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Original Research Article

Factors predicting difficult laparoscopic cholecystectomy: a single institution experience

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ABSTRACT

Background: Laparoscopic cholecystectomy is one of the most common operations performed by general surgeon. This study was performed to evaluate pre-operative factors predicting difficult laparoscopic cholecystectomy.
Methods: A prospective study was carried out at Jawaharlal Nehru Medical College Hospital, Ajmer, a tertiary care centre in Middle East Rajasthan, India. In present study we included 100 patients diagnosed with symptomatic gallstones disease on the basis of history, clinical examinations and USG findings and underwent laparoscopic cholecystectomy in our hospital by a single surgeon during the period of July 2014 to July 2016. These all patients were evaluated for a group of risk factors and preoperatively these risk factors were given a score between 0-5 labeled as easy, 5-10 as difficult and 11-15 as very difficult. Statistical analysis was done by Fischer's test and chi square test.
Results: BMI >30, previous medical disease like DM, palpable gall bladder, prior hospitalization pericholecystic collection and impacted stone are significant risk factors to predict difficult laparoscopic cholecystectomy.
Conclusions: The studied scoring system had a positive prediction value for easy prediction of 94% and for difficult prediction of 100%.

Keywords: Prospective study, Laparoscopic cholecystectomy, Pericholecystic collection, Impacted stone

INTRODUCTION

The prevalence of cholelithiasis is 10-15% in India, and approximately 1-2% of asymptomatic patients will develop symptoms and required cholecystectomy every year.[1] Laparoscopic cholecystectomy is the gold standard treatment for cholelithiasis. It has now become one of the most common operations performed by general surgeons. Since the introduction of laparoscopic cholecystectomy, the number of cholecystectomy performed in India has been increased due to widespread use of radiological investigation for screening. The advantages of laparoscopic cholecystectomy are earlier return to bowel function, less postoperative pain, cosmetic, shorter length of hospital stay, earlier return to full activity, and decreased overall cost. The purpose of this study is to determine the predictive factors for difficult laparoscopic cholecystectomy.

METHODS

Study protocol and population

A prospective, study was conducted at Jawaharlal Nehru Medical College Hospital, Ajmer, a tertiary centre in Middle East Rajasthan, India. All patients presented with upper abdominal pain, or vomiting or dyspepsia or jaundice from July 2014 to July 2016 were screened for

cholelithiasis. Hundred cases diagnosed with cholelithiasis following exclusion criteria and undergoing laparoscopic cholecystectomy were considered for the study. The Institutional ethical committee approved the study protocol and written informed consent was obtained before the study from all patients.

Patients screening, evaluation and scoring

Screening for patients with cholelithiasis presenting with abdominal symptoms was done using an abdominal ultrasonography. Those confirmed as having cholelithiasis on ultrasound, were subjected to routine hemogram, liver and kidney function tests, coagulation profile, and biochemical investigations. Patients with common bile duct calculus, dilated common bile duct, deranged liver function tests, features of obstructive jaundice, age <15 years and >60 years and those refusing for laparoscopic cholecystectomy were excluded.

Table 1: Scoring factors based upon history, clinical, and sonographic findings.

Scoring factors	Score	Maximum score
1. History		
Age (years)		
<50	0	1
>50	1	
Sex		
Female	0	1
Male	1	
Previous history of hospitalization		
No	0	4
Yes	4	
2. Clinical		
Body mass index		
<25	0	2
25.1-30	1	
>30	2	
Abdominal scar		
No	0	2
Infraumblical	1	
Supraumblical	2	
Palpable gallbladder		
No	0	1
Yes	1	
3. Sonography		
Wall thickness		
Thin	0	2
Thick >4 mm	2	
Pericholecystic collection		
No	0	1
Yes	1	
Impacted stone		
No	0	1
Yes	1	
Total maximum score		15

The selected patients were evaluated for the following risk factors: age, sex, history of previous hospitalization, body mass index (BMI), presence of any supra umbilical or infra umbilical abdominal scar, palpable gallbladder, gallbladder wall thickness, pericholecystic collection, and impacted stone. Following workup and evaluation of risk factors, each patient was assigned scores preoperatively based upon the history, clinical assessment, and ultrasonography findings 1 day prior to surgery (Table 1). The above preoperative scoring method to predict the difficulty/easy level for performing laparoscopic cholecystectomy was defined as easy if patient scored <5, difficult for scores between 6 and 10 and very difficult for scores 11-15. Following thorough clinical and investigative evaluation, all patients underwent laparoscopic cholecystectomy. Surgery was performed using CO_2 pneumoperitoneum with 12mmHg pressure and using standard two 5mm and two 10mm ports. The timing was noted from the first port site incision until the last port closure. All the intra operative events were recorded. Postoperatively, we defined the surgical procedure as easy, difficult and very difficult (Table 2).

