

# Assessment of Degree of Difficulty in Laparoscopic Cholecystectomy using Intraoperative Scoring System

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## ABSTRACT

**Introduction:** Laparoscopic cholecystectomy is one of the most commonly performed minimally invasive surgery. But in every patient, there are different types of difficulties in performing laparoscopic cholecystectomy and outcome may be different according to the difficulties.

**Aim:** To assess and grade the degree of difficulty in laparoscopic cholecystectomy and their postoperative outcome using intraoperative scoring system devised.

**Materials and Methods:** One hundred three consecutive patients who underwent elective laparoscopic cholecystectomy at Himalayan Institute of Medical Sciences, were included in the study. Inclusion criteria was all the cases of elective laparoscopic cholecystectomy and exclusion criteria was cases in which directly open cholecystectomy was performed. Intraoperative findings were assessed on the basis of five key aspects which

includes: 1) Gallbladder appearance and amount of adhesions; 2) Degree of distension/ contraction of the gallbladder; 3) Ease of access; 4) Local/septic complications; and 5) Time taken to identify the cystic artery and duct.

**Results:** Total 103 patients of laparoscopic cholecystectomy were included in this study. The severity score was between 2-4 in 63 (61.16%) patients and between 5-7 in 20 (19.41%) patients. Mild to moderate degree of difficulty was encountered in 80 (77.66%), severe degree in 20 (19.41%) and extreme degree of difficulty in 03 (2.91%) patients in performing cholecystectomy and conversion to open surgery were done in 08 (7.76%) patients with score between 6 to 8.

**Conclusion:** This scoring system is useful and reliable. If the intraoperative severity score is more, the severity of cholecystitis increases and then it is more difficult to perform laparoscopic cholecystectomy.

**Keywords:** Cholecystitis severity, Difficulty scoring, Pneumoperitoneum

## INTRODUCTION

Laparoscopic cholecystectomy is the current gold standard for the treatment of symptomatic cholelithiasis [1,2]. But the severity of cholecystitis may be different in every patient and performing laparoscopic cholecystectomy may be difficult accordingly. Conversion from laparoscopic to open cholecystectomy is the essential part of the safe surgical practice if the anatomy is unclear, if complications arise, or if there is failure to make reasonable progress in a timely manner. There is one retrospective study from the database on intraoperative scoring system done by Sugrue M et al., but its usefulness in prospective study is not been checked [1].

This prospective study was aimed to assess and grade the degree of difficulty in laparoscopic cholecystectomy and their postoperative outcome using intraoperative scoring system devised by Sugrue M et al., [1].

## MATERIALS AND METHODS

This prospective study was conducted at Himalayan Institute of Medical Sciences, Dehradun, Uttarakhand, India, from 29<sup>th</sup> November 2016 to 1<sup>st</sup> June 2017. The prospective study protocol was approved by local Ethical Committee. Informed consent was taken from all the participants included in the study. One hundred three consecutive patients who underwent elective laparoscopic cholecystectomy at are Institute from 29<sup>th</sup> November 2016 to 1<sup>st</sup> June 2017 were included in the study. Preoperative workup of all the cases was done. Some cases were diagnosed as acute cholecystitis and empyema but gangrene of the gallbladder was not diagnosed preoperatively. All the cases were taken for elective laparoscopic cholecystectomy and were operated in different surgical units by surgeons with more than 10 years of experience

in laparoscopic surgery. Inclusion criteria was all the cases of elective laparoscopic cholecystectomy and exclusion criteria was cases in which directly open cholecystectomy was performed. Reference of the scoring was taken from the study of Sugrue M et al., [1].

Pneumoperitoneum was created by Veress needle from infraumbilical site or palmer's point. Intraoperative findings were assessed on the basis of five key aspects which includes: 1) Appearance of gallbladder and amount of adhesions; 2) Distension/contraction of the gallbladder; 3) Access to peritoneal cavity; 4) Any local/septic complications; and 5) Time taken to dissect the Calot's triangle. A Score of zero was given when there was no adhesion; Score 1 when <50% adhesion; Score 2 was given to amount of adhesion in between 50% and completely buried gallbladder; and Score 3 was given when gallbladder was completely buried in adhesion. Rest of the scoring was done as per [Table/Fig-1]. The degrees of difficulty in laparoscopic cholecystectomy according to the severity of cholecystitis were graded with the total calculated score.

Intraoperative scoring was done in all the patients who underwent laparoscopic cholecystectomy and based on these findings grading of the degree of difficulty and outcome of the surgery assessed.

## STATISTICAL ANALYSIS

Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 24.0, statistical software.

