Preoperative prediction of difficult lap chole: a scoring method

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Abstract

Background Laparoscopic cholecystectomy (LC) has become the procedure of choice for management of symptomatic gallstone disease. At times it is easy and can be done quickly. Occasionally it is difficult and takes longer time. But there is no scoring system available to predict the degree of difficulty of LC preoperatively.

Aim To develop a scoring method to predict difficult LC preoperatively.

Materials and methods There were 228 cases in 2 years, operated by a single experienced surgeon. There are total 15 score from history, clinical, sonological findings. Score up to 5 predicted easy, 6–10 difficult and >10 are very difficult.

Results Prediction came true in 88.8% for easy and 92% difficult cases there were no cases with score above 10. The factors like BMI > 27.5 ($p < 0.010$), previous hospitalization ($p < 0.001$), palpable GB ($p < 0.01$) US-Thick-walled GB ($p < 0.038$) are found of statistical significance in predicting difficult LC.

Conclusion The proposed scoring system is reliable with a sensitivity and specificity of 75.00% and 90.24%, respectively.

Keywords Lap chole · Scoring · Prediction · Difficult

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Introduction

Laparoscopic cholecystectomy (LC) has become the procedure of choice for management of symptomatic gallstone disease [1, 2] for its minimal invasive, less pain and early recovery. At times LC becomes difficult. It takes longer time even with bile/stone spillage and occasionally it requires conversion to open cholecystectomy. It is very difficult to say preoperatively whether it is going to be easy or difficult. The degree of difficulties is again impossible to predict. At present there is no scoring system available to predict difficulty and the degree of difficulty. We have worked out one such system for predicting the degree of difficulty in LC.

Materials and methods

All the cases of elective LC, coming to the large Military Hospital were included for the study from January 2005 to December 2006 operated by a single experienced laparoscopic surgeon. The cases of LC conversion to open cholecystectomy due to equipment failure and any emergency surgery were excluded from the study. After the OPD work-up, the scores were given on history, clinical examination and sonological findings (Table 1) one-day prior to surgery on admission. Score upto 5 was defined as easy, 6–10 as difficult and 11–15 as very difficult. We preoperatively defined easy, difficult and very difficult (Table 2). Surgery were done using CO₂ pneumoperitoneum with 10 mm Hg pressure and using standard two 5 mm and two 10 mm ports. The timing was noted from the first port site incision till the last ports closure. All the intraoperative events were recorded. The entire cases received standard postoperative care and follow up.

Table 1 Scoring factors

History			Max. score
Age	<50 yrs (0)	>50 yrs (1)	1
Sex	Female (0)	Male (1)	1
H/o Hospitalization	N (0)	Y (4)	4
Clinical			
BMI wt (kg)/ht (m ²)	<25 (0)	25–27.5 (1) > 27.5 (2)	2
Abdominal scar	N (0)	Infra-umbilical (1) supra-umbilical (2)	2
Palpable gallbladder	N (0)	Y (1)	1
Sonography			
Wall thickness	Thin (0)	Thick > 4 mm (2)	2
Pericholecystic collection	N (0)	Y (1)	1
Impacted stone	N (0)	Y (1)	1

H/o = history of, N = No, Y = Yes

Total maximum score - 15

Table 2 Easy/difficult – our criteria

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

Statistical methods

The statistical software namely SPSS 15.0, Stata 8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables, etc. Chi-square test/Fisher exact test has been used to find the significant association of findings of preoperative score with peroperative outcome. Area under ROC has been used to find the Diagnostic and predictive value of preoperative score for predicting the peroperative outcome based on easy and difficult binary outcome. Univariate analysis of Chi-square test, Fisher exact test and odds ratio have been used to find the significant association of risk factors with peroperative outcome and multivariate analysis of logistic regression has been used to find the predictive association of risk factors in predicting the peroperative outcome namely easy and difficult.