Table 2: Easy/difficult criteria for laparoscopic cholecystectomy as suggested by Randhawa and Pujahari.[2]

Factors	Easy	Difficult	Very difficult
Time taken (min)	<60	60-120	>120
Bile/Stone spillage	-	+	+
Injury to duct/artery	-	+ duct only	+
Conversion to open cholecystectomy	-	+	+

Time taken for the surgery, biliary/stone spillage, injury to duct/artery or conversion to open cholecystectomy was noted. To avoid bias in surgical outcome, all patients enrolled in the study were operated by a single laparoscopic surgeon. Postoperatively cases were followed-up for any complication. Drain was removed between the 2nd and 5th postoperative day depending upon the amount of drainage. Suture removal was done on the 8th postoperative day for all the cases taking into account all aseptic precautions. A follow-up for any recurrent symptoms or infection was done for all patients for 6 months.

Data management and statistical analysis

The data for all the patients was entered into specifically designed computer software SPSS version 20.0 from IBM for statics analysis. Data cleaning and editing were performed on a timely basis. To ensure adequate accuracy and reliability of the data, standard quality assurance measures were followed at various stages of data handling. Statistical analysis was done using Fischer's test and chi square test and $P<0.05$ was considered as significant. Percentages and proportions were calculated wherever appropriate. Percentage value was rounded off to first decimal digit.

RESULTS

This study comprises of 100 cases that were studied prospectively over a period of 2 years, of which 11 (11%) were males and 89 (89%) were females. In this series, age range for the enrolled patients was from 15 to 60 years. Majority were in the group 20-40 years of age (80 patients, 80%). Baseline clinical characteristics of the enrolled patients that underwent laparoscopic cholecystectomy are summarized in Table 3.

Table 3: Baseline clinical characteristics of the enrolled patients that underwent laparoscopic cholecystectomy.

Factors	Results
Mean age ±SD (years)	42.16±11.84
Male gender, n (%)	11 (11)
BMI, n (%)	
<25	26 (26)
25.1-30	60 (60)
>30	14 (14)
Previous surgical history, n (%)	
Tubectomy	23 (23)
LSCS	4 (4)
Appendectomy	2 (2)
Hysterectomy	2 (2)
Ultrasonography findings, n (%)	
Multiple calculi	66 (66)
Solitary calculi	19 (19)
Impacted calculi	15 (15)
Wall thickening	32 (32)
Pericholecystic collection	12 (12)
Palpable gallbladder, n (%)	5 (5)
History of hospitalization, n (%)	9 (9)

BMI of patients were <25 in 26 (26%) patients; 25.1-30 in 60 (60%) patients and >30 in 14 (14%) patients. History of previous surgery was noted in 31% patients. It included 23 (23%) with tubectomy, 4 (4%) patients with lower (uterine) segment cesarean section, 2 (2%) with appendectomy and 2 (2%) with hysterectomy. Hence, 31 (31%) patients presented with scar over abdomen. Only two had supra umbilical scar while rest 29 had an infra umbilical scar. Nine (9%) patients of 100 had a previous history of admission; 7 (7%) for acute cholecystitis, 2 (2%) for obstructive jaundice had ERCP with stenting done (Table 3).

Nine patients presented with hypertension, four with diabetes and two with bronchial asthma. On histopathology, 96 cases were reported as chronic cholecystitis, while four were reported as acute cholecystitis. No case of malignancy of the gallbladder was detected (Table 3).

Postoperative complication was seen in four patients who developed an infection of the epigastric port site. These patients were treated with dressing and closure with secondary intention. These patients healed after 1-2 weeks of treatment.

