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ORIGINAL ARTICLE

Validation of a Pre-Existing Scoring System for Preoperative Prediction of Difficulty in Laparoscopic Cholecystectomy

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ABSTRACT

Background: One of the most commonly performed surgeries globally is Laparoscopic Cholecystectomy (LC) which is the gold standard surgical procedure for removal of gallbladder. It provides numerous benefits over open cholecystectomy but has also shown higher complication rates. Therefore, a system devised for pre operative assessment of intra operative difficulty level of Laparoscopic Cholecystectomy should be adopted to help with preparedness for complications and ensure an efficient course of surgery.

Objective: The aim of this study was to validate a scoring system made by Randhawa Et al to assess intra operative difficulty level of Laparoscopic Cholecystectomy preoperatively.

Study Design: This is a non randomized prospective observational study

Methodology: This study was conducted in the department of general surgery unit 2 at Dow University Hospital, Karachi, Pakistan on 202 patients. Age, gender, BMI, history of previous hospitalization, examination finding of palpable gallbladder, previous abdominal surgery scars and sonographic findings including wall thickness of gallbladder, pericholecystic collection and impacted stone were considered to score a patient preoperatively.

Results: Male gender and presence of pericholecystic fluid collection were found to be statistically significant in predicting intraoperative difficulty in patients undergoing laparoscopic cholecystectomy.

Practical implications: Around 7 to 35% of laparoscopic cholecystectomy ends up getting converted into open cholecystectomy. This could be due to various reasons one of which is due to lack of preparedness for intraoperative difficulty in performing the surgery. For this reason, a scoring system that accurately predicts difficulty of surgery could help reducing this rate. Keeping this benefit in mind, a preformed scoring system was tested for its validity in assessing the intraoperative difficulty level of LC preoperatively.

Keywords: Laparoscopic cholecystectomy, Scoring system, complications

INTRODUCTION

In the last two decades, Laparoscopic Cholecystectomy (LC) attained status of the most commonly performed surgeries worldwide. (1) Laparoscopic cholecystectomy is minimally invasive and is a gold standard procedure for gall bladder removal in symptomatic gallstone disease.

Benefits of LC as compared to open cholecystectomy includes less post-operative pain, brief ileus, immediate oral intake, and early reinstatement of normal activities with good cosmetic scar. (2)

However, difficulty can be encountered while performing LC due to anatomical variation, dense adhesions around gallbladder and presence of contracted or gangrenous gallbladder. (3)

The rate of conversion of LC to open cholecystectomy is around 7 to 35% pertaining to difficult laparoscopic cholecystectomy. (4)

This could be prevented if difficulty level is accurately anticipated preoperatively. It could help in operative planning and high risk patients for difficult LC can be informed accordingly. Therefore, we evaluated a preformed scoring system put together by Randhawa and Pujahari for its validity to assess intraoperative difficulty based on preoperative assessment.

MATERIALS AND METHODS

We conducted a non-randomized prospective observational study in Dow University Hospital, Karachi in the General Surgery Department Unit 2 from January of 2022 till December of 2022 on a total of 202 patients who underwent Laparoscopic Cholecystectomy. All patients aged between 18 to 70 years were included in the study that had gallstone disease. Patients who fell in the exclusion criteria were those with Gallbladder carcinoma, choledocholithiasis, dilated CBD, obstructive jaundice and those who did not give consent to be included in our study.

Study Design: Patients operated by only one surgeon were included in the study. Preoperative assessment was done by giving scores to patients based on the history (age, gender, history of previous hospitalization), examination (BMI, palpable gallbladder, abdominal scar) and sonographic findings (wall thickness, impacted stone and pericholecystic fluid collection) as described by Randhawa and Pujahari scoring system (Table 1).

Table 1: Preoperative scoring parameters for grading of intraoperative difficulty

History	Levels	Scores	Max score
Age	≤50 years >50 years	0 1	1
Gender	Female Male	0 1	1
Previous admission	No Yes	0 4	4
Clinical			
BMI	<25 25-27.5 >27.5	0 1 2	2
Previous surgical scar	No Supraumbilical Infraumbilical	0 1 2	2
Palpable gall bladder	No Yes	0 1	1
Radiology			
Impacted stone	No Yes	0 1	1
Pericholecystic fluid	No Yes	0 1	1
Gall bladder wall thickness	<4mm >4mm	0 2	2
Total			15

While performing Laparoscopic Cholecystectomy, pneumoperitoneum was created using CO2 at the pressure of 10mmHg to 12mmHg. Each surgery was performed using two 10mm ports and two 5mm ports. Time of surgery was calculated from first port site incision till closure of last port site. Intraoperative findings of bile or stone spillage, injury to duct or artery and conversion to open cholecystectomy were documented and based off on those findings; LC was classified into easy, difficult or very difficult category (table 2).

