stone on ultrasonography found associated with difficulty of cholecystectomy in present study (P=0.004). However, other factors including GB wall thickness, GB stone size, GB stone number, and liver ultrasonography finding found insignificant with the cholecystectomy outcome in present study (P>0.05) **(Table 4)**.

Table (4): Pre-operative, and USG findings against the endpoint of difficult cholecystectomy

Outcome / Parameters	Easy N=33	Difficult N=14	Very difficult N=3	P-value
History of acute cholecystitis				
No	32(97%)	11(78.6%)	3(100%)	0.091
Yes	1(3%)	3(21.4%)	0(0%)	
History of ERCP				
No	31(93.9%)	13(92.9%)	3(100%)	0.894
Yes	2(6.1%)	1(7.1%)	0(0%)	
History of DM				
No	19(57.6%)	10(71.4%)	2(66.7%)	0.660
Yes	14(42.4%)	4(28.6%)	1(33.3%)	
Abdominal scar				
No	27(81.8%)	10(71.4%)	2(66.7%)	
Infra-umbilical	3(9.1%)	3(21.4%)	0(0%)	0.464
Supra-umbilical	3(9.1%)	1(7.1%)	1(33.3%)	
CBD distension				
Normal	31(93.9%)	12(85.7%)	2(66.7%)	0.263
Distended	2(6.1%)	2(14.3%)	1(33.3%)	
Pericholecystic collection				
No	33(100%)	10(71.4%)	2(66.7%)	0.004*
Yes	0(0%)	4(28.6%)	1(33.3%)	
Palpable GB				
No	31(93.9%)	9(64.3%)	2(66.7%)	0.028*
Yes	2(6.1%)	5(35.7%)	1(33.3%)	
GB Wall thickness				
<4mm	31(93.9%)	10(71.4%)	2(66.7%)	0.077
≥4mm	2(6.1%)	4(28.6%)	1(33.3%)	
GB stone size				
small	27(81.8%)	8(57.1%)	3(100%)	0.117
Large	6(18.2%)	6(42.9%)	0(0%)	
GB stone number			1(33.3%)	
Solitary	7(21.2%)	5(35.7%)	2(66.7%)	0.559
Multiple	26(78.8%)	9(64.3%)		
Impacted stone in the neck of GB				
No	33(100%)	10(71.4%)	2(66.7%)	0.004**
Yes	0(0%)	4(28.6%)	1(33.3%)	
Liver ultrasonography finding				
Average	30(90.9%)	11(78.6%)	3(100%)	0.396
Fatty	3(9.1%)	3(21.4%)	0(0%)	

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Pre-operative and USG against conversion to open:

There was no significant association between Pre-operative and intraoperative data and the conversion to open surgery (P>0.05) **(Table 5)**.

Table (5): Pre-operative and intraoperative findings against the conversion to open surgery

Conversion to open Parameters	No(N=47)	Yes (N=3)	P-value
History of acute cholecystitis			
No	43(91.5%)	3(100%)	
Yes	4(8.5%)	0(0%)	0.598
History of ERCP			
No	44(93.6%)	3(100%)	
Yes	3(6.4%)	0(0%)	0.652
History of DM			
No	29(61.7%)	2(66.7%)	
Yes	18(38.3%)	1(33.3%)	0.863
Abdominal scar			
No	37(78.7%)	2(66.7%)	
Infra-umbilical	6(12.8%)	0(0%)	0.337
Supra-umbilical	4(8.5%)	1(33.3%)	
CBD distension			
Normal	43(91.5%)	2(66.7%)	
Distended	4(8.5%)	1(33.3%)	0.164
Pericholecystic collection			
No	43(91.5%)	2(66.7%)	
Yes	4(8.5%)	1(33.3%)	0.164
Palpable GB			
No	40(85.1%)	2(66.7%)	
Yes	7(14.9%)	1(33.3%)	0.398
GB Wall thickness			
<4mm	41(87.2%)	2(66.7%)	
≥4mm	6(12.8%)	1(33.3%)	0.396
GB stone size			
small	35(74.5%)	3(100%)	
Large	12(25.5%)	0(0%)	0.315
GB stone number			
Solitary	12(25.5%)	1(33.3%)	
Multiple	35(74.5%)	2(66.7%)	0.765
Impacted stone in the neck of GB			
No	43(91.5%)	2(66.7%)	
yes	4(8.5%)	1(33.3%)	0.165
Liver ultrasonography finding			
Average	41(87.2%)	3(100%)	
Fatty	6(12.8%)	0(0%)	0.373