DISCUSSION

This single institution based observational study was done to determine factors for prediction of difficult laparoscopic cholecystectomy. It excels in providing more consistency in the selection of the study group patients, standardized surgical practices and post follow-up. The study does not have any observer related bias as done by a single observer. The majority of the population in this study was young to middle-aged group with the majority of patients falling under the 20-40 year age group; which is similar with previous study.[3] Multiple calculi, solitary calculi, and impacted calculi are mutually exclusive events. In present study, highest numbers were patients with multiple calculi, which was similar to findings of previous study.[4] Though the thickening of the gallbladder wall and pericholecystic collection can be seen in any number of calculi patients the percentages of these findings were higher in present study when compared with the findings reported by previous study.[5] Present study statistics did not show age as significant factors for difficult laparoscopic cholecystectomy (Table 4), whereas according to previous study age and gender have been found significant.[6,7] The discrepancies could be because we had more chronic cases than acute. This study showed gall bladder thickness as a significant factor for difficult laparoscopic cholecystectomy (Table 4), which is supported by other studies.[8–11]

However, one study gives opposite results for gallbladder wall thickness.[12] Present study shows that stone impaction at the gallbladder neck is a good predictor of difficulty in laparoscopic cholecystectomy, which is contrary to the findings in other studies in which stone impaction is shown to have a moderate correlation.[13] According to present study prior hospitalization, BMI>30, palpable gallbladder, thick gallbladder wall on USG were significant predictors of difficult laparoscopic cholecystectomy. Comparison with similar study is shown in Table 4.

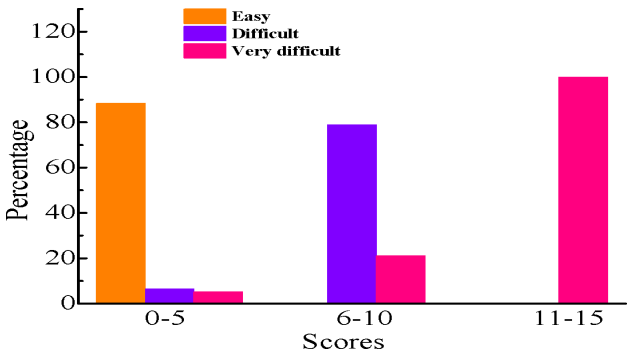

Figure 1: Percentage scores for easy, difficult and very difficult laparoscopy cholecystectomy.

In present study patients who score between 0-5 have easy laparoscopic cholecystectomy in 88.4% patients, difficult laparoscopic cholecystectomy in 6.4% patients and very difficult in 5.2% patients. Patients who score between 6-10 have difficult laparoscopic cholecystectomy in 78.9% patients and very difficult in 21.1% patients. Patient who score between 11-15 have very difficult laparoscopic cholecystectomy in 100% patients (Figure 1). From present data, it was observed that a higher BMI, previous history of hospitalizations, palpable gallbladder, thickened wall of gallbladder, impacted stone and pericholecystic collection were significant factors associated that posed difficulties in laparoscopic cholecystectomy.

Table 4: Comparison of preoperative risk factors and surgical outcome in the present study with that conducted by Randhawa and Pujahari.[2]

Risk factors	Preoperative score		p-value	
	Difficult	Easy	Present study	Randhawa and Pujahari[2]
Age (years)				
<50	18	64	0.511	0.937
>50	2	15		
Sex				
Female	15	53	0.596	0.736
Male	5	26		
BMI				
<25	2	59	<0.001	0.227
25.1-30	2	18		
>30	16	2		
Previous surgery				
None	15	53	0.596	0.882
Yes	5	26		
History of hospitalisation				
No	11	79	<0.001	<0.001
Yes	9	0		
Gallbladder palpable				
Not palpable	15	79	0.0002	0.022
Yes	5	0		
Ultrasound wall thickness				
Not thickenec	2	66	<0.0001	0.038
Thickened	18	13		
Impacted stone				
None	11	74	0.0001	0.190
Yes	9	5		
Pericholecystic collection				
None	13	75	0.001	0.999
Yes	7	4		

Limitations

One of the main limitations of the study is the defined age group. No patients above 60 years were undertaken so and also the majority of the population in this study was young to middle aged group. Hence, it does not prove factors efficacy or co-relation for older age group. Cohort study and meta-analysis of the data from various regions/study groups and private hospitals are needed to validate these findings.

CONCLUSION

Considering each factors independently previous surgery, BMI>30, palpable gallbladder, thick gallbladder wall on USG, impacted stone at the neck and pericholecystic collection are strong predictors of difficult laparoscopic cholecystectomy. Furthermore, keeping in mind that the scoring system was applied as a whole the proposed scoring system had a positive prediction value for easy prediction of 94% and for difficult prediction of 100%.

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