

## Original Research Article

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# Pre-operative assessment of difficult laparoscopic cholecystectomy: a scoring method

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## ABSTRACT

**Background:** Laparoscopic cholecystectomy (LC) has become the gold standard procedure for management of symptomatic gallstone disease. At times, it is difficult and takes longer time or has to be converted to an open procedure. The study was undertaken to determine the factors which predict difficult LC. The aim of the study was to evaluate a pre-operative scoring method to predict difficult LC.

**Methods:** This was a prospective study conducted in the department of general surgery, MVJ Medical College, Bangalore from December 2020 to August 2021. There were 100 cases operated by experienced surgeons. Scoring method which included parameters from history, clinical and sonological findings with maximum score up to 15. Score up to 5 predicted easy, 6-10 difficult and 11-15 is very difficult.

**Results:** Pre-operative scoring system correlated with 85.7% for easy, 83.3% in difficult cases and 100% in very difficult cases. The factors like previous history of hospitalization ( $p=0.004$ ), clinically palpable gallbladder (GB) ( $p=0.009$ ), impacted GB stone ( $p=0.001$ ), pericholecystic collection ( $p=0.04$ ), and abdominal scar due to previous abdominal surgery ( $p=0.009$ ) were found statistically significant in predicting difficult LC.

**Conclusions:** Pre-operative prediction of risk factors to assess the operative difficulty is an important point for planning the surgery and the high-risk patients may be informed accordingly.

**Keywords:** Laparoscopic cholecystectomy, Acute cholecystitis, Scoring system, Operative difficulty, Preoperative assessment

## INTRODUCTION

Laparoscopic cholecystectomy (LC), one of the most commonly performed surgical procedures worldwide is accepted as the gold standard in the treatment of symptomatic gallstone disease.<sup>1</sup> Advantages of LC compared to open cholecystectomy are well described and usually include decreased post-operative pain, shorter ileus, earlier oral intake, earlier return to normal activities with better cosmesis and shorter hospital stay.<sup>2-7</sup>

Pre-operative assessment of complexity factors is needed for any surgical procedure in order to avoid complications and delays and to guarantee an efficient course of surgery.<sup>8</sup> The use of a predictive score of operative difficulty plays

an important role to identify high-risk procedures and could be helpful to improve patient counseling, optimize surgical planning and operating room efficiency, detect patients at risk of complications and change, when necessary, the operative technique or the surgeon, identify patients eligible for outpatient care and select those for resident training.

In case of LC, pre-operative estimation of difficulty helps surgeons deciding whether to proceed with a minimally invasive approach or opt for an open procedure or make a referral to a more experienced surgeon. It may also be useful to counsel the patients regarding perioperative events. Although laparoscopic cholecystectomy has generally a low incidence of morbidity and mortality and

of conversion rate to open surgery, its outcome is mainly affected by the presence and severity of inflammation, male sex, advancing patient's age and greater body mass index.<sup>9</sup>

Previous upper abdominal surgery is associated with a higher rate of adhesions, an increased risk of operative complications, a greater conversion rate, a prolonged operating time and longer hospital stay.<sup>10</sup>

LC after Endoscopic retrograde cholangiopancreatography (ERCP) with Endoscopic sphincterotomy (ES) for combined choledochocystolithiasis is more difficult with prolonged procedure than in uncomplicated gallstone disease with a longer post-operative hospital stay.<sup>11</sup> Various clinical and ultrasonological parameters that may help to predict the difficulty level preoperatively were analyzed in this study. Such prediction done preoperatively may help the patient as well as the surgeon in being better prepared for the intra-operative challenges

## METHODS

This was a prospective study conducted in the department of general surgery, MVJ Medical College, Bangalore from December 2020 to August 2021. All patients with symptomatic gallstones who presented to the general

surgery department and willing to participate in the study were included in the study.

