A Clinical Study to Determine Various Factors For Difficult Laparoscopic Cholecystectomy

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ABSTRACT
Laparoscopic cholecystectomy is a relatively safe procedure and very effective. To assess various preoperative predictors for difficult laparoscopic cholecystectomy. Study conducted on 80 patients aged 18 years and above at department of General surgery, Govt. R.D.B.P Jaipuria hospital (attached RUHS-CMS), Jaipur from May 2022 to October 2022 after ethical committee clearance. Patients who are undergoing laparoscopic cholecystectomy in Govt. R.D.B.P Jaipuria hospital (attached RUHS-CMS), Jaipur and consenting for participation and whose age is 18 years and above were taken into the study. The study access Randhawa score and G10 cholecystitis severity score for difficult laparoscopic cholecystectomy. Mean age of the study population is 39.74±13.95 years, 72 (90%) patients required hospitalization. 72 participants had a score less than 5, 4 participants had score between 6, 10 and 4 had score between 11 and 15 as per Randhawa scoring system. In this study, intra-operative assessment using the G10 cholecystitis severity score predicted 15 (18.75%) patients to have easy laparoscopic cholecystectomy, 53 (66.25%) patients to be moderate, 9 (11.25%) to be difficult and 3 (3.75%) to be extremely difficult. Both Randhawa score and G10 cholecystitis severity score good positive correlation with difficulty of laparoscopic cholecystectomy.

INTRODUCTION

Diseases of the gallbladder are common within northern parts of India, having one of the highest prevalence of gallbladder disease (GBD) being 6.20% with the prevalence of gallstone disease (GST) being 4.15% in adult population[1]. The North indian population has 2-4 fold higher prevalence of GST as compared with those among South Indian population[2]. Gall stones and their complications are one of the most common indications for both elective and emergency surgeries whether laparoscopic or open surgery.

Laparoscopic cholecystectomy is a relatively safe procedure and very effective. However, some difficulties may be encountered by surgeons during the procedure. Many complications are reported during the procedure. The definition of difficult laparoscopic cholecystectomy is not well established until now and it may be very difficult to be established, this is because the difficulty depends not only on patient's factors but also on the surgeon's experience and skills. Several factors are widely accepted for the difficulties[3].

Although, laparoscopic cholecystectomy is one of the most widely practiced surgical procedures, it is still associated with some morbidity and even mortality. Identification of pre and intra operative risk factors for anticipating difficult laparoscopic cholecystectomy will help in reducing the associated mortality and morbidity and early conversion to conventional cholecystectomy[4].

The overall conversion rate still ranges between 1.86-10% in various studies despite the advances in the technique[5].

Therefore, the aim of this study is to assess various preoperative predictors (history/clinical/imaging) and intra-operative findings for difficult laparoscopic cholecystectomy in patients undergoing laparoscopic cholecystectomy in Govt. R.D.B.P Jaipuria Hospital (Attached RUHS-CMS), Jaipur.

Aim: To assess various preoperative predictors (history/clinical/imaging) for difficult laparoscopic cholecystectomy.

MATERIALS AND METHODS

This is a prospective observational study conducted on 80 patients aged 18 years and above at department of General surgery, Govt. R.D.B.P Jaipuria hospital (attached RUHS-CMS), Jaipur from May 2022 to October 2022 after ethical committee clearance. Patients who are undergoing laparoscopic cholecystectomy in Govt. R.D.B.P Jaipuria hospital (Attached RUHS-CMS), Jaipur and consenting for participation and whose age is 18 years and above were taken into the study. Patients whose age is

<18 years, patients in whom CBD exploration is needed, Patients with suspected malignancy of GB or CBD, Patients refusing surgery and Patients who are conservatively managed for gallbladder diseases were ruled out from study. Patients underwent thorough history evaluation and physical evaluation, routine blood investigations and radiological investigations (ultrasonography) after obtaining informed written consent. Blood samples were taken for laboratory examinations. Based on the history, physical evaluation and radiological investigations, they were allotted modified Randhawa scoring system and categorised into easy, difficult and very difficult laparoscopic cholecystectomy.