## RESULTS

The study enrolled 103 consecutive cases of laparoscopic cholecystectomy in which 74 were female (71.84%) and 29 males

(28.15%) [Table/Fig-2]. Majority of the female were between the age group of 28-55 years and males between 40-65 years. Various operative findings were scored from 1 to 10 as per the operative predictors for difficult laparoscopic cholecystectomy shown in [Table/Fig-1]. The scoring is grouped as < 2, 2-4, 5-7, and 8-10 and is graded respectively as mild, moderate, severe and extreme degree of difficulty [Table/Fig-1].

Evaluation started from the first port insertion and the points for difficulty encountered include Body Mass Index (BMI) and adhesion from the previous abdominal surgery. The first port was inserted through infraumbilical point and palmer's point was used in the patients with midline scar from the previous abdominal surgery. Next level of difficulty encountered due to adhesion of omentum with gallbladder and due to failure to grasp gallbladder with atraumatic laparoscopic forceps or difficulty to retract the infundibulum of gallbladder due to impacted stone at Hartman's pouch.

Degrees of difficulty were assessed and mean of the severity score calculated as shown in [Table/Fig-3]. Patient with symptomatic cholelithiasis (biliary colic) were 57 (55.33%) and their mean intraoperative score were 2.1. Although, the mean score just crosses 2, which comes under moderate degree of difficulty but in majority mild degree of difficulty encountered. Duration of laparoscopic cholecystectomy in symptomatic cholelithiasis (biliary colic) was between 25-38.33 minutes [Table/Fig-3].

Total 27 (26.21%) cases of acute cholecystitis were operated and their mean severity score found to be 3.3. Laparoscopic cholecystectomy is done in these patients with moderate degree of difficulty and without any morbidity. Average duration of laparoscopic cholecystectomy in these 27 cases was between 30-51.66 minutes [Table/Fig-3].

Total five (4.85%) cases of mucocele gallbladder were operated and their mean severity score was 4.6. In all these five cases, laparoscopic cholecystectomy was done without any morbidity. Moderate to severe degree of difficulty encountered in these cases in performing laparoscopic cholecystectomy. Decompression of gallbladder was performed to allow grasping with atraumatic laparoscopic forceps in all cases of mucocele. Average duration of laparoscopic cholecystectomy in mucocele gallbladder was between 45-55 minutes [Table/Fig-3].

Cases with empyema of gallbladder were 11 (10.67%) and we encountered severe to extreme degree of difficulty in all these cases [Table/Fig-3]. In five cases of empyema, open cholecystectomy done. The severity score in four of these cases were >6 and in one case it was 6. The indication for conversion in four cases were frozen Calot's with dense adhesion, subtotal cholecystectomy was done in these 4 cases. In one case conversion was done due to bile duct injury (0.97%) when the

severity score was 8. Bile duct injury was repaired with T tube placement. Average duration of cholecystectomy in empyema gallbladder was between 60-105 minutes [Table/Fig-3]. Here increased duration of surgery was due to conversion to open. In one case, it took 105 minutes because of bile duct injury.

In three (2.91%) cases we found gangrene of the gallbladder with dense adhesion at Calot's and pus spillage outside the gallbladder. The severity score in these cases were between 6-8 and severe to extreme degree of difficulty encountered. All these three cases

Operative Predictors	Score
<b>Difficulty in Access</b>	
BMI >30	1
Adhesions from previous surgery limiting access	1
<b>Gallbladder and Omental Adhesion</b>	
No adhesion	
Adhesions < 50% of GB	
Adhesions burying GB	Max 3
*Score 0 for no adhesion; Score 1 for <50% adhesion; Score 2 for adhesion in between 50% and completely buried GB; and Score 3 when gallbladder is completely buried in adhesion.	
<b>Appearance of GB</b>	
Distended GB or contracted shriveled GB	1
Unable to grasp with atraumatic laparoscopic forceps	1
Stone impacted in Hartman's Pouch	1
<b>Severe Sepsis or Complications</b>	
Bile or pus outside GB or gangrene of GB	1
Time to identify cystic artery and duct >90 minutes	1
Total Max	10
<b>Grading of Degree of Difficulty</b>	
A-Mild	<2
B-Moderate	2-4
C-Severe	5-7
D-Extreme	8-10

[Table/Fig-1]: Scoring for various operative predictors for difficult laparoscopic cholecystectomy. \*GB-Gallbladder

Manifestations of Gall Stone	Male	Female
Symptomatic cholelithiasis (biliary colic)	16	41
Acute cholecystitis	07	20
Mucocele GB	02	03
Empyema GB	02	09
Gangrene of GB	02	01

[Table/Fig-2]: Distribution of total patient according to manifestation of gall stone in different gender (n=103). \*GB-Gallbladder