A total 100 cases were included and the scores were given based on history, clinical examination and sonological findings, 1-day prior to surgery. The scoring system used was of Randhawa and Pujahari (Table 1).<sup>2</sup>

The scores were added up to get a total score and the patients were risk stratified based on the total score (Table 2). The operative parameters were recorded for all the patients undergoing LC were- (a) time taken for surgery, (b) bile/stone spillage, c) injury to cystic duct or cystic artery, d) conversion to open cholecystectomy. Based on these observations postoperative outcome of LC was grouped into easy, difficult and very difficult and evaluated (Table 3).

All cases were performed by experience surgeons having more than 10 years of laparoscopic experience. Standard four port entry made in all cases. The timing was noted from the first port site incision till the last ports closure. The following study was approved by Institutional Ethical Committee with informed consent from participants. Statistical analysis was done using SPSS 20.0 (Statistical Package for the Social Sciences) software package for Windows and the p value<0.05 was considered statistically significant.

**Table 1: Pre-operative scoring system using history, clinical and sonological findings.**

Parameters		Findings (score)
History	Age (years)	<50 0 >50 1
	H/o previous attacks of cholecystitis	No 0 Yes 4
	Sex	Female 0 Male 1
		<25 0 25-27.5 1 >27.5 2
Clinical	BMI	No 0 Infra umbilical 1 Supra umbilical 2
	Abdominal scar	No 0 Yes 1
	Palpable gall bladder	<4 0 >4 2
		No 0 Yes 1
Sonography	GB Wall thickness (mm)	<4 0 >4 2
	Pericholecystic collection	No 0 Yes 1
	Impacted stone in GB	No 0 Yes 1

**Table 2: Pre-operative risk stratification based on scoring system.**

Risk	Scoring
No risk	0-5
Moderate risk	6-10
High risk	11-15

**Table 3: Scale for categorization of patients into easy, difficult and very difficult cases post-operatively.**

Parameters	Easy	Difficult	Very difficult
<b>Time taken for surgery (min)</b>	<60	60-120	>120
<b>Bile/stone spillage</b>	No	Yes	-
<b>Injury to duct or artery</b>	No	Yes	-
<b>Conversion to open procedure</b>	No	No	Yes

## RESULTS

Of the 100 patients included in the study, 14 patients were male (14%) and 86 were females (86%). The mean age group of the study was  $38.53 \pm 13.008$  years with the minimum age being 19 years and the maximum being 64 years. Seventeen were scored easy (56.7%) and 13 (43.3%) were difficult and nil in very difficult 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 4.

We observed a positive predictive value of 85.7% for our scoring system for cases predicted to be easy. For cases predicted to be difficult we registered a positive predictive value of 83.3% for the scoring system and for very difficult cases a positive predictive value of 100% were recorded.

**Table 4: Correlation of preoperative score and the outcome.**

Pre-operative score	Easy		Difficult		Very difficult		Total
	N	%	N	%	N	%	
<b>Easy (0-5)</b>	48	85.7	8	14.3	0	0	56
<b>Difficult (6-10)</b>	6	14.3	35	83.3	1	2.4	42
<b>Very difficult (11-15)</b>	0	0	0	0	2	100	2
<b>Total</b>	54	54	43	43	3	3	100

## DISCUSSION

LC has become the 'gold standard' for the treatment of symptomatic cholelithiasis, and is now completely integrated in surgical educational programs as a standard operation with which to begin a laparoscopic surgery course.<sup>12</sup> However, LC remains a highly technical procedure, especially when the surgeon experiences difficulties at the calots triangle. Such difficult cholecystectomies can cause several problems: (i) for patients, they increase the risk of inadvertent intraoperative complications. For example, the risk of bile duct injury is three to ten times higher with LC and increases with technical difficulty.<sup>13</sup> Difficult cholecystectomies also increase the risk of conversion to open, blood loss, postoperative complications and increased operative time, as shown in our study; (ii) for the hospital, they favor disorganization of the operative program, the surgical team, and the management of hospital beds, especially when patients are scheduled for outpatient operations. Pre-operative recognition of difficult cases could thus improve patient counseling, optimize surgical planning and operating room efficiency, decrease LC associated complications, and help to select patients for resident training. Many studies analyzed risk factors of complications following LC, or proposed risk scores for conversion.<sup>14-20</sup>

Clinically palpable Gallbladder (GB) was found to be predictor of difficult LC. This could be due to a distended GB, mucocele GB, thick-walled, or due to the adhesions between the GB and the omentum. In our study, only 20 patients had clinically palpable GB and out of them 75% (15 out of 20) turned out to have a difficult procedure post-

surgery. There are very few studies supporting clinically palpable GB as a predictor of difficult LC. This is one of the unique features of this study and found strongly significant.

