Original Research Article

Can difficulties in laparoscopic cholecystectomy be anticipated preoperatively: evaluation of a scoring system

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ABSTRACT

Background: Laparoscopic cholecystectomy is often associated with intra operative difficulties leading to increased intra and post-operative morbidity. Accurate prediction of a difficult laparoscopic cholecystectomy can reduce the complication rate, rate of conversion and overall medical cost. This study was an attempt to validate a scoring system developed to predict difficult laparoscopic cholecystectomy.

Methods: 100 patients undergoing laparoscopic cholecystectomy were included. Details such as age, sex, BMI, previous surgical history, history of hospitalisation for biliary disease, sonographical wall thickness, pericholecystic collection and presence of impacted stone were noted. With these, pre-operative score was calculated using the scoring system. Intra operative details and complications were noted and were classified as easy, difficult and very difficult. Student t test and chi square test was used to test the difference of significance (p<0.05).

Results: Male sex, higher BMI, a history of previous surgery, a history of prior hospitalisation for biliary disease, a palpable gall bladder, a thickened gall bladder wall, impacted stone and pericholecystic collection all had a statistically significant accurate prediction of the difficulty in laparoscopic cholecystectomy. The mean duration of surgery was 62.7±33.15 minutes. The scoring system developed by Randhawa et al predicted difficult laparoscopic cholecystectomy with a sensitivity of 77.8%, specificity of 78.1%, positive predictive value of 66.7% and a negative predictive value of 86.2%.

Conclusions: The proposed scoring system predicted difficult laparoscopic cholecystectomy with a sensitivity of 77.8%, specificity of 78.1%, positive predictive value of 66.7% and a negative predictive value of 86.2%.

Keywords: Difficult laparoscopic cholecystectomy, Pre-operative prediction, Scoring system

INTRODUCTION

The first laparoscopic cholecystectomy was performed by Dr. Muhe in 1987.[1,2] Since its introduction, it's been gaining popularity and now is one of the most widely performed procedures. It has shown to have more advantages over open cholecystectomy in terms of early post-operative recovery and reduced post-operative complications.[3] It has been declared by National Institute of Health as the treatment of choice for patients with symptomatic cholelithiasis.[4] Although it is a safer alternative to the open procedure, it is occasionally associated with intra operative difficulties which may lead to intra and post-operative complications. Intra operative factors like fatty abdomen, adhesions and frozen Callot's triangle pose a difficulty for the safe dissection. This often leads to complications such as injury to cystic artery and bile ducts, leading to bleeding, bile leak, stone spillage and biliary peritonitis intra and post operatively. In these situations, it might be appropriate to convert to open procedure to avoid significant morbidity and mortality.[5]

There have been several studies that have tried to list the factors that could predict a difficult laparoscopic cholecystectomy. These include number of previous attacks of cholecystitis, WBC count, gall bladder wall thickness, pericholecystic collection, urgency, necrotic gallbladder and history of prior abdominal surgeries.[6,7]

Accurate prediction of a difficult laparoscopic cholecystectomy can not only prepare a surgeon for the possible complications, but is also important in patient education and preparation. This pre-operative knowledge can be used for accurate decision making in and planning the surgery, thus reducing the complication rate, rate of conversion and overall medical cost.[8,9] There have been many scoring systems which have been developed to predict difficult laparoscopic cholecystectomy. This study was an attempt to validate one such scoring system.

METHODS

This study conducted among 100 patients diagnosed with symptomatic cholelithiasis undergoing laparoscopic cholecystectomy in Victoria hospital between the months of August 2018 to August 2019 to validate the scoring system developed by Randhawa and Pujari.[10]

Inclusion criteria

Patients above 18 years of age, patients diagnosed with symptomatic cholelithiasis undergoing elective cholecystectomy by a single surgeon were included.

Exclusion criteria

Patients below 18 years of age, patients undergoing cholecystectomy as a part of another procedure, patients with dilated common bile duct, choledocholithiasis and obstructive jaundice and patients not consenting for participation in the study were excluded.

The patients with clinical suspicion of gall stone disease attending OPD at Victoria Hospital were subjected to abdominal ultrasonography for confirmation of diagnosis. 100 such patients with ultrasonography proven gall stone disease fulfilling the above criteria were chosen and included in the study after obtaining verbal consent. Patient details such as age, sex, BMI, previous surgical history, history of hospitalisation for biliary disease were noted. The ultrasonography findings such as wall thickness, pericholecystic collection and presence of impacted stone were also noted. Based on the above findings, the pre-operative score was calculated for each patient using the scoring system developed by Randhawa et al. The scoring system is depicted in Table 1. The maximum score was 15 and the minimum was 0. The scoring system was defined as easy if the score was less than 5, difficult if the score was between 6 to 10 and very difficult if the score was between 11 to 15.

