A scoring system for laparoscopic cholecystectomy to pick up difficult cases

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Background
The conventional surgical treatment for cholelithiasis is laparoscopic cholecystectomy (LC), although some patients still require conversion to open cholecystectomy, primarily due to technical challenges. Risk factor prediction before surgery aids in determining intraoperative challenges. There are several rating systems that can be used to anticipate intraoperative challenges during LC. However, a trustworthy and consistent scoring and prediction system must be developed.
Aim and objectives
to reduce complications from LC and establish a score system to anticipate difficult LC before surgery.
Patient and methods
This observational cohort research, which involved 50 patients with calculous cholecystitis, was conducted at the General Surgery Department of the Assiut University Hospitals. One day before to surgery, all patients undergoing elective LC underwent scoring procedures. The intraoperative activities were all documented. Every patient got the usual postoperative treatment and monitoring.
Result
The preoperative score and LC results were significantly correlated.
Conclusion
The improvement of patient counselling, surgical planning, and postoperative expectations is made possible by identifying preoperative risk factors that indicate difficult LC. These variables also assist the surgeon in LC difficulty prediction and in maintaining a lower threshold for conversion under tough intraoperative situations.

Keywords:
cholecystectomy, cholecystitis, laparoscopic, preoperative prediction, scoring system

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Introduction

The conventional surgical treatment for cholelithiasis is laparoscopic cholecystectomy (LC), although some patients still require conversion to open cholecystectomy, primarily due to technical challenges. Kama *et al*., goal is to create a risk score that can predict if a LC will change to an open procedure [1].

Classifying these patients before surgery may enable better preoperative planning and save operating expenses [2–4].

The ability of preoperative clinical, laboratory, and radiological data to forecast the conversion of laparoscopic (LC) for acute cholecystitis to open operation [5].

Predicting a difficult LC before surgery can help both the patient and the surgeon better prepare for intraoperative risk and the possibility of conversion to open cholecystectomy [6]; depending on the surgeon's expertise, unique procedures, and intraoperative examinations, so iatrogenic injuries and conversion rate can be decreased [7].

For these factors, this study is done to predict difficult LC preoperatively & to decrease complication of LC.

Patients and methods

At the Assiut University Hospital's Department of General Surgery, an observational cohort research was carried out. The study was conducted between

Table 1 Scoring factors

History		
Age	< 50 Yrs. (0)	>50 Yrs. (1)
Sex	Female (0)	Male (1)
History of hospitalization for acute cholecystitis	NO (0)	Previous Abdominal surgery (2)
Previous Acute cholecystitis (4)		
Clinical Examination		
BMI	<25	25–27.5 (1) >27.5 (2)
Abdominal scar	NO (0)	Infra-Umbilical (1) Supra-Umbilical (2)
Palpable gall bladder	NO (0)	Yes (1)
Ultrasound findings		
Thick wall	Thin	Thick 2–4 cm (1) >4 cm (2)
Pericholecystic collection	NO (0)	Yes (1)
Impacted stone	NO (0)	Yes (1)

Table 2 Intraoperative assessment

Grading	Score	Parameters
Easy	0–5	Time taken< 60 min no bile spillage no injury to duct, artery
Difficult	6–10	Time taken 60–120 min bile/stone spillage injury to duct –no conversion
Very difficult	11–15	Time taken >120 min Conversion

April 2022 and October 2022. There were 50 individuals with calculous cholecystitis in the sample.

Inclusion Criteria: Adult male and female Age of or above 18 years, Symptomatic gall bladder stones, Ultrasonography shows gall bladder stones, Uncomplicated chronic calculous cholecystitis and Acute on top of chronic calcular cholecystitis.

Exclusion criteria: Complex gall bladder stones, malignant gall bladder mass, LC conducted concurrently with another laparoscopic procedure, LC with common bile duct exploration, unfit patient, and equipment failure.