Table 2: Criteria for intraoperative difficulty level

Factors	Easy	Difficult	Very difficult
Time Taken (minutes)	<60	60-120	>60
Bile/stone spillage	No	Yes	Yes
Injury to duct/artery	No	Duct only	Both
Conversion to open	No	No	Yes

The preoperative scores were then compared to intraoperative difficulty to assess whether this scoring system helped in predicting the findings encountered during surgery. The data collected was analyzed using SPSS v21. In our study, a p-value of < 0.05 was considered significant statistically.

RESULTS

A total of 202 patients were included in our study. Out of those 202 patients, 170 patients were female (83.7 %) while 32 were males (15.8 %). Majority of the patients belonged to age group ≤50 years of age i.e., 117 patients (57.6%) were ≤ 50 years of age while 85 patients (42.4%) were >50 years. 56 patients had BMI of <25 kg/m^2, 89 patients had BMI between 25-27.5 kg/m^2 whereas 57 patients had a BMI of > 27.5 kg/m^2. 136 (67%) patients had no previous history of hospital admission, however 66 (33%) patients gave history of hospitalization previously. 42 patients had infraumbilical abdominal scar and only 11 patients had supraumbilical abdominal scar as a result of previous surgery. Gall bladder was palpable on examination in only 12 patients. Ultrasonography revealed 129 patients had thin walled gall bladder wall whereas 73 had a thick walled gall bladder wall > 4mm in thickness. Impacted stone was found in 28(13.8%) patients and pericholecystic collection in only 14 (6.5%) patients.

On the basis of table 2, 158 patients were classified as easy, 41 patients were classified as difficult whereas only 3 patients were included in the very difficult surgery group. The relation between the prediction of the difficulty level of the cases preoperatively and the actual outcome of the cases is shown in Table-3.

Table 3: Relation between preoperative score and intraoperative difficulty level.

Pre-op Score	Easy	Difficult	Very Difficult	Total
0-5	109	25	2	136
6-10	46	14	1	61
11-15	2	2	0	4
Total	157	41	3	202

Table 4: Multivariate analysis of intraoperative outcome and preoperative risk factors

Pre operative factors	Findings	Results			P Value
		Easy	Difficult	Very difficult	
Age	AGE < 50 AGE > 50	93 (46%) 65 (32%)	22 (10.9%) 19 (9.4%)	2 (1%) 1 (1.5%)	0.704
Gender	Female Male	138 (68.3%) 20 (9.9%)	30 (14.9%) 11 (5.4%)	2 (1%) 1 (0.5%)	0.019
H/o hospitalization	Absent Present	107 (53%) 51 (25.2%)	27 (13.4%) 14 (6.9%)	2 (1%) 1 (0.5%)	0.833
Bmi	<25 25-27.5 >27.5	43 (21.3%) 69 (34.2%) 46 (22.8%)	13 (6.4%) 18 (8.9%) 10 (5%)	0 2 (1%) 1 (0.5%)	0.801
Abdominal scar	Absent Infraumbilical Supraumbilical	116 (57.4%) 33 (16.3%) 9 (4.5%)	30 (14.9%) 9 (4.5%) 2 (1%)	3 (1.5%) 0 0	0.611
Palpable gallbladder	NO YES	148 (73.3%) 10 (5%)	39 (19.3%) 2 (1%)	3 (1.5%) 0	0.608
Wall thickness	<4MM >4MM	103 (51%) 55 (27.2%)	24 (11.9%) 17 (8.4%)	2 (1%) 1 (0.5%)	0.520
Pericholecystic collection	Absent Present	152 (75.2%) 5 (2.5%)	33 (16.3%) 8 (4.0%)	3 (1.5%) 0	0.013
Impacted stone	Absent Present	137 (67.8%) 21 (10.4%)	34 (16.8%) 7 (3.5%)	3 (1.5%) 0	0.830

This table clearly shows that pre-op score of 0-5 had total 136 patients out of which 109 (80.1%) were classified as easy, similarly out of 61 patients with pre-op score of 6-10 46(75.4%)were classified as easy and out of 4 patients with preop score of 11-15 , 2(50%) patients were classified as easy.

Multivariate analysis of intraoperative outcome with the risk factors was carried out which showed that only 2 variables were statistically significant (Gender and presence of pericholecystic fluid collection) with a p value of <0.05.