Results

There were 228 cases with 148 (64.912%) females and 80 (35.087%) males. The age ranging from 9 years to 71 years with a mean of 44.37 years (SD $\pm$ 12.45). Maximum cases were in the age group of 30–50 years (54.4%), and 22.6% had associated medical illness of which hypertension was the com-

monest. One hundred and seventy-eight (78%) were scored easy and 50 (21.9%) were difficult and nil in the very difficult group. The operative outcome is given (Table 3) with a positive predictive value of 88.8% and 92.2% for easy and difficult, respectively. At score of five sensitivity and specificity are 75.00% and 90.24%, respectively. On uni and multivariate analysis (Table 4) BMI >27.5 kg/m² ($p > 0.010$), Palpable gallbladder ($p > 0.022$), previous hospitalization and sonology wall thickness more than 4 mm were found statistically significant (p 0.038) with a ROC curve is 0.82 with 95% confidence interval (Fig. 1). There was no conversion due to equipment failure.

Discussion

Many factors are given as difficult predictors. Age above 60 makes it difficult [3] and conversion is higher with increasing age [4]. We have given higher score above 50 years and found it non-significant (p 0.937) possibly because of long

Fig. 1 ROC curve and its area under curve for predicting the operative outcome based on preoperative scores

Table 3 Correlations of pre-op score and the outcome

Pre-op score	Easy	Difficult	Very difficult	Total
0–5	158 (88.8)	14 (7.9)	6 (3.4)	178
6–10	6 (12)	40 (92)	4 (8)	50
11–15	–	–	–	–
Total	164 (71.9)	54 (23.7)	10 (4.4)	228

Inference: Positive prediction value – *Easy prediction* – 88.8% Difficult prediction – 92%

Table 4 Univariate and multivariate analysis of peroperative outcome with risk factors (predictive association of risk factors with peroperative outcome)

Risk factors	Level	Peroperative outcome		p value	OR	
		Difficult No. (%)	Easy No. (%)		Univariate	Multivariate
Age	≤50 years	22 (68.8%)	57 (69.5%)	0.937	Referent	1.09
	>50 years	10 (31.3%)	25 (30.5%)		1.04	
Sex	Female	20 (62.5%)	54 (65.9%)	0.736	Referent	1.96
	Male	12 (37.5%)	28 (34.1%)		1.16	
BMI	≤25.0 (kg/m ²)	9 (28.1%)	42 (51.2%)	0.227	Referent	1.15
	25.1–27.5 (kg/m ²)	9 (28.1%)	22 (26.8%)		1.91	
	>27.5 (kg/m ²)	14 (43.8%)	18 (21.9%)		3.63	
Previous surgery	Nil	25 (78.1%)	63 (76.8%)	0.882	Referent	1.49
	Yes	7 (21.9%)	19 (23.2%)		0.92	
Hospitalisation	Nil	14 (43.8%)	73 (89.0%)	<0.001**	Referent	10.72
	Yes	18 (56.3%)	9 (10.9%)		10.43	
Gallbladder palpable	NP	24 (75.0%)	76 (92.7%)	0.022*	Referent	4.21
	Yes	8 (25.0%)	6 (7.3%)		4.22	
US-Wall thick	Normal	27 (84.4%)	79 (96.3%)	0.038*	Referent	9.41
	Thickened	5 (15.6%)	3 (3.6%)		4.88	
Impacted stone	Nil	30 (93.8%)	81 (98.8%)	0.190	Referent	1.28
	Yes	2 (6.3%)	1 (1.2%)		5.40	
Pericholecystic collection	Nil	32 (100.0%)	81 (98.8%)	0.999	Referent	–
	Yes	–	1 (1.2%)		–	
Total		32	82	–	–	–