Following this the patients underwent laparoscopic cholecystectomy. To avoid discrepancy, the surgeries done by a single surgeon only were included in the study. Intra operative details such as time of surgery from first port site incision to last post closure, whether or not there was bile/stone spillage, whether or not there was arterial/duct injury and conversion to open surgery were noted.

Table 1: Pre-operative scoring.

	Parameter		Score	Max score
History	Age (in years)	<50	0	1
		>50	1	
	Sex	Female	0	1
		Male	1	
	Prior hospitalization	No	0	4
		Yes	4	
Clincal	BMI (kg/m²)	<25	0	2
		25-27.5	1	
		>27.5	2	
	Abdominal scar	No	0	2
		Infraumbilical	1	
		Supraumbilical	2	
	Palpable gall bladder	No	0	1
		Yes	1	
Sonological	Wall thickness (in mm)	<4	0	2
		>4	2	
	Pericholecystic collection	No	0	1
		Yes	1	
	Impacted stone	No	0	1
		Yes	1	
Total				15

Post operatively the surgeries were classified as easy, difficult and very difficult (as described by Randhawa and Pujari) (Table 2). Post operatively, the patients were followed up until discharge and were observed for the development of complications.

Table 2: Post-operative classification of the level of difficulty of surgery.

Classification	Description
Easy	Time taken <60 min
	No bile spillage
	No injury to duct/artery
Difficult	Time taken 60-120 min
	Bile/stone spillage
	Injury to duct
	No conversion
Very difficult	Time taken >120 min
	Conversion

The above details were tabulated and analysed. SPSS v26 was used for the statistical analysis. The data was described in terms of mean and standard deviation. Student t test and chi square test was used to test the difference of significance. A p value of less than 0.05 was considered statistically significant.

RESULTS

The study included 100 patients who underwent laparoscopic cholecystectomy by a single surgeon between August 2018 and August 2019. Of the 100 patients, 32 were males and 68 were females. The age of the patients included in the study ranged from 18-69 years with a maximum number of patients in the age group of 31-40 years (32%). 16 patients had age more than 50 years while the rest had age <50 years.

42 patients had BMI <25 kg/m^2, 34 had BMI between 25-27.5 kg/m^2, while the test had BMI >27.5 kg/m^2. 60% patients had history of previous surgery and 30% patients had history of hospitalisation for biliary disease. 96% patients had no palpable gall bladder prior to the surgery while it was palpable in 4% of the patients. On analysis of the ultrasonography findings it was noted that 40% of the patients had normal wall thickness while the rest had increased wall thickness; impacted stone at the neck oh hall bladder was noted in 28% of the patients and pericholecystic collection was observed among 38% of the patients (Table 3).

On analysis of the pre-operative risk factors and surgical outcomes, it was found that male sex, higher BMI, a history of previous surgery, a history of prior hospitalisation for biliary disease, a palpable gall bladder, a thickened gall bladder wall, impacted stone and pericholecystic collection all had a statistically significant

accurate prediction of the difficulty in laparoscopic cholecystectomy (p<0.05) (Table 4).

Table 3: Clinical and sonological characteristics of patients undergoing laparoscopic cholecystectomy.

Variable	Factors	Results
Age (in years)	<50	83
	>50	17
Mean age in years	37.96±10.49	
Sex	Male	32
	Female	68
BMI (kg/m^2)	<25	42
	25-27.5	24
	>27.5	34
Previous surgical history	No	40
	Infraumbilical	38
	Supraumbilical	22
Sonological findings	Multiple calculi	70
	Solitary calculus	30
	Impacted calculus	28
	Thickened GB wall	60
	Pericholecystic collection	38
Palpable gall bladder	Yes	4
	No	96
Prior hospitalization	Yes	30
	No	70

58 patients had a preoperative score of 0-5, of which 50 (86.2%) patients had easy surgery, 6 (10.3%) had difficult surgeries and 2 (3.4%) had very difficult surgeries.36 patients had a preoperative score between 6-10, of which 14 (38.88%) had easy surgeries, 20 (55.55%) had difficult surgeries and 2 (5.55%) had very difficult surgeries. 6 patients had a preoperative score of 11-15 of which 2 (33.33%) had difficult surgeries and 4 (66.66%) had very difficult surgeries (Table 5). The sensitivity was found to be 77.8%, specificity was 78.1%, positive predictive value was 66.7% and negative predictive value was 86.2%.

