

Pre-Operative Prediction of Difficulty Grading in Laparoscopic Cholecystectomy using Scoring Method - A Cross-Sectional Descriptive Study

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Abstract: ***Introduction:** Any age group might be impacted by gallstones. The likelihood of gall stone disease increases with age. The aim of the study was to evaluate a scoring method to predict difficult Laparoscopic Cholecystectomy preoperatively. **Materials and Methods:** It is a Cross sectional descriptive study conducted at Department of General Surgery, Sri Venkateshwaraa Medical College Hospital and Research Centre for 18 months (March 2021 - July 2022). All patients undergoing laparoscopic cholecystectomy for gall stone disease were included. Laparoscopy to open conversion due to intraoperative suspicion of malignancy, laparoscopy to open conversion due to Gallbladder perforation diagnosed intraoperatively and laparoscopy to open conversion for CBD stone were excluded. Scoring method used were Randhawa and Pujahari scoring system. Estimated sample size was around 76 using Sensitivity-80% (Parent article -Preoperative prediction of difficult laparoscopic cholecystectomy: A SCORING METHOD [JUNE 2016]); confidence Interval-95%, margin of error-9% and sample size calculated using EPI INFO version 7.3.1.2 **Results:** In present study about 55% were of age 41 to 50 years. About 23.7% were in the age of 51 to 60 years. About 10.7% were in the age of 61 to 70 years. Only 5.3% were in the age of less than 40 years of age. Mean age is 42.17 and SD is 11.41. In present study about 30% were male, 70% were females. In present study about 46% were overweight, 46% were obese. Mean BMI is 25.37 and SD is 5.68. About 37% were smokers and 29% were alcoholics. The sensitivity was 83.33%, specificity 95%, positive predictive value 93.75% and negative predictive value 86.36%. **Conclusion:** A preoperative scoring system based on age, gender, history, clinical examination, laboratory, sonographic findings was created to help surgeons decide on a surgical approach, counsel the patients, reduce the risk of complication, reduce the rate of conversion to open cholecystectomy, reduce overall medical cost.*

Keywords: Laparoscopic cholecystectomy, grading, scoring, difficult, gallstones

1. Introduction

Any age group might be impacted by gallstones. The likelihood of gall stone disease increases with age. Around 25% of women over the age of sixty are affected by gall stone disease. The prevalence of gallstone disease is rising right now¹. In the majority of gall stone disease cases, symptoms are typically absent. However, it is thought that 10- 20% of individuals will manifest symptoms 5-20 years following the development of the gall stones. It follows that gall stone disease has a lower probability of developing symptoms, which is predicted to be between 2.2 and 2.5 percent annually². In 1987, laparoscopic cholecystectomy became widely used. It turned out to be a blessing for the patients and offers several benefits over open cholecystectomy³.

This surgical procedure has numerous advantages over open cholecystectomy, including less trauma, pain, hospital stay, cosmetic outcome, and recovery time. In certain research, laparoscopic cholecystectomy had more complications than open surgery. A Veress needle and trocar can cause common bile duct injury, bile leakage, gallbladder perforation, external biliary fistula, perihepatic collection, wound sepsis, hematoma, foreign body inclusions, adhesions, metastatic port-site deposits, and cholelithoptysis. Early laparoscopic surgery conversion rates were 2-15%. After years of laparoscopic study and clinician expertise, the conversion rate dropped to 1-6 percent. (It was converted to avoid concerns caused by many procedure challenges. Dense adhesions at Calot's triangle, a history of upper abdominal surgery, an acutely inflamed and gangrenous gallbladder, an empyema, Mirizzi's syndrome, a past cholecystectomy, and

a cholecystogastric or cholecystoduodenal fistula are all factors.⁴

Age, BMI, male gender, previous abdominal surgery, acute cholecystitis with fever, leucocytosis, gallbladder stones, and ultrasonographic findings like gallbladder distention and wall thickness 4 mm, impacted gallstones, and pericholecystic fluid collection increase the complexity of laparoscopic cholecystectomy. Kama et al. found that open cholecystectomy risk increased with age, male gender, prior abdominal surgery, upper abdominal discomfort at operation, sonographically identified gallbladder wall thickness, and preoperative acute cholecystitis. 6 A preoperative scoring system based on age, gender, history, clinical examination, laboratory, and sonographic results helps surgeons choose a surgical approach, counsel patients, reduce complications, conversion to open cholecystectomy, and medical expense. This system is compared to the intraoperative score to predict laparoscopic cholecystectomy difficulty.⁵