Preoperative settings: Detailed history taking and clinical examination.

ECG was done for patients above 40 years old. All of the patients will not receive any premedication.

Score 0–5 easy, 6–10 difficult, 11–15 very difficult (Table 1)

Tables 1 and 2 show scoring factors used for grading the patient parameters. [8]

Statistical analysis

With the use of the IBM SPSS software package version 20.0, data were input into the computer and analysed. IBM Corp., Armonk, New York Number and percentage were used to describe qualitative data.

Table 3 Demographic characteristics of the studied cases

Patient characteristics	*n* (%), *n* = 50
Age (years)	
≤50	32 (64%)
> 50	18 (36%)
Gender	
Male	12 (24%)
Female	38 (76%)
Body mass index (kg/m^2)	
≤25	5 (10%)
25.1–27.5	24 (48%)
> 27.5	21 (42%)

The normality of the distribution was examined using the Kolmogorov-Smirnov test. The range (minimum and maximum), mean, standard deviation, median, and interquartile range were used to characterize quantitative data. At the 5% level, the significance of the results was determined.

Results

A total of 50 patients were involved in the study. All patients of elective LC were subjected to scoring parameters 1-day before surgery on admission.

As shown in Table 3, Most of the patients 32 (64%) were aged below 50 years, with a female preponderance 38 (76%). Of the 50 patients, 5 (10%) had BMI ≤ 25 kg/m^2, 24 (48%) had BMI 25.1–27.5 kg/m^{2}and 21 (42%) had BMI > 27.5 kg/m^2.

Table 4 shows that there was highly significant difference between both Easy LC, Difficult and very Difficult LC groups as regards Age, gender, and History of hospitalization ($P < 0.001$).

As shown in Table 5 that there was highly significant difference between both Easy LC, Difficult and very

Difficult LC groups as regards BMI, Abdominal Scar, and Palpable gall bladder ($P < 0.001$).

Table 6 shows that there was highly significant difference between both Easy LC, Difficult and very Difficult LC groups as regards thick wall GB, Pericholecystic collection and Impacted stone ($P < 0.001$).

Table 7 shows that there was highly significant difference between both Easy LC, Difficult and very Difficult LC groups as regards Operation time ($P < 0.001$).

Using a cutoff value of 5, Table 8 shows preoperative Difficulty scoring had sensitivity and specificity of 84.2 and 96.1%, respectively, with an accuracy of 99.1% to predict the difficulty of LC

Table 4 Relation between difficulty score and demographic data (*n*=50)

Demographic data	Easy LC (n = 40) No. (%)	Difficult and Very Difficult LC (n = 10) No. (%)	Test of Sig.	*P*
Age				
≤50	29 (58.0)	3 (30.0)	χ^2= 32.12*	<0.001*
> 50	11 (22.0)	7 (70.0)		
Gender				
Male	10 (25.0)	8 (80.0)	χ^2 = 60.65*	<0.001*
Female	30 (75.0)	2 (20.0)		
History of Hospitalization				
No previous history of hospitalization	34 (85.0)	0 (0.0)		
Previous Abdominal Surgery	3 (7.5)	4 (40.0)	χ^2= 10.064*	0.002*
Previous Acute Cholecystitis	3 (7.5)	6 (60.0)		

χ^2, Chi square test; FE, Fisher Exact; MC, Monte Carlo; SD, Standard deviation; t, Student *t*-test; U, Mann Whitney test. *P*: *P* value for comparing between the studied categories. *: Statistically significant at $P \leq 0.05$.

Table 5 Relation between difficulty score and Clinical Examination (*n*=50).