Obese patients may have a difficult laparoscopic surgery due to various factors.<sup>21</sup> Port placement in obese patient takes longer time due to the thickness of the abdominal wall. Dissection at the Calot's triangle is also technically difficult due to the obscure anatomy because of excessive intraperitoneal fat and difficulty in handling of instruments through an excessively thick abdominal wall. In our study, we found no correlation between BMI and difficult level of surgery. Surgical expertise of the operating surgeon could be one of the reasons for this discrepancy; as such increased BMI is not a technical problem. Pericholecystic collection was found to be a predictor of difficult LC.<sup>22</sup> Post-operatively we found 80% of these patients having difficulty in LC. Hence, we found a strong correlation between pericholecystic collection and difficult LC.

Upper abdominal surgical scars may cause the formation of intraperitoneal adhesions that may lead to increased probability of injury and bleeding while port placement.<sup>23</sup> It was found to be statistically significant factor in our study. Increased GB wall thickness is associated with difficult dissection of the GB from its bed.<sup>24</sup>

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.

Adhesions are the important cause for difficulty encountered in LC and these cannot be assessed on routine Ultrasonography (USG) done for gallstone disease. One more factor is the presence of anatomical variation, making the identification of structures a demanding task.<sup>25</sup> These anatomical variations are usually not diagnosed on routine USG. And finally, another important factor that plays a role in the time requirement for the procedure is the surgical expertise of the operating surgeon.<sup>26</sup>

## CONCLUSION

Parameters like clinically palpable GB, impacted GB stone, pericholecystic collection, previous history of hospitalization due to acute cholecystitis and abdominal scar due to previous abdominal surgery were found statistically significant to predict difficult LC. Difficult cases for laparoscopic cholecystectomy should be recognized in the preoperative course and operated by experienced surgeons as these cases carry a higher risk of conversion to open surgery and complications. The pre-operative scoring is statistically and clinically a good test for predicting the operative outcome in LC. Our sample size is relatively small but the predictors of difficult LC correlated well with previous studies. Further randomized prospective trial with larger sample size required to validate the scoring system.

