

# Comparative Study between Preoperative Ultrasonographic Based Scoring System and Intraoperative Scoring System for Predicting Difficult Laparoscopic Cholecystectomy

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DOI: [10.36347/sasjs.2021.v07i06.012](https://doi.org/10.36347/sasjs.2021.v07i06.012)

| Received: 12.05.2021 | Accepted: 12.06.2021 | Published: 19.06.2021

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## Abstract

## Original Research Article

**Background:** Laparoscopic cholecystectomy (LC) has become the treatment of choice for cholelithiasis. Still some patients required conversion to open cholecystectomy (OC). The condition of the patient, the level of experience of the surgeon and technical factors all play a role in the decision for conversion. Inability to define the anatomy and difficult dissection are the leading reasons for conversion. **Aims and objectives:** To compare between and to validate: preoperative ultrasonographic based scoring system and intraoperative scoring system (SURGUE ET AL, IRELAND) as predictors for difficult laparoscopic cholecystectomy. **Materials and Methods:** This prospective randomized study was conducted at Kempegowda Institute of Medical Sciences Hospital, Bangalore after obtaining the Hospital Ethical Committee clearance for a period of 6 months from AUGUST 2018-JANUARY 2019. Pre-operative Ultrasonographic based scoring system was compared with Intra-operative scoring system to predict laparoscopic cholecystectomy. **Results:** In the study among those with Easy Pre-operative score, 90.9% had easy, 9.1% had moderate Intra-operative score. Among those with difficult pre-operative score, 33.3% had easy, 11.1% had moderate, 22.2% had difficult and 33.3% had extreme Intra-operative score. There was significant association between Pre-operative score and Intra-operative score. **Conclusion:** With the help of accurate prediction, high risk patient may be informed beforehand regarding the probability of conversion and hence they may have a chance to make arrangements accordingly. Surgeons can also be aware about the possible complications that may arise in high risk patients. Our study also concludes that radiological parameters are good predictors of difficulty. **Abbreviations:** LC: Laparoscopic Cholecystectomy, OC- Open Cholecystectomy, GB-Gallbladder, CBD- Common Bile Duct, BMI- Body Mass Index **Keywords:** Laparoscopic cholecystectomy, Conversion to Open, Ultrasonographic scoring system, Intraoperative scoring system.

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## INTRODUCTION

Cholecystectomy was established as the surgical treatment for cholelithiasis in 1882, when Carl Johann August Langenbuch performed the first Cholecystectomy in a 43 year old woman who was suffering from gallstone disease for 16 years [5]. Laparoscopic cholecystectomy (LC) has become the treatment of choice for cholelithiasis. It is one of the most common laparoscopic procedures being performed by general surgeons all over the world. Preoperative prediction of the risk of conversion or difficulty of operation is an important aspect of planning laparoscopic surgery [4]. Still some patients required conversion to open cholecystectomy (OC) [1]. Laparoscopic cholecystectomy (LC) results in less post-

operative pain, a decreased incidence of atelectasis and chest infection, rapid mobilisation and early discharge from hospital [2, 10]. However, compared with open cholecystectomy, the incidence of injuries to the bile duct seems to be increased [11, 3]. On the basis of ultrasound findings, surgeons can select the cases appropriate for their skills aiming at reducing operative complications and minimizing the waste of operating time available [3].

The condition of the patient, the level of experience of the surgeon and technical factors all play a role in the decision for conversion. Inability to define the anatomy and difficult dissection are the leading reasons for conversion. Conversion rate for elective LC is 5% whereas the conversion rate in the setting of acute

cholecystitis may be as high as 30%. “Currently it is estimated that 90% of cholecystectomies are performed by laparoscopy.”

## AIMS AND OBJECTIVES

To compare between and to validate: preoperative ultrasonographic based scoring system and intraoperative scoring system (SURGUE ET AL, IRELAND) as predictors for difficult laparoscopic cholecystectomy.

## MATERIALS AND METHODS

This prospective randomized study was conducted at Kempegowda Institute of Medical Sciences Hospital, Bangalore after obtaining the Hospital Ethical Committee clearance for a period of 6 months from AUGUST 2018-JANUARY 2019. All patients who presented with symptomatic gall stone disease presenting with upper abdominal pain or vomiting or dyspepsia or jaundice of age groups and both sexes were screened for gallstone disease and were included in this study. The cases of LC converted to open cholecystectomy due to: Equipment failure or emergency surgeries were excluded from the study.