Pre-operative, and USG findings and the risk of difficult cholecystectomy:

Patients with pericholecystic collection had 3.750 times more risk for difficult cholecystectomy when compared with patients with no pericholecystic collection with significant p value =0.003. Patients who had palpable gall bladder had 8.455

times more risk for difficult cholecystectomy when compared with patients without; with significant p value =0.013. Patients who had gall bladder wall thickness ≥4mm had 6.458 times more risk for difficult cholecystectomy when compared with patients with gall bladder wall thickness< 4mm; with significant p value = 0.037. Patients who had impacted stone in the neck of GB had 3.750 times more risk for difficult cholecystectomy when compared with patients without impacted stone with significant p value =0.003. All the other variables were not statistically significant (p-value > 0.05) **(Table 6)**.

Table (6): Pre-operative, and USG findings and risk of difficult cholecystectomy

Parameters / Risk of difficult cholecystectomy	Difficult (N=17)	Easy (N=33)	Odd ratio (C.I)	P-value
Age				
>40 years	12(70.6%)	16(48.5%)	2.550	0.136
≤40 years	5(29.4%)	17(51.5%)	(0.733-8.872)	
BMI				
>25 kg/m²	13(76.5%)	20(60.6%)	2.875	0.266
≤25 kg/m²	4(23.5%)	13(39.4%)	(0.616-3.539)	
History of acute cholecystitis				
Yes	3(17.6%)	1(3%)	6.857	0.711
No	14(82.4%)	32(97%)	(0.655-71.807)	
History of ERCP				
Yes	1(5.9%)	2(6.1%)	0.969	0.980
No	16(94.1%)	31(93.9%)	(0.082-11.512)	
History of DM				
Yes	5(29.4%)	14(42.4%)	0.565	0.369
No	12(70.6%)	19(57.6%)	(0.162-1.976)	
Abdominal scar				
Present	5(29.4%)	6(18.2%)	1.875	0.364
Absent	12(70.6%)	27(81.8%)	(0.477-7.363)	
CBD distension				
Distended Normal	3(17.6%) 14(82.4%)	2(6.1%) 31(93.9%)	3.321 (0.498-22.146)	0.196
Pericholecystic collection				
Yes	5(29.4%)	0(0%)	3.750	<0.001**
No	12(70.6%)	33(100%)	(2.310-6.088)	
Palpable GB				
Yes	6(35.3%)	2(6.1%)	8.455	<0.008*
No	11(64.7%)	31(93.9%)	(1.481-48.259)	
GB Wall thickness	5(29.4%)	2(6.1%)	6.458	
≥4mm <4mm	12(70.6%)	31(93.9%)	(1.100-37.918)	0.024*
GB stone size				
Large	6(35.3%)	6(18.2%)	2.455	0.180
Small	11(64.7%)	27(81.8%)	(0.648-9.292)	
GB stone number			0.494	
Multiple	11(64.7%)	26(78.8%)	(0.135-1.808)	0.282
Solitary	6(35.3%)	7(21.2%)		
Impacted stone in the neck of GB	5(29.4%)			
yes	12(70.6%)	0(0%)	3.750	0.001
No		33(100%)	(2.310-6.088)	
Liver ultrasonography				
Fatty	3(17.6%)	3(9.1%)	2.143	0.398
Average	14(82.4%)	30(90.9%)	(0.383-11.984)	

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Correlation of peri operative score and the outcome:

Among the 33 (100%) cases with easy operation, 31(93,9%) had an easy score while 2 (6,1%) had difficult one.. Also, among the 14(100%) cases with difficult operation, 9(64.3%) cases had an easy score, 4 cases (28.6%) had difficult score while 1 (7.1%) had very difficult operation. And the only 3 cases who developed very difficult operation: one case (33.3%) had very difficult score and another 2 (66.7%) cases had difficult operation **(Table 7)**.