Intra operatively, it was found that the mean duration of surgery was 62.7±33.15 minutes. Bile and stone spillage were seen in 28 patients, 16 patients had arterial injury, and 8 patients underwent conversion to open surgery. 64 of the surgeries were classified as easy, 28 as difficult and 8 as very difficult.

Table 4: Analysis of pre-operative risk factors and surgical outcomes.

Risk factors		Number			P value
		Very difficult	Difficult	Easy	
Age (in years)	>50	4	4	8	0.815
	<50	4	24	56	
Sex	Females	4	14	50	0.007
	Males	4	14	14	
BMI (kg/m^2)	<25	2	10	30	0.017
	25-27.5	2	12	10	
	>27.5	4	6	24	
Previous surgery	Nil	6	4	30	0.03
	Yes	2	24	34	
Hospitalization	Nil	2	12	56	0
	Yes	6	16	8	
Palpable GB	No	8	24	64	0.02
	Yes	0	4	0	
Wall thickness	Normal	2	6	32	0.01
	Thickened	6	22	32	
Impacted stone	Nil	2	16	54	0.05
	Yes	6	12	10	
pericholecystic collection	No	2	10	50	0
	Yes	6	18	14	

Table 5: Correlation of pre-operative score and surgical outcome.

Pre operative score	Easy	Difficult	Very difficult	Total
0-5	50	6	2	58
6-10	14	20	2	36
11-15	0	2	4	6
Total	64	28	8	

DISCUSSION

From this prospective observational study, it was observed that the scoring system developed by Randhawa and Pujari et al accurately predicted the level of difficulty of laparoscopic cholecystectomy. Further it was observed that male sex, higher BMI, a history of previous surgery, a history of prior hospitalisation for biliary disease, a palpable gall bladder, a thickened gall bladder wall, impacted stone and pericholecystic collection all had a statistically significant accurate prediction of the difficulty in laparoscopic cholecystectomy (p<0.05). 6 (10.3%) of the 58 patients predicted to have an easy surgery had difficult surgeries and 2 (3.4%) had very difficult surgeries; 14 (38.88%) of the 36 patients predicted to have difficult surgery had easy surgery while 2 (5.55%) had very difficult surgeries; 2 (33.33%) of the 6 patients predicted to have very difficult surgeries had difficult surgeries.

Hussain et al reported that the factors predicting difficulty in laparoscopic cholecystectomy were male sex, increased age, acute and thick wall chronic cholecystitis, wide and short cystic duct, cholecystodigestive fistula, previous upper abdominal surgery, obesity, liver cirrhosis, anatomic variation, cholangiocarcinoma, and low surgeon's caseload. Though age wasn't a significant predictive factor for difficulty in our study, this discrepancy could be due to the small sample size in the study.[11]

Vivek et al described similar results when they reported the role of increasing age, male gender, high BMI, previous biliary disease, previous surgery, and pre-operative sonological findings in accurately predicting the intra operative difficulties of laparoscopic cholecystectomy.[12]

Similar results were also obtained by Gupta et al and Kulkarni et al.[13,14] The study found the scoring system developed by Randhawa and Pujari et al to have a sensitivity of 77.8%, specificity of 78.1%, positive predictive value of 66.7% and a negative predictive value of 86.2% in the prediction of difficult laparoscopic cholecystectomies. However, Randhawa and Pujari et al reported a sensitivity and specificity of 75.00% and 90.24%, respectively. They also reported that prediction came true in 88.8% for easy and 92% difficult cases.[10]

Other studies which have tried to validate the same questionnaire have varied results. Agarwal et al observed a positive predictive value of 76.4% for cases predicted to be easy and a positive predictive value of 100% for cases predicted to be difficult. Dhanke et al reported a positive prediction value of 94.05% for easy prediction and 100%

for difficult prediction.[15,16] However, further studies with larger samples are needed for better validation of results.

CONCLUSION

The difficulty of a laparoscopic cholecystectomy can be predicted pre operatively. Factors such as male sex, higher BMI, a history of previous surgery, a history of prior hospitalisation for biliary disease, a palpable gall bladder, a thickened gall bladder wall, impacted stone and pericholecystic collection are predictive factors for difficult laparoscopic cholecystectomy. The scoring system developed by Randhawa and Pujari et al predicted difficult laparoscopic cholecystectomy with a sensitivity of 77.8%, specificity of 78.1%, positive predictive value of 66.7% and a negative predictive value of 86.2%. Further studies with larger samples are needed for better validation of results.

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