The positive predictive value observed for cases predicted to be easy by this scoring system came out to be 80.29%. At preoperative score of 5, the sensitivity came out to be 69.6% and the specificity was 38.6%.

DISCUSSION

The first ever laparoscopic Cholecystectomy was performed by Fillipi, Mall and Roosma in 1985 followed by the first ever removal of gallbladder via a mechanical rigid tube without doing laparotomy by Philip Mouret in 1987. (5)

There has been a lot of improvement in intraoperative complications occurring during LC and conversion of it into open cholecystectomy with advancements in technology and increasing expertise of surgeons worldwide. A wide range of work has been done to ensure intraoperative safety protocols thereby improving the surgical outcomes however; we still don't have adequate literature for preoperative assessment of candidates opting for LC. With the help of a system that accurately anticipates the intraoperative complications of LC preoperatively; we can improve our patient selection. We conducted a validation study on a scoring system that was put forward by Randhawa and Pujahari. (6)

Age above 50 years was seen to be a factor that increases risk of LC to be difficult in researches done by Lee et al and Rothman et al. (7,8) Our research did not show any statistically significant association of age with difficulty in LC and this finding was also supported by other studies. (9) Our study showed that gender was a significant determinant in predicting level of difficulty in LC as was corroborated by multiple other studies. (10) The study done by Gupta et al suggests no significant association of gender with difficult LC. (5) History of repeated acute cholecystitis that ends up in hospital admissions has been suggested to be one of the significant preoperative factors resulting in difficult LC as repeated attacks result in increased wall thickness of gallbladder along with increased fibrosis. (11) Most studies have shown significant association of previous hospitalization with increased difficulty in performing LC however our study couldn't establish similar association.

Amongst clinical parameters, obesity was believed to pose a great challenge in safe and timely progress of surgery due to difficult abdominal access; however, our study did not find any significant correlation with BMI as was also the case of study conducted by Khetan et al. (12) Another parameter was abdominal scar secondary to previous surgery that is considered an important determinant in anticipation of difficult LC due to adhesions that are formed between viscera and omentun with abdominal wall. (13) In our study, it was not found to be a significant confounding factor perhaps due to only 53 patients' inclusion in our study with abdominal scar. Similar results were yielded in the study conducted by Gupta et al. (5) Palpable gallbladder is seen in patients with empyema or mucocele of gallbladder. This distension may cause difficulty in holding the gallbladder thereby increasing difficult LC. Gupta et al and Randhawa et al found significant association of palpable gallbladder with intraoperative difficulty. (5,6) The results of our study did not agree with this correlation and certain other studies have also shown no significant association of palpable gallbladder with difficult LC. (12)

Ultrasound finding of thick walled (>4mm) gallbladder was found to show higher incidence of difficult LC in patients as was demonstrated by Goyal et al (14) but Carmody E et al concluded that detailed preoperative ultrasound added no significant value in screening patients for difficult LC. (15) Our study results also showed no significant association of wall thickness with difficult LC. Our study agreed with significant association of pericholecystic collection on ultrasound with increased difficulty in performing LC

which is in accordance with results demonstrated by Goyal et al. (14) Our study showed no significant bearing of impacted stone of gallbladder on difficulty index which congrues with the results of study conducted by Ashraf et al. (16)

A preexisting elaborative system of scoring was used in our study for prediction of difficulty faced during performing laparoscopic cholecystectomy. Our study demonstrated sensitivity of 69.6% only and specificity which was much less i.e., 38.6% with a positive predictive value of 80.29%. These values were calculated at the score of 5. Previous study done by Randhawa et al had sensitivity and specificity of 75% and 90.2% respectively with a positive predictive value for easy cases to be 88% and for difficult cases to be 92.2%. (6) Our study showed that this scoring system is sensitive for detecting easy cases of LC with a good positive predictive value; however, there is much work that is still to be done and many modifications to be made to establish a scoring system that could prove to be helpful in ascertaining difficult LC preoperatively.

The limitation of our study was that it was done on a small sample size in one institution only. Therefore, we recommend conducting a detailed multi center based study with a larger sample size to validate this scoring system.

CONCLUSION

The scoring system designed by Randhawa et al needs scrupulous revision for the current considered factors. There are multiple factors that don't add much help in prediction of difficult Laparoscopic cholecystectomy surgeries that are included in this study. simultaenously, there are many factors that should be taken into account while doing a preoperative assessment for possibility of intraoperative difficult LC. The current system is a good scoring system to predict easy cases of LC however, in predicting difficult LC; the scoring system might need adjustments. Surgical skill and experience of the primary surgeon is an important factor in assessing intraoperative difficulty of LC.

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