*Moderately significant $0.01 < p \leq 0.05$

**Strongly significant $p \leq 0.01$ Highly significant if $p < 0.001$

surgical experience. Male sex makes the surgery difficult [5]. Conversion rate and significantly higher mortality reported in male sex [6]. Even though we have scored the males, our findings are not significant (p 0.736). We scored two to BMI >27.5 kg/m² and found LC is difficult (p 0.010). Without mentioning BMI obese group reported to be having 6.2% conversion in relation to over all 5.4% [7]. One author found acute cholecystitis in obese as the most important factor for conversion [8]. Even history of an acute attack requiring hospitalisation made the surgery difficult in our study ($p < 0.001$). There are reports of higher rate of bleeding, ductal injury and subsequent conversion in acute

cholecystitis [3, 4, 7, 9]. Clinically palpable gallbladder is not reported earlier as a predictor of difficult cholecystectomy. This is one of the unique features of this study and found significant (p 0.022). Thick-walled GB is one of the predictor of conversion of 4.3% [10], 5.6% [7]. We found it to be a significant factor (p 0.038). Upper abdominal surgery is reported to have high rate of conversion 37.5% [10] and attributed to dense adhesion [9]. With increasing experience on adhesiolysis and advanced laparoscopic surgery, conversion is less often seen [11]. We also found it to be not significant (p 0.882). Sonologically impacted stone and pericholecystic collections are other factors scored giv-

ing the acuteness of the condition, but there were no good correlation between sonological findings and operative findings and hence found not significant. There was no correlation of score and conversion in our study. The conversion rate was 3/228 (1.315%). All were due to anomalous ducts, which were not detected on USG. Possibly MRCP might have predicted it better.

Conclusion

The preoperative scoring is statistically and clinically a good test for predicting the operative outcome in LC (area under ROC = 0.82).

Conflict of interest The authors do not have any disclosable interest

References

1. Lam CM, Murray FE, Cuschieri A (1996) Increased cholecystectomy rate after the introduction of laparoscopic cholecystectomy in Scotland. *Gut* 38:282–284
2. The southern Surgeons Club, Meyers WC (1991) A prospective analysis of 1518 laparoscopic cholecystectomy. *N Engl J Med* 324:1073–1078
3. Kama NA, Kolongue M, Doganay M, Reis E, Atle M, Dolapiu M (2001) Risk score conversion from laparoscopic to open cholecystectomy. *Am J Surg* 181:520–525
4. Kanaan SA, Murayama KM, Merriam LT, Dawes LG, Puystowsky JB, Reye RB, Jochl RJ (2002) Risk factor for conversion of laparoscopic to open cholecystectomy. *J Surg Res* 106:20–24
5. Heng-Hui Lein MD, Ching-Shui Huang (2002) Male gender: Risk factor for severe symptomatic cholelithiasis. *World J Surg* 26:598–601
6. Russell JC, Walsh SJ, Fourquet LR, Mattie A, Lynch J (1998) Symptomatic cholelithiasis: a different disease in men? *Ann Surg* 277:195–200
7. Fried GM, Barkun JS, Sigman HH, Joseph L, Uas D, Garzon J, Hinchey EJ, Meakins JL (1994) Factors determining conversion to laparotomy in patient undergoing laparoscopic cholecystectomy. *Am J Surg* 167:35–41
8. Rosen M, Brody F, Ponsky J (2002) Predictive factors for conversion of laparoscopic cholecystectomy. *Am J Surg* 184:254–258
9. Ahmet Alponat, Cheng K, Bee C Koh, Andrea R, Peter MY Goh (1997) Predictive Factors for conversion of laparoscopic cholecystectomy. *World J Surg* 21:629–633
10. Schrenk P, Woisetschlager R, Reiger R, et al. (1998) Preoperative ultrasonography and prediction of difficulties in laparoscopic cholecystectomy. *World J Surg* 22:75–77
11. Walnerhanssen BK, Ackermann C, Guenin MO, Kern B, Tondelli P, von Felie M, Peterli R (2005) Twelve years of LC. *Chirurg* 76(3):263–269