Patients who consented for surgery were evaluated for fitness for surgery and anaesthesia. Once declared fit by the anaesthetist, patients were taken up for laparoscopic cholecystectomy. Patients were followed up till discharge post-surgery for development of any complications.

RESULTS

The mean age of the study population is 39.74±13.95 years (mean±S.D). For Females it was 39.23±14.85 years (mean±S.D) and for males it was 41.25±10.98 (mean±S.D). The maximum cases are among the age group 31-50 years (N = 39), accounting for 48.75%. There were 60 females and 20 males in this study which constituted 75 and 25% of the study population, respectively (Table 1).

Pain in the right upper abdomen was the most common presenting symptom found in 91.3% (N = 73) of the patients followed by nausea in 17.5% (N = 14) of the patients. About 8.8% (N = 7) had asymptomatic presentation (Incidental finding of cholelithiasis in ultrasonography), vomiting was present in 3.8% (N = 3) and fever in 1.3%. (N = 1) of the study population (Table 2).

In this study 64 (80%) patients were below the age of 50 years, 72 (90%) patients required hospitalisation or had previous history of hospitalisation for their symptoms, According to BMI categorization in the Randhawa score, in this study 18 (22.5%) patients had BMI <25 (normal), 51 (63.75%) patients had BMI between 25 and 27.5 (obese) whereas 11 patients (13.75%) had BMI of more than 27.5 (obese). About 10 patients accounting for 12.5% population had infra-umbilical scar and 77 (96.2%) patients had no palpable gall bladder on physical examination.

In this study 74 (92.5%) patients had gall bladder wall thickness <4 mm on ultrasonological examination and 6 (7.5%) patients presented with a thick gall bladder wall, i.e., more than 4 mm. On ultrasonological examination 3 (3.8%) patients presented with pericholecystic collection and 16 (20.0%) presented with impacted stones (Table 3).

Table 1: Age and gender distribution

Groups	Frequency	Percentage
Age		
<20	1	1.30
21-30	24	30.00
31-40	25	31.25
41-50	14	17.50
51-60	6	7.50
>60	10	12.50
Gender		
Female	60	75.00
Male	20	25.00

Table 2: Distribution study subjects according to Randhawa attributes

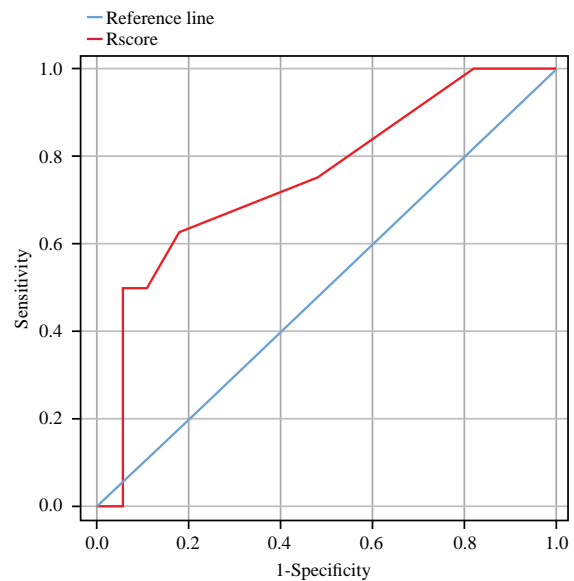| Parameters	Frequency	Percentage
Age		
<50	64	80.0
>50	16	20.0
Sex		
Female	60	75.0
Male	20	25.0
History of hospitalisation		
No	72	90.0
Yes	8	10.0
BMI		
<25	18	22.5
25-27.5	51	63.8
>27.5	11	13.8
Abdominal Scar		
No	70	87.5
Infra-umbilical	10	12.5
Supra-umbilical	0	0.0
Palpable gall bladder		
No	77	96.3
Yes	3	3.8
Sonography		
Wall thickness		
Thin	74	92.5
Thick >2 mm	6	7.5
Pericholecystic collection		
No	77	96.3
Yes	3	3.8
Impacted stone		
No	64	80.0
Yes	16	20.0

Fig. 1: ROC analysis of Randhawa score for prediction of difficult laparoscopic cholecystectomy