Table (7): Correlation of preoperative score and the outcome

Surgical outcome	Easy	difficult	Very difficult	Total
Score:				
Easy(0-5)	31 (93.9%)	9(64.3%)	2(66.7%)	**42(84%)**
Difficult(6-10)	2 (6.1%)	4(28.6%)	1(33.3%)	**7(14%)**
Very difficult(11-15)	0(0%)	1(7.1%)	0(0%)	**1(2%)**
Total	**33(100%)**	**14(100%)**	**3(100%)**	**50(100%)**
P-value	0.087			

Roc curve analysis showed that a score above 4.5 was found to be associated with difficult cholecystectomy. As the score increases, difficulty level increases with sensitivity (50%) and specificity (93.9%) and AUROC curve 0.749; P= (0.007).
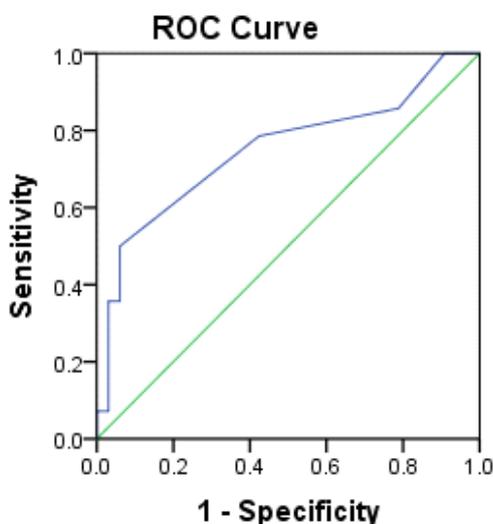
Diagonal segments are produced by ties.

Figure (1): ROC curve analysis of score in predicting difficult laparoscopic cholecystectomy

DISCUSSION

As regard age, results of the present work revealed that 2 (4%) of cases were found to have been falling in the age group (20-30) years, 20 (40%) of them were falling in the age group (31-40), 22(44%) had an age ranged between (41-50) years, whereas 6(12%) of patients were in the age group 51-60 years The mean age was 41.82±7.65 years. In this

current work age wasn't found to be correlated with difficult operation.

In accordance to our results, *Agrawal et al. (2015)* found that the majority of patients were in the age group of ≤50 years (25 patients) and only 16.7% (five cases) were >50 years and they found no significant correlation between age and the difficult level of surgery.

Moreover, in line with our results, *Abd-El-Aal and Abdallah (2018)* found that the mean age of cases underwent LC was 43.92 years (range: 19–70 years). Most patients were in the age group of 41–50 years followed by age group of 31–40 years. Also, *Kulkarni and Kumar (2018)* found that the maximum incidence (36.14%) of LC was seen in the age group of 35 to 50 years.

However, in accordance to our results, *Sandhu et al. (2016)* published that there was no significant association was found between age and outcome of LC and that was in conformity with *Naik and Kailas (2017)* who found that age was not a significant(p = 1.59) factor for predicting difficulty in LC.

A meta-analysis by *Rothman et al. (2016)* in their meta-analysis concluded that quality of evidence for age as a risk factor for conversion was low.

Regarding gender and BMI, the majority of included cases, were females with the gender was not linked to difficult LC.

In studies done worldwide, male sex has been described to be associated with difficult LC *(O'Leary et al., 2013)*. In contrary to our finding, *Ghanem and his co-workers (2017)* also found that the patient gender was found to be a significant factor that associates the difficulty of LC.

Agrawal et al. (2015) found that there was no statistically significant difference in the total time taken for the procedure between the two sexes.

In conformity with our results, *Bhar et al. (2013)* published a study suggesting that male sex was not statistically significant predictor of difficult LC. This finding was also in line with that of *Nityasha et al. (2016)* and *Naik and Kailas (2017)* who published that gender had little influence on the course of surgery which may be due to small size of their sample.

Meta-analysis by *Rothman et al. (2016)* found that quality of evidence of male gender as a risk factor for conversion was low.

Moreover, out of 14 patients with difficult outcome, 28.6% had history of DM. Furthermore, there was no statistically significant difference between distention of CBD and outcome of operation.

Our results were in accordance to meta-analysis of *Rothman et al. (2016)* published that none of studies evaluating diabetes mellitus as a risk factor found it to be significant. *Lowndes et al. (2016)* mentioned that diabetes was not statistically significant in this regression model as predictors of prolonged operative duration.

On the other hand, history of diabetes mellitus (DM) was found to be a significant predictive factor for difficulties during LC in a published studies by *Bhar et al. (2013)* and *Ghanem et al. (2017)* as they claimed that diabetes had positive

correlation with difficulties encountered in LC as in diabetic patients there may be several attacks of sub-acute inflammation causing more scarring and making cholecystectomy more difficult.