Ultrasound findings of 30 patients with symptomatic cholelithiasis posted for LC were collected prospectively. The following ultrasound findings were analysed: GB wall thickness, pericholecystic collection, distended GB, impacted stones, multiple stones, CBD diameter and liver size. Out of seven parameters, four were statistically significant in our study. A score of 2

was assigned for the presence of each significant finding and a score of 1 was assigned for the remaining parameters to a total score of 11. A cut-off value of 5 was taken to predict easy and difficult LC. This scoring system was compared with intraoperative scoring system in 32 patients. The following parameters were assessed intraoperatively: gall bladder appearance, distension/contraction of gall bladder, access (previous surgery), time to identify cystic duct and artery, sepsis (bile/pus outside GB). Each parameter is given a score of 1 and a score of 3 for adhesions and the degree of difficulty is tabulated as mild (<2), difficult (2-4), severe (5-7) and extreme (8-10).

**Table-1: Preoperative Scoring System**

Ultrasound Parameters	Score
GB wall thickness $\geq 4$ mm	2
Transverse diameter of GB $\geq 5$ cm	1
Presence of impacted stones	2
CBD diameter $> 6$ mm	2
Presence of pericholecystic collection	2
Number of stones $> 1$	1
Liver size $\geq 15.5$ cm	1

All patients underwent surgery between 2 hours and 7 days after sonographic examination. Single experienced surgeon performed the surgeries. The LC was performed using a standard four-puncture technique with two 5 mm and two 10 mm ports. All the patients received standard postoperative care and follow up. A score of less than 5 was considered easy and a score of greater than 5 was considered as difficult LC

**Table-2: Intraoperative scoring system developed by Sugrue et al.**

Severity	Score
GB appearance:	
Adhesions $< 50\%$	1
Adhesions $> 50\%$ but GB buried	2
Completely buried GB	3
Distension/Contraction	
Distended GB or Contracted shriveled GB	1
Inability to grasp without decompression	1
Stone $> 1$ cm impacted in Hartman's Pouch	1
Access	
BMI $> 30$	1
Adhesions from previous surgery limiting surgery	1
Sepsis and complications	
Free bile or pus outside the GB	1
Fistula	1

The degree of difficulty intraoperatively was scored as - SCORES I) EASY  $< 2$  ii) MODERATE 3-4 iii) DIFFICULT 5-7 iv) EXTREME 8-10

## STATISTICAL ANALYSIS

Data was entered into Microsoft excel data sheet and was analysed using SPSS 22 version

software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test was used as test of significance for qualitative data. ROC Curve was used to represent the Area under the curve. p value  $< 0.05$  was considered as statistically significant after assuming all the rules of statistical tests.

## RESULTS

Table-3: Pre-Operative scoring of subjects

		Pre-Operative Score				P value
		<5 (Easy)		>5 (Difficult)		
		Count	%	Count	%	
Age	<50 years	15	68.2%	3	33.3%	0.074
	>50 years	7	31.8%	6	66.7%	
Sex	Female	13	59.1%	7	77.8%	0.324
	Male	9	40.9%	2	22.2%	
GB Wall Thickness	No	19	86.4%	1	11.1%	<0.001*
	Yes	3	13.6%	8	88.9%	
Impacted Stones	No	22	100.0%	7	77.8%	0.022*
	Yes	0	0.0%	2	22.2%	
Dilated CBD	No	22	100.0%	6	66.7%	0.004*
	Yes	0	0.0%	3	33.3%	
Collection	No	20	90.9%	3	33.3%	0.001*
	Yes	2	9.1%	6	66.7%	
GB Diameter	No	13	59.1%	1	11.1%	0.015*
	Yes	9	40.9%	8	88.9%	
Stones	No	10	45.5%	1	11.1%	0.070
	Yes	12	54.5%	8	88.9%	
Liver Size	No	19	86.4%	7	77.8%	0.555
	Yes	3	13.6%	2	22.2%	

In the study there was significant association between pre-operative score and GB wall thickness,

impacted stones, dilated CBD, collection and GB diameter.