Clinical Examination	Easy LC (*n*=40) No. (%)	Difficult and Very Difficult LC (*n*=10) No. (%)	Test of Sig.	*P*
BMI				
> 25	20 (50.0)	0 (0.0)	χ^2= 81.2	<0.001*
25–27.5	15 (37.5)	4 (40.0)		
> 27.5	5 (12.5)	6 (60.0)		
Abdominal Scar				
No	27 (67.5)	0 (0.0)	χ^2= 29.42	<0.001*
Infra-Umbilical	11 (27.5)	2 (20.0)		
Supra-Umbilical	2 (5.0)	8 (80.0)		
Palpable Gall Bladder				
No	37 (92.5)	1 (10.0)	χ^2= 9.094	0.003*
Yes	3 (7.5)	9 (90.0)		

χ^2, Chi square test; FE, Fisher Exact; MC, Monte Carlo; SD, Standard deviation; t, Student *t*-test; U:Mann Whitney test; *P*: *P* value for comparing between the studied categories. *: Statistically significant at $P \leq 0.05$.

Table 6 Relation between difficulty score and Ultrasound Findings (*n*=50)

Ultrasound Findings	Easy LC (*n*=40) No. (%)	Difficult and Very Difficult LC (*n*=10) No. (%)	Test of Sig.	*P*
Thick Wall				
No	22 (55.0)	2 (20.0)	χ^2=6.41	0.04*
Yes	18 (45.0)	8 (80.0)		
Pericholecystic Collection				
No	39 (97.5)	3 (30.0)	χ^2=27.12	<0.001*
Yes	1 (2.5)	7 (70.0)		
Impacted Stone				
No	36 (90.0)	4 (40.0)	χ^2=10.064	<0.001*
Yes	4 (10.0)	6 (60.0)		

χ^2, Chi square test; FE, Fisher Exact; MC, Monte Carlo; SD, Standard deviation; t, Student *t*-test; U, Mann Whitney test. *P*: *P* value for comparing between the studied categories. *: Statistically significant at $P \leq 0.05$.

Discussion

The removal of the gall bladder due to a stone or inflammation is known as a cholecystectomy. The gold standard surgical method for treating individuals with symptomatic gallstones is LC. It has a number of benefits over open cholecystectomy, including less postoperative discomfort, better cosmetic results, a shorter hospital stay, and quicker recovery. However, due to numerous challenges encountered during the procedure, 2–15% of patients who underwent LC were changed to open surgery [9].

In this thesis, we established that 38 (76% of the patients) were female and that 32 (64%) of the patients were under 50 years old. Of the 50 patients, 24 (48%) had a BMI between 25 and 27.5 kg/m2, whereas 21 (42%) had a BMI more than 27.5 kg/m2.

In a research to evaluate a preoperative grading system to forecast difficult LC, Ali *et al.* [10] discovered that 91 (86.7%) of the patients were female and 14 (13.3%) were male. Patients' ages ranged from 14 to 70 years old. Most of the patients were between the ages of 21 and 50. The standard deviation was 14.06 and the average age was 38.7. Out of 105 patients, 57 (54.3%) had previously been hospitalised for acute episodes; 46 women and 11 men. 30 patients (28.6%) had a BMI under 25, 45 patients (42.9%) had a BMI between 25 and 27.5, and 30 patients (28.6%) had a BMI beyond 27.5.

Age, gender, and history of hospitalisation were found to be highly significant differences between the easy LC and difficult LC groups in this study (p 0.001). Male patients over 50 with a history of biliary hospitalisation are thought to be the most likely candidates for difficult LC.

Table 7 Relation between difficulty score and Operation time

Operation time	Easy LC (n=40)	Difficult and Very Difficult LC (=10)	Test of Sig.	*P*
Mean ±SD.	28±5.8	82±18.4	t=10.064	<0.001*
Range	20–40	50–120		

χ^2, Chi square test; FE, Fisher Exact; MC, Monte Carlo; SD, Standard deviation; t, Student *t*-test; U, Mann Whitney test. *P*: *P* value for comparing between the studied categories. *: Statistically significant at $P \leq 0.05$.