In addition, this study showed that pericholecystic collection was significantly association with difficult laparoscopic cholecystectomy. On risk factor assessment, patients with pericholecystic collection had 3.750 times more risk for difficult cholecystectomy when compared with patients with no pericholecystic collection with significant.

In agreement with our results, *Abd-El-Aal and Abdallah (2018)* mentioned that pericholecystic collection, and GB wall thickness was found to be predictor of difficult LC. In thier study, 28 patients had palpable GB, 14 of them had a difficult procedure after surgery. Palpable GB was found to be statistically significant in univariate analysis of preoperative and intraoperative outcomes with risk factor.

There was a statistical significant association between pericholecystic collection on Sonography and LC difficulty in other studies *(Agrawal et al., 2016*, *Sandhu et al., 2016* and *Ghanem et al., 2017)*.

However, *Naik and Kailas (2017)* found that pericholecystic collection was not statistically significant in predicting difficulty.

Clinically palpable GB may be due to distended GB, mucocele of GB, thick-walled or owing to adhesions between the GB and the omentum. Increased thickness of GB wall was associated with difficult dissection of the GB from its bed; thick GB wall may make grasping and manipulation of GB difficult, and this also makes the dissection at Calot's triangle and the GB bed to be difficult and limits the extent of anatomical definition *(Lowndes et al., 2016)*.

Sugrue et al. (2015) published palpable gallbladder has been shown to increase the likelihood of a difficult procedure and in conformity *Kumar et al. (2015)* found it to be significant clinical predictive factor in LC. *Agrawal et al. (2016)* mentioned that clinically palpable GB was found to be predictor of difficult LC. *Singh and Nath (2016)* published that if gall bladder is palpable then it would be difficult, as there may be residual inflammation adhesion. *Elhady and Esmail (2017)* found that presence of palpable tender right hypochondrial mass was risk factor for difficulty, complications, operative and postoperative outcome in patients undergoing LC for acute cholecystitis.

Also, in the current work, impacted stone on ultrasonography found associated with difficulty of cholecystectomy in present study. Patients who had impacted stone in the neck of GB had 3.750 times more risk for difficult cholecystectomy when compared with patients without impacted stone.

In line with that, *Kidwai et al. (2016)* concluded that impacted stones at Hartmann's pouch make dissection difficult because of difficulty in holding GB at Hartmann's pouch. *Husain et al. (2016)* found that stone size more than 1 cm was a significant factor for difficult and very difficult LC with. Moreover, *Ghanem et al. (2017)*; found that it was a significant predictive factor for difficult LC.

Patients who had gall bladder wall thickness ≥4mm had 6.458 times more risk for difficult cholecystectomy when compared with patients with gall bladder wall thickness< 4mm.

Agrawal et al. (2016) found that increased GB wall thickness is associated with difficult dissection of the GB from its bed. *Nityasha et al. (2016)* found in their study that thickened gall bladder wall was found significant predictor of difficulty and was significantly associated with adhesions bleeding increased operating time and all the three converted patients had thickened gall bladder wall. *Naik and Kailas (2017)* published that significantly intraoperative difficulty demonstrated in patients with GB wall thickness greater than 3 mm that may be due to difficulty during grasping the gall bladder, difficult GB bed dissection and higher incidence of bleeding.

Presence of a thick GB wall may make grasping and manipulation of GB difficult. This makes the dissection at the Calot's triangle and the GB bed to be difficult and limits the extent of anatomical definition. In our study, we found no significant correlation between the GB wall thickness and the difficulty level of surgery. Better randomization of the patients into the two groups and a larger sample size would have allowed us to extrapolate the results into the general population *(Agrawal et al., 2015)*.

Furthermore, *Kania (2017)* recommended that it should be borne in mind that ultrasound assessment of the gall-bladder wall, even if no pathology has been found, remains an auxiliary examination and does not mean that the operator should not be watchful and thoughtful while skeletonizing the Calot's triangle structures.

In this study also, other factors as GB stone size, GB stone number, and liver ultrasonography findings were found insignificant with the cholecystectomy outcome in the present study.

Several prediction models for a difficult LC, based on subjective assessment intra-operative difficulty have been proposed (e.g. 'unable to', 'difficult dissection of'). However, these assessments also depend on surgeons' experience and routine practice and are therefore not easily transferable between institutions *(Wennmacker et al., 2019)*.