Table-4: Intra-Operative Score of subjects

		Intra Operative Score								P value
		<2 (Easy)		3 to 4 (Moderate)		5 to 7 (Difficult)		8 to 10 (Extreme)		
		Count	%	Count	%	Count	%	Count	%	
Age	<50 years	17	73.9%	0	0.0%	0	0.0%	1	33.3%	0.018*
	>50 years	6	26.1%	3	100.0%	2	100.0%	2	66.7%	
Sex	Female	14	60.9%	2	66.7%	2	100.0%	2	66.7%	0.742
	Male	9	39.1%	1	33.3%	0	0.0%	1	33.3%	
GB Appearance	Distended	8	34.8%	2	66.7%	2	100.0%	3	100.0%	0.059
	Normal	15	65.2%	1	33.3%	0	0.0%	0	0.0%	
Unable to Grasp	No	23	100.0%	3	100.0%	0	0.0%	0	0.0%	<0.001*
	Yes	0	0.0%	0	0.0%	2	100.0%	3	100.0%	
Impacted Stone	No	23	100.0%	3	100.0%	2	100.0%	1	33.3%	<0.001*
	Yes	0	0.0%	0	0.0%	0	0.0%	2	66.7%	
BMI (>25)	No	14	60.9%	1	33.3%	2	100.0%	0	0.0%	0.103
	Yes	9	39.1%	2	66.7%	0	0.0%	3	100.0%	
Adhesions	No	23	100.0%	1	33.3%	0	0.0%	0	0.0%	<0.001*
	Yes	0	0.0%	2	66.7%	2	100.0%	3	100.0%	
Pus/Bile	No	23	100.0%	3	100.0%	0	0.0%	1	33.3%	<0.001*
	Yes	0	0.0%	0	0.0%	2	100.0%	2	66.7%	
Time to Identify Cystic Artery	No	20	87.0%	2	66.7%	0	0.0%	0	0.0%	0.002*
	Yes	3	13.0%	1	33.3%	2	100.0%	3	100.0%	

In the study there was significant association between Postoperative score and Age, Unable to Grasp,

Impacted Stone, Adhesions, Pus/bile and time to identify Cystic Artery.

**Table-5: Comparison between Pre-Operative score and Intra-Operative score**

		Pre-Operative Score			
		<5 (Easy)		>5 (Difficult)	
		Count	%	Count	%
Intra-Operative Score	<2 (Easy)	20	90.9%	3	33.3%
	3 to 4 (Moderate)	2	9.1%	1	11.1%
	5 to 7 (Difficult)	0	0.0%	2	22.2%
	8 to 10 (Extreme)	0	0.0%	3	33.3%

$$\chi^2 = 15.1, df = 3, p = 0.002^*$$

In the study among those with Easy Pre-operative score, 90.9% had easy, 9.1% had moderate Intra-operative score. Among those with difficult pre-operative score, 33.3% had easy, 11.1% had moderate, 22.2% had difficult and 33.3% had extreme Intra-operative score. There was significant association between Pre-operative score and Intra-operative score.

Pre-Operative score at >6 had sensitivity of 100%, specificity of 96.15%, Positive predictive value of 83.3% and negative predictive value of 100%.

## DISCUSSION AND CONCLUSION

According to our study, out of the studied preoperative parameters, GB wall thickness, pericholecystic collection, impacted stones, CBD diameter and transverse diameter of the gallbladder were significant in predicting difficult LC, intraoperatively all parameters except the BMI were significant in predicting difficult LC.

Many studies have attempted to form a scoring system to predict difficult laparoscopic cholecystectomy, but most of them are complex, use large number of determining factors, and they are difficult to use in day-to-day practice [13]. Many of these scoring systems cannot be applied pre-operatively. The score used in our study can be applied pre-operatively.

This study was conducted mainly to find predictive factors of a difficult cholecystectomy and to validate the new scoring system developed by Randhava *et al.*, Commando hospital Bengaluru and intra operative grading system developed by Surgue *et al.*, of Ireland.

Patients having high risk may be informed and scheduled appropriately and decision to convert to open cholecystectomy in case of anticipated difficulty may be taken earlier.

With the help of accurate prediction, high risk patient may be informed beforehand regarding the probability of conversion and hence they may have a chance to make arrangements accordingly.

Surgeons can help counsel patients undergoing laparoscopic cholecystectomy with regards to the probability of conversion to an open procedure.

Our study also concludes that radiological parameters are good predictors of difficulty. "The need for conversion to laparotomy is neither a failure nor a complication, but an attempt to avoid complications"

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