According to Boraii *et al.* [11]'s research, the intraoperative classification of simple cases is substantially correlated with the lack of a prior history of hospitalisation due to bouts of acute cholecystitis ($P = 0.002$).

According to the Abd-El-Aal *et al.* [12] study, intraoperative result in univariate analysis revealed a strong link between male sex and the difficulty degree of surgery ($P = 0.03$).

In this study, we showed that there was a highly significant difference in BMI, abdominal scar, and palpable gall bladder between the Easy LC, Difficult LC, and very Difficult LC groups (p 0.001). BMI greater than 27.5 and prior supraumbilical incisions were considered the most challenging factors for LC.

BMI greater than 27.5 kg/m^2 and 30 kg/m^2, respectively, was reported by Dhanke *et al.* [13] and Nachnani *et al.* [6] to be significant in predicting a challenging LC.

BMI was discovered to be a strong preoperative predictor of a difficult operation for LC by Mohammed *et al.* [14]. Of the 46 cases with BMI more than 30, 30 of them required a difficult surgery (*P* 0.001).

With regard to the thick wall GB, pericholecystic collection, and impacted stone at the neck of GB, our study showed that there was a highly significant difference between the Easy LC, Difficult, and very Difficult LC groups (p 0.001). As a result, palpable GB, sonographic findings of thick wall GB, pericholecystic collection, and impacted stone at the neck of GB were considered difficult scores for LC.

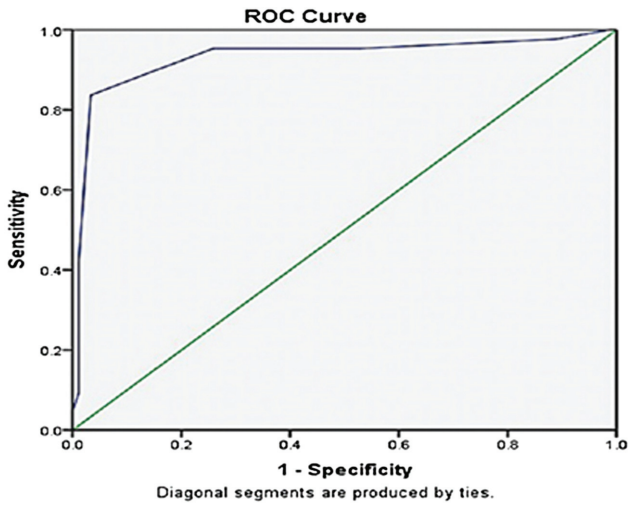
According to Boraii *et al.* [11], thickened gall bladder walls were seen in all of the challenging and extremely challenging patients ($P = 0.041$). In difficult and extremely difficult instances, the presence of pericholecystic collection was strongly noted ($P = 0.001$).

In a study by Nidoni *et al.* [15], the pericholecystic collection's sensitivity, specificity, positive predictive value, and negative predictive value in predicting the conversion of laparoscopic to open surgery were,

Table 8 Validity of preoperative Difficulty scoring to predict difficulty of LC

	Cutoff point	AUC (95%CI)	Sensitivity	Specificity	PPV	NPV	Accuracy	*P* value
Difficulty score	5	0.972	84.2	96.1	95.2	100.0	99.1	<0.001*

Fig. 1



ROC curve analysis of preoperative Difficulty scoring to predict difficulty of LC.

respectively, 70, 91.76, 33.33, and 98.11%, as opposed to 50.0, 97.5, 90.9, and 79.6%.

In our thesis, we demonstrated that there was a significantly significant difference in operation time between the Easy LC, Difficult LC, and Very Difficult LC groups (p 0.001). The longer the procedure, the more difficult the LC score.

According to the preoperative evaluation score, Boraii *et al.* [11] discovered that the length of the operation was statistically longer in cases classified as difficult or extremely difficult than in instances classified as easy.

Preoperative difficulty score exhibited an accuracy of 99.1% and sensitivity and specificity of 84.2 and 96.1% when used to predict the difficulty of LC using a cutoff value of 5.