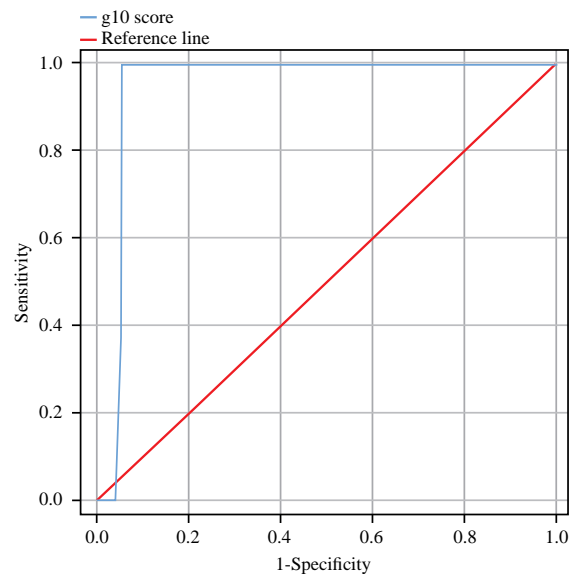Fig. 2: ROC analysis of G10 cholecystitis severity score for prediction of difficult laparoscopic cholecystectomy

In this study, 72 participants had a score less than 5, 4 participants had score between 6 and 10 and 4 had score between 11 and 15 as per Rand hawa scoring system.

The positive predictive value for easy cholecystectomy is 94.4% for difficult and very difficult it is 100% (Fig. 1).

Area under the curve (AUC) with 95% CI in ROC analysis in terms of predicting difficult cholecystectomy for Randhawa score is 0.752 (0.567-0.936). This indicates a 75.2% of correct prediction of difficult laparoscopic cholecystectomy (Table 4).

Intra operatively in this study 8 (10.0%) patients had more than 50% of gall bladder buried and 8 (10.0%) patients were with completely buried GB, 8 (10.0%) participants were found to have distended or contracted/shrilled gallbladder and 15 (18.8%) patients demonstrated difficulty without decompression of the gall bladder. About 7 (8.8%) showed impacted stones in hartmann's pouch. 62 (77.5%) patients had BMI of more then 25 (pre-obese and obese), 10 (12.5%) population had Adhesion from previous surgery and 12 (15.0%) population showed intra-operative free bile or pus. None of the patients had any fistula in our study (Fig. 2).

Area under the curve (AUC) with 95% CI in ROC analysis in terms of predicting difficult cholecystectomy for G10 cholecystitis severity score is 0.947 (0.896-0.998). This indicates a 94.7% of correct prediction of difficult laparoscopic cholecystectomy (Table 5).

In this study, intra-operative assessment using the G10 cholecystitis severity score predicted 15 (18.75%) patients to have easy laparoscopic

Table 3: Expected difficulty among subjects as per Randhawa score

		Observed difficulty			
Pre-operative score	Expected difficulty	Easy	Difficult	Very difficult	Total
0-5	Easy	68 (94.44%)	4 (5.56%)	0	72
6-10	Difficult	0	4 (100%)	0	4
11-15	Very difficult	0	0	4 (100%)	4

Table 4: Distribution study subjects according G10 cholecystitis severity score

Parameters	Frequency	Percentage
Appearance		
Adhesion		
<50% of GB	68	85.0
>50% of GB but GB buried	8	10.0
Completely buried GB	4	5.0
Distention or contraction		
Distended or contracted shrilled GB		
No	72	90.0
Yes	8	10.0
Inability to grasp without decompression		
No	65	81.3
Yes	15	18.8
Calculi >1 cm impacted in Hartmann's pouch		
No	73	91.3
Yes	7	8.8
Access		
Obesity		
No	18	32.5
Yes	62	77.5
Adhesion from previous surgery		
No	70	87.5
Yes	10	12.5
Sepsis symptoms		
Free bile or pus outside GB		
No	68	85.0
Yes	12	15.0
Fistula		
No	80	100.0
Yes	0	0.0

Table 5: expected difficulty as per G10 cholecystitis severity score

G10 cholecystitis severity score	Expected degree of difficulty	Frequency	Percentage
<2	Easy	15	18.75
2-4	Moderate	53	66.25
5-7	Difficult	9	11.25
8-10	Extreme	3	3.75

cholecystectomy, 53 (66.25%) patients to be moderate, 9 (11.25%) to be difficult and 3 (3.75%) to be extremely difficult.