History of previous abdominal scar was found to be insignificant predictive factor for difficulty during LC. This was in agreement with *Bhar et al. (2013)* as they did not find any significant correlation between past abdominal surgeries and difficulties encountered during LC which also was is in accordance with the study of *Kumar et al. (2015)* as they were published that previous surgery was not significant predictive risk factor for difficult LC. *Sandhu et al. (2016)* also found that the abdominal scar in has not been a significant association with the outcome of LC. *Ko-iam and his colleuges (2017)* found that it was non-significant predictive Factors for a long hospital stay in patients undergoing LC.

However, *Singh and Nath (2016)* found that previous abdominal scar (supraumbilical) will lead to conversion to open cholecystectomy in conformity to *Agrawal et al. (2016)* and *Ghanem et al. (2017)* who published those upper

abdominal scars was found to be statistically significant factor.

The scoring system used in this study was of *Randhawa and Pujahari (2010)* the scores were added up to get a total score and the patients were divided into categories of risks based on the total score, Results of recurrent study revealed that among 100% cases with easy operation, positive predictive value for this scoring system was 93.9% as they were predicted to be easy. Also, among 100% cases with difficult operation, 64.3% cases had an easy score, 28.6% had difficult score while 7.1% had very difficult operation.

Agrawal et al. (2015) utilized the same score observed a positive predictive value of 76.4% for cases predicted to be easy. For cases predicted to be difficult, they registered a positive predictive value of 100% for the scoring system.

Abd-El-Aal and Abdallah (2018) found that the number of cases predicted to be difficult/very difficult on preoperative evaluation were 28% patients, of which 26% were difficult/very difficult on surgery, whereas 2% cases were turned out to be easy. The cases predicted to be easy on preoperative evaluation were 72%, of which 63% cases were actually easy whereas 9% cases turned out to be difficult/very difficult on surgery, and also five cases were converted to open.

Moreover, Roc curve analysis in our study showed that a score above 4.5 was found to be associated with difficult cholecystectomy. As the score increases, difficulty level increases with sensitivity (50%) and specificity (93.9%) and AUROC curve 0.749.

In agreement with our results, *Abd-El-Aal and Abdallah (2018)* found that ROC curve for difficult versus easy cases at cutoff point greater than 5 and AUC of 0.91, with 95% CI=0.83–0.96, showed sensitivity of 77.8, specificity 96.9%.

The sensitivity and specificity used in a study conducted by *Veerank and Togale (2018)* at score 5, were 86.36% and 75%, respectively and the prediction has come true in 90.48 % easy and 66.67% difficult cases.

A similar study conducted by *Gupta and his Co-workers (2013)* on this scoring method had sensitivity and specificity of 95.74 % and 73.68 %, respectively with positive predictive values for easy and difficult as 90% and 88%, respectively.

So, from these results, we observed that the preoperative scoring system is statistically and clinically a good and valuable for predicting the perioperative outcome in LC. Also, we conclude that the difficult laparoscopic cholecystectomy and conversion to open surgery can be predicted preoperatively based on number of previous attacks of cholecystitis, gall bladder wall thickness, and presence of pericholecystic collection, palpable gall bladder and or impacted stones.

Tackling these problems depend on the experience and learning curve of the surgeon. It is a well-accepted fact that an experienced surgeon needs less operating time and is better equipped to face these risk factors. It must be understood that none of these risk factors are an absolute contraindication to proceed with the procedure. But while assessment of a patient these must be kept in mind so that intraoperative technical difficulty can be expected and averted.

CONCLUSION

The difficult laparoscopic cholecystectomy and conversion to open surgery can be predicted preoperatively based on number of previous attacks of cholecystitis, gall bladder wall thickness, and presence or absence of pericholecystic collection and palpable gall bladder /or impacted stones.

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تقييم العوامل المحيطة للتتبؤ بصعوبه استئصال المراره بالمنظار الجراحي

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خلفيــة البحــث: تعـد الحصـوات المراريــة مـن أكثرالأمـراض شـيوعًا و أحـد أهـم أسـباب الألــم البــاطني والتـي تحـدث فـي حـوالي 10-15٪ مـن الأشـخاص. وعلـى الـرغم مـن أنهـا عـادة مـا تتواجـد دون اعـراض فـي أكثـر مـن 80٪ مـن المرضـي الا أن 1-2 ٪ مـن المرضـى سـوف يعـانون يومـا مـا مـن الأعـراض التـي تتطلـب استئصـال المـرارة سـنويا ممـا يجعـل عمليـة استئصـال المـرارة العمليـة الأشـهر فـي الجراحـة العامـة. بالتــالي، تــم اقتــراح نظـام الـدرجات الجراحيــة لاستئصـال المـرارة بالمنظـار ونظـام التصـنيفات لتصـنيف عمليـة استئصـال المـرارة الصـعبة مـن سـهلة الـي صـعبةعلى أساس عوامل للتتبؤ اما قبل العملية أو أثناء العملية.