Surgeons' preoperative scores reduce laparoscopic cholecystectomy complications and conversions. Preoperative circumstances can make laparoscopic cholecystectomy difficult or impossible. Studies show that pre-operative grading can predict laparoscopic cholecystectomy difficulty. However, various qualities can make treatment difficult, and such patients cannot benefit from a laparoscopic procedure, especially if they need a long hospital stay. Laparoscopic cholecystectomy can be difficult for gallbladders with congenital vascular, ductal, or morphological abnormalities. Acute inflammation, gangrenous gallbladder, dense adhesions, small, fibrotic, thick-walled gallbladder, etc. might make laparoscopic

cholecystectomy difficult. Advanced age, male sex, obesity, acute cholecystitis clinical symptoms, past upper abdominal surgery, impacted stones, and pericholecystic fluid make laparoscopic cholecystectomy harder. Predicting conversion or surgical difficulty before laparoscopic cholecystectomy is critical.⁶

Due to its efficiency and safety, laparoscopic cholecystectomy (LC) is the preferred procedure for treating symptomatic cholelithiasis. Laparoscopic cholecystectomy has a number of advantages over traditional cholecystectomy, including reduced postoperative pain, a quicker recovery, an earlier resumption of bowel function, and a shorter hospital stay^{7, 8}. Even though LCs are the most often done operations today, some LCs that are intended for use require conversion for a variety of reasons. Due to intraoperative problems, it frequently necessitates conversion to open cholecystectomy, which requires more time than expected. On the other hand, recent literature has noted a conversion rate of roughly (2%-10%)⁹. The degrees of difficulty are typically difficult to predict. Nevertheless, it is essential to foresee so that the patient is aware of the likelihood of conversion. Similar to this, the surgeon can psychologically prepare themselves for having a strong surgical team, an intraoperative cholangiogram, the timing of the procedure, and general readiness to face the challenging cholecystectomy for better postoperative results. Knowing the indicators is always preferable while performing such difficult surgeries. The likelihood of potential complications and conversion to open surgery can be estimated^{10, 11} based on risk factors including patient demographics such as age, gender, body weight, comorbidity, and ASA score, clinical findings (acute vs chronic cholecystitis), and the surgeon's experience. In order to develop suitable management plans and gather resources to overcome problematic LC, it would be very helpful to have knowledge of the reliable predictors of difficult cholecystectomy. In order to identify predictors for problematic LC, this study set out to do so.

For the purpose of advising the patient and those who will be with them regarding conversion to open cholecystectomy, an accurate prediction is required. The adoption of a grading system aids the surgeon in planning the surgery's time and personnel as well as in warning patients to expect a lengthier hospital stay and more intensive postoperative care. Therefore, the RANDHAWA and PUJAHARI rating system may be useful in predicting difficult laparoscopic cholecystectomy, which we will examine in a semi-urban location (Sri Venkateshwara Medical College and Hospital, Ariyur). The aim of the study was to evaluate a scoring method to predict difficult Laparoscopic Cholecystectomy preoperatively.

2. Material and Methods

It is a Cross sectional descriptivestudy conducted at Department of General Surgery, Sri Venkateshwara Medical College Hospital and Research Centre for a period of 18 months (March 2021 - July 2022). All patients undergoing laparoscopic cholecystectomy for gall stone disease were included. Laparoscopy to open conversion due to intraoperative suspicion of malignancy, laparoscopy to open

conversion due to Gallbladder perforation diagnosed intraoperatively and laparoscopy to open conversion for CBDstone were excluded. Scoring method used were Randhawa and pujahari scoring system. Estimated sample size was around 76 using Sensitivity-80% (Parent article - Preoperative prediction of difficult laparoscopic cholecystectomy: A SCORING METHOD [JUNE 2016]); confidence Interval-95%, margin of error-9% and sample size calculated using EPI INFO version 7.3.1.2.

All patients coming to Surgery OPD with gall stone disease were assessed accordingly and planned for laparoscopic cholecystectomy based on necessity. After thorough OPD workup, the scores were given on history, clinical examination and sonological findings one-day prior to surgery on admission. Score upto 5 were defined as easy, 6-10 as difficult and 11-15 as very difficult. Surgery was done using CO₂pneumoperitoneum with 14 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 like Time taken, bile or stone spillage, cystic duct/cystic artery injury, lap to open conversion were recorded. Then, preoperatively defined easy, difficult, very difficult scores were compared with above mentioned intra operative events and graded finally as easy, difficult and very difficult according to Randhawa and Pujahari scoring system. The entire cases received standard postoperative care and were followed up.

An informed and written consent form was obtained. If the patients were not willing to be part of the study, they can withdraw themselves at any time. No financial or other competing interests.

Descriptive statistics were reported as mean (SD) for continuous variables, frequencies (percentage) for categorical variables. Chi square was used to find the association between categorical variables. Diagnostic ability of the score was calculated using sensitivity, specificity, positive predictive value and negative predictive value. Data were statistically evaluated with IBM SPSS Statistics for Windows, Version 26.0., IBM Corp., Chicago, IL.