DISCUSSIONS

There were 60 females and 20 males in this study which constituted 75 and 25% of the study population respectively. Study by Bhattarai and Bhusal[6] showed the same. Many studies show that male sex is a risk factor for difficult cholecystectomy despite more number of females being afflicted with gallbladder diseases[7,8,9].

The mean age of the study population is 39.74±13.95 years (mean±S.D). For Females it was 39.23±14.85 years (mean±S.D) and for males it was 41.25±10.98 (mean±S.D). The maximum cases are among the age group 31-50 years, accounting for 48.75%. Randhawa and Pujahari[7] also reported the same.

Pain in the right upper abdomen was the most common presenting symptom found in 91.3% of the patients. Ganey *et al.*[10] reported pain as the most common presenting symptom. The second most common symptom was nausea, seen in 17.5% of the patients and vomiting was present in vomiting was present in 3.8% which is comparable to the series of Bhattarai and Bhusal[6].

We scored the patients pre-operatively based on Randhawa score and categorised the patients as easy, difficult and very difficult laparoscopic cholecystectomy. About 72 (90%) patients were expected to have easy laparoscopic cholecystectomy, 4 patients each accounting for 5% each were grouped as difficult and very difficult laparoscopic cholecystectomy respectively. Raza and Rajeev[11] had 78% scored easy, 19% scored difficult and 3% scored preop very difficult. Singh and Agrawal[12] had 56.7% scored easy 43.3% were scores difficult and nil in very difficult group.

Intra-operatively the patients were scored using the G10 cholecystitis severity score and were categorised as easy 15 (18.75%), moderate 53 (66.25%), difficult 9 (11.25%) and extreme score 3 (3.75%).

In our study, the total time taken for completion of cholecystectomy in this study was <60 min in 68 (85.0%) of the patients in 8 (10.0%) patients the duration was between 60 and 120 min whereas in 4 (5.0%) patients it was more than 120 min. Similarly Sugrue *et al.*[13] reported a mean operative time of 78.7 min (range 15-400 min) in their study.

In our study, the outcome was found to be easy in 68 (85.0%) patients, difficult in 8 (10.0%) of the patients and very difficult in 4 (5.0%) of patients. Our overall outcome is comparable to that of Randhawa and Pujahari[7] and that of Raza and Rajeev[11].

In our study, on analysis of correlation of the Randhawa score and its attributes we see that the Randhawa score showed Pearson correlation coefficient of 0.839 (p<0.0001) with observed outcome indicating good prediction. Area under the curve (AUC) with 95% CI in ROC analysis in terms of predicting difficult cholecystectomy for Randhawa score is 0.752 [0.567-0.936]. This indicates a 75.2% of correct prediction of difficult laparoscopic cholecystectomy. The original Randhawa and Pujahari[7] study reported a AUC of 0.82. Singh et al.[12] reported an AUC of 0.873 for the Randhawa score in their study. Gupta et al.[14] reported an AUC of 0.86 for the Randhawa score in their study. Compared to these studies our study shows lesser predictive potential for Randhawa study.

In our study the G10 cholecystitis severity score showed Pearson correlation coefficient of 0.941 (p<0.0001) with observed outcome indicating good prediction. Similarly findings were reported by Sugrue et al.[13].

Only one (1.3%) participant of very difficult group underwent conversion to open cholecystectomy in our series. Conversion rates vary between 0-60% in reported literatures[13,14].

On follow up only one (1.3%) patient developed post operative complications in our study. This patient had a very difficult laparoscopic cholecystectomy, the longest hospital and ICU LOS among the participants. Radunovic et al.[15] have reported 9.45% post operative complication rate in their series from 740 patients.

CONCLUSION

The Randhawa score appears to be a valid tool for pre-operative prediction of level of operative difficulty for laparoscopic cholecystectomy with good positive prediction value. Although, used for prediction of conversion to open cholecystectomy, the G10 cholecystitis severity score can be used for prediction of difficult laparoscopic cholecystectomy. Both Randhawa score and G10 cholecystitis severity score good positive correlation with difficulty of laparoscopic cholecystectomy.

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