الهـدف مـن البحـث: تحديـد المؤشـرات السـابقة للعمليـة لاستئصـال المـرارة بالمنظـار الصـعب، وتحديـد المؤشـرات أثنـاء العمليـة لاستئصـال المـرارة بالمنظـار، وتطـوير نظام التسجيل التنبؤي بناءً على هذه العوامل.

المرضـي وطـرق البحـث: تـم إجـراء هـذه الدراسـة فـي قسـم الجراحـة العامـة فـى مستشـفي الحسـين الجـامعي ومستشـفى بـاب الشـعريه علـى 50 مريضـاً فـى الفتـرة مـا بـين ينـاير 2020 الـي أغسـطس 2020. تـم أخـذ التـاريخ المرضـى بحـرص وتـم عمـل فحـص إكلينيكـى والفحـوص المعمليـة والسـونار للتشـخيص. وتـم تقيـيم المرضـى المختارين لعوامل الخطر قبل الجراحة.

نتـائج البحـث: فيمـا يتعلـق بـالعمر، كشـفت نتـائج العمـل الحـالي أن 2 (4٪) مـن الحـالات كانـت تقـع فـي الفئـة العمريــة (20-30) سـنة، 20 (40٪) مـنهم تقـع فـي الفئـة العمريــة (31). -40)، 22 (44٪) تراوحـت أعمـارهم بـين (41-50) سـنة، بينمـا 6 (12٪) مـن المرضـى كـانوا فـي الفئـة العمريـة 51-60 سـنة وكـان متوسـط العمـر 41.82 ± 7.65 سـنة. و لـم يـتم العثـور علـى علاقـة للعمـر بصـعوبة العمليـة. وفيمـا

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يتعلـــق بـــالنوع ومؤشـــر كتلـــة الجســـم، كانـــت غالبيـــة الحـــالات المشـــمولة، 33 (66 ٪)، مـــن الإنـــاث بمتوســـط مؤشـــر كتلـــة الجســـم كـــان 29.8 ± 5.129. ولـــم يكـــن النـــوع مرتبطـــا بصـــعوبة العمليـــة. ومـــن بـــين 33 (100٪) حالـــة ســـهلة، حصـــل31 (93،9٪) علـــى نتيجـــة ســـكور للتنبـــؤ ســـهل فـــي حـــين أن مـــن بـــين 14 (100٪) حالـــة مـــع عمليـــة صـــعبة، حصـــل 4 حـــالات (28.6٪) علـــى نتيجـــة ســـكور للتنبـــوء صـــعب. والحـــالات الـــثلاث التـــي خضـــعن لعمليـــة جراحيـــة صـــعبة للغايـــة: كـــان مـــن بينهـــا حالـــة واحـــدة (33.3٪) لـــديها ســـكور صـــعب للغايـــة. وأظهـــر تحليـــل منحنـــى Roc أنـــه تـــم العثـــور علـــى درجـــة أعلـــى مـــن 4.5 مرتبطـــة باستئصـــال المـــرارة الصـــعب. مـــع زيـــادة الدرجـــة، يـــزداد مســـتوى الصـــعوبة مـــع الحساســـية (50٪) والنوعيـــة (93.9٪) ومنحنـــى AUROC 0.749؛ (0.007) P P = كبيرة 0.003 =.

الاســـتنتاج: إستئصـــال المـــرارة الصـــعب بالمنظـــار والتحويـــل إلـــى الجراحـــة المفتوحـــة يمكـــن التنبـــوء بـــه قبـــل الجراحـــة بنـــاءً علـــى عـــدد المـــرات الســـابقة لالتهـــاب المـــرارة، وســـماكة جـــدار المـــرارة، ووجـــود أو عـــدم وجـــود تجمـــع حـــول المـــرارة والمـــرارة الملموسة أو الحصوات المدفونة في العنق.

الكلمـــات الدالـــة: تقيـــيم العوامـــل المحيطـــة للتنبـــوء بصـــعوبه استئصـــال المـــراره بالمنظـــار الجراحي.