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## REFERENCES

1. Sahu SK, Agrawal A, Sachan PK. Intraoperative Difficulties in Laparoscopic Cholecystectomy. *Jurnalul de Chirurgie (Iași)*. 2013;2:149-55.
2. Southern Surgeons Club. A prospective analysis of 1518 laparoscopic cholecystectomies. *N Engl J Med*. 1991;324(16):1073-8.
3. Cuschieri A, Dubois F, Mouiel J, Mouret P, Becker H, Buess G, et al. The European experience with laparoscopic cholecystectomy. *Am J Surg*. 1991;161(3):385-7.
4. Trondsen E, Reitersen O, Andersen OK, Kjaersgaard P. Laparoscopic and open cholecystectomy. A prospective, randomized study. *Eur J Surg*. 1993;159(4):217-21.
5. Buanes T, Mjåland O. Complications in laparoscopic and open cholecystectomy: a prospective comparative trial. *Surg Laparosc Endosc*. 1996;6(4):266-72.
6. Hollington P, Toogood GJ, Padbury RT. A prospective randomized trial of day-stay only versus overnight-stay laparoscopic cholecystectomy. *Aust N Z J Surg*. 1999;69(12):841-3.
7. Hollington P, Toogood GJ, Padbury RT. A prospective randomized trial of day-stay only versus overnight-stay laparoscopic cholecystectomy. *Aust N Z J Surg*. 1999;69(12):841-3.
8. Sodergren MH, Orihuela EF, Clark J, Teare J, Yang GZ, Darzi A. Evaluation of orientation strategies in laparoscopic cholecystectomy. *Ann Surg*. 2010;252(6):1027-36.
9. Kanakala V, Borowski DW, Pellen MG, Dronamraju SS, Woodcock SA, Seymour K, et al. Risk factors in laparoscopic cholecystectomy: a multivariate analysis. *Int J Surg*. 2011;9(4):318-23.
10. Bouasker I, Ouaer MA, Smaali I, Khalfallah M, Achour J, Najah N, et al. Laparoscopic cholecystectomy on a previously operated abdomen. *Tunis Med*. 2010;88(2):88-91.
11. Reinders JS, Gouma DJ, Heisterkamp J, Tromp E, Ramshorst B, Boerma D. Laparoscopic cholecystectomy is more difficult after a previous endoscopic retrograde cholangiography. *HPB*. 2013;15(3):230-4.
12. Schol FP, GO PM, Gouma DJ, Kootstra G. Laparoscopic cholecystectomy in a surgical training programme. *Eur J Surg*. 1996;162(3):193-7.
13. Cagir B, Rangraj M, Maffuci L, Ostrander LE, Herz BL. A retrospective analysis of laparoscopic and open cholecystectomies. *J Laparoendosc Surg*. 1994;4(2):89-100.
14. Alponat A, Kum CK, Koh BC, Rajnakova A, Goh PM. Predictive factors for conversion of laparoscopic cholecystectomy. *World J Surg*. 1997;21:629-33.
15. Lal P, Agarwal PN, Malik VK, Chakravarti AL. A difficult laparoscopic cholecystectomy that requires conversion to open procedure can be predicted by preoperative ultrasonography. *JSLS*. 2002;6(1):59-63.
16. Rosen M, Brody F, Ponsky J. Predictive factors for conversion of laparoscopic cholecystectomy. *Am J Surg*. 2002;184:254-8.
17. Livingston EH, Rege RV. A nationwide study of conversion from laparoscopic to open cholecystectomy. *Am J Surg*. 2004;188(3):205-11.
18. Kanakala V, Borowski DW, Pellen MG, Dronamraju SS, Woodcock SA, Seymour K, et al. Risk factors in laparoscopic cholecystectomy: a multivariate analysis. *Int J Surg*. 2011;9(4):318-23.
19. Asai K, Watanabe M, Kusachi S, Matsukiyo H, Saito T, Kodama H, et al. Risk factors for conversion of laparoscopic cholecystectomy to open surgery associated with the severity characteristics according to the Tokyo guidelines. *Surg Today*. 2014;44:2300-4.
20. Yajima H, Kanai H, Son K, Yoshida K, Yanaga K. Reasons and risk factors for intraoperative conversion from laparoscopic to open cholecystectomy. *Surg Today*. 2014;44:80-3.

21. Rosen M, Brody F, Ponsky J. Predictive factors for conversion of laparoscopic cholecystectomy. *Am J Surg.* 2002;184:254-8.
22. Dhanke PS, Vgane SP. Factors predicting difficult laparoscopic cholecystectomy: A single institution experience. *Int J Stud Res.* 2014;4:3-7.
23. Botaitis S, Pitiakoudis M, Perente S, Tripsianis G, Polychronidis A, Simopoulos C. Laparoscopic cholecystectomy in acute cholecystitis: An analysis of the risk factors. *S Afr J Surg.* 2012;50:62-8.
24. Fried GM, Barkun JS, Sigman HH, Joseph L, Clas D, Garzon J, et al. Factors determining conversion to laparotomy in patients undergoing laparoscopic cholecystectomy. *Am J Surg.* 1994;167(1):35-9.
25. Meshikhes AW, Dhurais S, Bhatia D, Khatir N. Laparoscopic cholecystectomy: the Dammam Central Hospital experience. *Int Surg.* 1995;80(2):102-4.
26. Takegami K, Kawaguchi Y, Nakayama H, Kubota Y, Nagawa H. Preoperative grading system for predicting operative conditions in laparoscopic cholecystectomy. *Surg Today.* 2004;34:331-6.

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