3. Results

In the present study about 55% were in the age of 41 to 50 years. About 23.7% were in the age of 51 to 60 years. About 10.7% were in the age of 61 to 70 years. Only 5.3% were in the age of less than 40 years of age. Mean age is 42.17 and standard deviation is 11.41 (Table 1). In the present study about 30% were males and 70% were females. In the present study about 46% were overweight and 46% were obese. Mean body mass index is 25.37 and standard deviation is 5.68. About 37% were smokers and 29% were alcoholics.

Table 1: Distribution of demographic variables among the study participants (N=76)

S. No	Variable	Frequency	Percentage
1	Age		
	≤40	4	5.3
	41-50	42	55
	51-60	18	23.7
	61-70	8	10.7
2	Gender		
	Male	53	30
	Female	23	70
3	Body Mass Index		
	<18.5	2	2.6
	18.5-22.99	4	5.4
	23.0-24.99	35	46
	≥ 25.0	35	46
4	Smoking		
	Yes	28	37
	No	48	63
5	Alcoholism		
	Yes	22	29
	No	54	71

Table 2: Diagnostic ability of the score among study participants (N=76)

Preoperative	Postoperative		Total
	Easy	Difficult	
Easy	30	2	32
difficult	6	38	44
Total	36	40	76

The sensitivity was 83.33%, specificity =95%, positive predictive value 93.75% and negative predictive value 86.36% (Table 2).

Table 3: Comparison of preoperative and postoperative finding among study participants (N=76)

Preoperative Finding		Postoperative Finding			Total	P value
		Difficult	Easy	Very Difficult		
Preoperative Finding	Difficult	26	9	0	35	<0.001
	Easy	5	27	0	32	
	Very difficult	0	0	9	9	
Total		31	36	9	76	

Comparison of preoperative and postoperative finding was found to be statistically significant (Table 3, Figure 1).

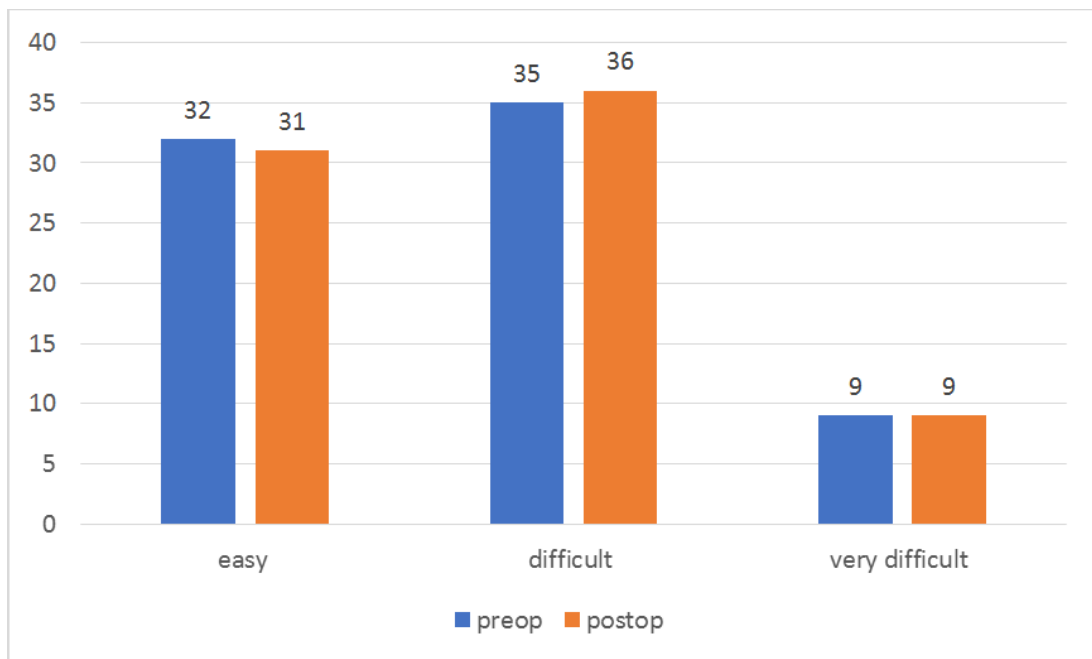


Figure 1: Comparison of preoperative and postoperative finding among study participants (N=76)

4. Discussion

In comparison to a traditional open cholecystectomy, this surgical method provides many benefits, including less trauma, less pain, a shorter hospital stay, a better cosmetic result, and a quicker recovery. Laparoscopic cholecystectomy, in contrast to open cholecystectomy, has been demonstrated in some studies to have a higher prevalence of problems.

Preoperative scores have been devised based on the experience of surgeons to lower the problems and conversion rate among patients undergoing laparoscopic cholecystectomy. Laparoscopic cholecystectomy is regarded

to be challenging or highly difficult depending on a few preoperative conditions. According to studies, pre-operative grading can be useful in predicting whether a laparoscopic cholecystectomy will be difficult or extremely difficult.