When compared to the intraoperative scoring method, Sudhir et al. [16] found that preoperative scoring had a sensitivity of 95.71%, specificity of 50%, positive predictive value of 81.71%, negative predictive value of 83.3%, diagnostic accuracy of 82%, and Kappa agreement of 0.5161.

Conclusion

Recognizing preoperative risk variables can help with patient counseling, operation preparation, and postoperative expectations. These variables also assist the surgeon in LC difficulty prediction and in maintaining a lower threshold for conversion under tough intraoperative situations. Therefore, identifying risk factors for challenging LC increases patient safety in general.

Preoperative grading is a reliable indicator of the surgical result in LC, both statistically and clinically Fig. 1.

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Conflicts of interest

There are no conflicts of interest.

References

1 Kama NA, Kologlu M, Doganay M, Reis E, Atli M, Dolapci M. A risk score for conversion from laparoscopic to open cholecystectomy. Am J Surg 2001; 181:520–525.

2 Abdel Baki NA, Motawei MA, Soliman KE, Farouk AM. Pre-operative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. JMRI 2006; 27:102–107.

3 Randhawa JS, Pujahari AK. Preoperative prediction of difficult laparoscopic cholecystectomy: a scoring method. Indian J Surg 2009; 71:198–201.

4 Lee NW, Collins J, Britt R, Britt LD. Evaluation of preoperative risk factors for converting laparoscopic to open cholecystectomy. Am Surg 2012; 78:831–833.

5 Khan IA, El-Tinay OE. Laparoscopic cholecystectomy for acute cholecystitis: can preoperative factors predict conversion?. Saudi Med J 2004; 25:299–302.

6 Nachnani J, Supe A. Pre-operative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. Indian J Gastroenterol 2005; 24:16–18.

7 Hussain A. Difficult laparoscopic cholecystectomy: current evidence and strategies of management. Surg Laparosc Endosc Percutan Tech 2011; 21:211–217.

8 Vannucci M, Laracca GG, Mercantini P, Perretta S, Padoy N, Dallemagne B, Mascagni P. Statistical models to preoperatively predict operative difficulty in laparoscopic cholecystectomy: a systematic review. Surgery 2021; 171:1158–1167.

9 Bhandari TR, Khan SA, Jha JL. Prediction of difficult laparoscopic cholecystectomy: an observational study. Ann Med Surg 2021; 72:103060.

10 Ali MA, Uddin MM, Ahmad MN, Jawed S. Study of a preoperative scoring system to predict difficult laparoscopic cholecystectomy. J Surg Surg Res 2021; 7:032–036.

11 Boraii S, Abdelaziz DH. Does difficulty assessment of laparoscopic cholecystectomy using currently available preoperative scores need revision?. Egypt J Surg 2020; 39:641–6.

12 Abd-El-Aal AS, Abdallah HA. Evaluation of preoperative predictive factors for difficult laparoscopic cholecystectomy in comparison with intraoperative parameters. Egypt J Surg 2018; 37:504–11.

13 Dhanke PS, Ugane SP. Factors predicting difficult laparoscopic cholecystectomy: a single-institution experience. Int J Students' Res 2014; 4:3.

14 Mohammed MA, Moustafa AF, Omar AM. Preoperative prediction and good planning for technically difficult laparoscopic cholecystectomy: a scoring method. Menoufia Med J 2021; 34:682.

15 Nidoni R, Udachan TV, Sasnur P, Baloorkar R, Sindgikar V, Narasangi B. Predicting difficult laparoscopic cholecystectomy based on clinicoradiological assessment. J Clin Diagn Res: JCDR 2015; 9:PC09.

16 Sudhir MS, Raj P. Preoperative grading system versus intraoperative grading system as predictors for difficult laparoscopic cholecystectomy: A comparative validation study. J Clin Basic Res 2018; 2:39–47.