Due to its efficiency and safety, laparoscopic cholecystectomy (LC) is the preferred procedure for treating symptomatic cholelithiasis. Laparoscopic cholecystectomy has a number of advantages over traditional cholecystectomy, including reduced postoperative pain, a quicker recovery, an earlier resumption of bowel function and a shorter hospital stay.

For the purpose of advising the patient and those who will be with them, regarding conversion to open cholecystectomy, an accurate prediction is required. The adoption of a grading system aids the surgeon in planning the surgery's time and personnel as well as in warning patients to expect a lengthier hospital stay and more intensive postoperative care. Therefore, the RANDHAWA and PUJAHARI rating system may be useful in predicting difficult laparoscopic cholecystectomy, especially in resource constraint country like India.

Hence the present study was conducted with objectives, to predict difficult Laparoscopic cholecystectomy and to establish relationship between pre operative clinical, diagnostic evaluation and intraoperative difficulty.

In the present study about 55% were in the age of 41 to 50 years. About 23.7% were in the age of 51 to 60 years. About 10.7% were in the age of 61 to 70 years. Only 5.3% were in the age of less than 40 years of age. Mean age is 42.17 and standard deviation is 11.41. In the present study 76 patients undergoing laparoscopic cholecystectomy for gall stone disease were included in the study. In the present study about 55% were in the age of 41 to 50 years. About 23.7% were in the age of 51 to 60 years. About 10.7% were in the age of 61 to 70 years. Only 5.3% were in the age of less than 40 years of age. Mean age is 42.17 and standard deviation is 11.41. In the present study about 30% were males and 70% were females. In the present study about 46% were overweight and 46% were obese. Mean body mass index is 25.37 and standard deviation is 5.68. About 37% were smokers and 29% were alcoholics. Diagnostic ability of score Sensitivity =83.33%; Specificity =95%; Positive predictive value =93.75% and Negative predictive value=86.36%.

Randhawa and Pujahari studied 228 instances over the course of two years that were handled by a single skilled surgeon. There are a total of 15 scores based on the history, clinical, and sonographic results. Scores of 0 to 5 are projected to be easy, 6 to 10 to be difficult, and >10 to be very difficult. There were no examples with a score higher than 10, and predictions were accurate in 88.8% of easy cases and 92% of difficult cases. In a study conducted by Joshi MR et al., Preoperative scoring for challenging cases had a PPV of 63.64% and NPV of 84.62%, with sensitivities and specificities of 53.8% and 89.2%, respectively. In order to predict difficult LC individually, only three factors—history of acute cholecystitis, gall bladder wall thickness, and contracted gall bladder—were statistically significant. This study came to the conclusion that problematic LC can be predicted using a preoperative rating system. Surgery can be planned by surgeons depending on expected difficulty. Prior to surgery, patients and their loved ones might get preoperative counselling on the risk of a challenging procedure, an extended hospital stay, and greater costs in a tough case¹². A study by Saber A. et al¹³, enrolling 204 patients with difficult-to-treat cholecystitis. All patients had the trinity of a clinical examination, laboratory analysis, and ultrasound scan. Operative outcome served as the study's major end point, while morbidity associated with surgery served as its secondary end point. According to the grading system, each patient who underwent conversion to open surgery or experienced postoperative biliary leakage

received a total score between 6 and 10 points, suggesting a challenging surgical approach. This study also came to the conclusion that it is crucial for operational planning to anticipate preoperative conversion or difficulty risk factors, so that high-risk patients can be informed¹³.

In a study conducted by Wibowo A. A. et al.¹⁴, the cut off for easy—difficult using the ROC curve was 3.5, and for tough—very difficult it was 7.5. Each patient's scores were compared in order to see whether the preoperative prediction score was useful. The important characteristics that indicate difficult laparoscopic cholecystectomy were a history of acute cholecystitis hospitalisation (p 0.001), high BMI (p = 0.002), abdominal scar (p = 0.005), palpable gallbladder (p 0.001), thick gallbladder wall (p 0.001), and leucocyte (p 0.001). The scoring method's sensitivity and specificity for the easy-difficult cut off were 72.6% and 87.5%, respectively, with a ROC curve area of 0.849.

5. Conclusion

A preoperative scoring system based on age, gender, history, clinical examination, laboratory, and sonographic findings was created to help surgeons decide on a surgical approach, counsel the patients, reduce the risk of complication, reduce the rate of conversion to open cholecystectomy, and reduce overall medical cost. This system is then compared with the score given based on intraoperative difficulties to predict the difficulty of laparoscopic cholecystectomy. The present study has found that score was good enough in predicting the outcome of postop period. More studies to be conducted in future to evaluate the efficacy of scoring system.

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