Diagnosis	Score								Total Number	Mean Score	Bile Duct Injury
	1	2	3	4	5	6	7	8			
No. of symptomatic cholelithiasis	13	27	14	03	-	-	-	-	57	2.1	
Duration	25	28.51	32.14	38.33							
No. of acute cholecystitis	04	05	02	10	06	-	-	-	27	3.3	
Duration	30	33.75	35	45	51.66						
No. of mucocele	-	-	-	02	03	-	-	-	05	4.6	
Duration				45	55						
No. of empyema	-	-	-	-	01	06	02	02	11	6.4	01
Duration					60	61.66	65	105			
No. of gangrene of GB	-	-	-	-	-	01	01	01	03	7.0	
Duration						90	90	80			

[Table/Fig-3]: Scores in different types of presentation of gall stone disease and its complication with mean duration of surgery in minutes. \*GB-Gallbladder

Degree of Difficulty	Number of Cases
Mild (<2)	17
Moderate (2-4)	63
Severe (5-7)	20
Extreme (8-10)	03

[Table/Fig-4]: Degree of difficulty.

Different Types of Cholecystectomy	No. of Patients	Severity Score			Grading of Difficulty
		<6	6	>6	
Laparoscopic cholecystectomy	95	90	5	-	Mild to severe
Lap to open cholecystectomy with bile duct repair	01	-	-	1	Severe
Lap to open subtotal cholecystectomy	07	-	1	6	Severe to extreme

[Table/Fig-5]: Grading of difficulty encountered in different types of cholecystectomy.

were converted to open surgery and subtotal cholecystectomy done. Average duration of cholecystectomy in these cases was between 80-90 minutes [Table/Fig-3].

Out of these 103 cases, laparoscopic cholecystectomy was done in 92.23% (95 patients) and degree of difficulty was from mild to severe [Table/Fig-4]. In the majority, we encountered moderate degree of difficulty in performing laparoscopic cholecystectomy whereas conversion to open cholecystectomy and subtotal cholecystectomy was done in 7.76% (08 patients) and degree of difficulty were found to be severe to extreme respectively [Table/Fig-5]. So, as the intraoperative severity score increased, the severity of cholecystitis increased and more difficulty encountered in performing cholecystectomy safely. Conversion to open surgery indicated in severe to extreme degree of difficulty.

## DISCUSSION

Laparoscopic cholecystectomy is one of the most unpredictable operations in general surgery due to variability in the natural history of gall stone and operative findings at laparoscopic cholecystectomy [2-4]. In some cases, cholecystectomy may be very easy and in some there may be unexpected degree of surgical difficulty [5]. Likewise, depending on the severity of the disease, recovery may be delayed or there are chances of complications or conversion to open surgery. Conversion rate of laparoscopic cholecystectomy to open surgery is about 7%-35% [6]. Our study also showed conversion rate of 7.76%. Major cause of conversion to open is dense adhesion due to severe cholecystitis or inability to delineate anatomy [7,8]. There are many preoperative scoring systems to predict the difficult cholecystectomy with some degree of accuracy [9].

Vivek MA et al., recently reported scoring assessment for difficult laparoscopic cholecystectomy using 22 parameters including intraoperative findings like distended/contracted gallbladder or inflamed gallbladder, overhanging liver edge and cirrhosis and also some subjective parameters like difficulty in port placement and gallbladder grasping. Some of these predictors are similar in our study [10].

Nowadays, there is increasing pressure to perform laparoscopic cholecystectomy at index admission of acute cholecystitis. Intraoperative scoring system will provide indications for conversion to open surgery and allow for assessment of outcome [11]. Scoring and grading surgical conditions provide a uniform tool for reporting the severity of disease.

Studies had claimed that repeated attacks of acute cholecystitis and hospitalization increases the difficulty of laparoscopic

cholecystectomy due to adhesions in pericholecystic region [2,12,13]. Our study also showing increase score in acute cholecystitis and its related complications.

Gangrene of the gallbladder is more common in male than female. Our study is also showing the similar results with increased severity score [14-16].

In our study, we encountered mild to severe degree of difficulty in 87.37% (90 patients) when the score was <6, we were able to complete the laparoscopic cholecystectomy but when it was > 6 conversion to open surgery done. In three of our patient's (2.91%) extreme degree of difficulty encountered with score of 8 and conversion to open subtotal cholecystectomy done. In one of this patient (0.97%) conversion to open surgery done due to bile duct injury when the score was 8. Sugrue M et al., also reported the moderate degree of difficulty when the score was between 2-4 and severe degree of difficulty at score 5-7, which is very similar to our study.

## LIMITATION

There is some limitation to this study. This is a short term and single centre study. Further, long term and large multicentric study is required.

## CONCLUSION

This intraoperative scoring system is useful and reliable in assessing the severity of cholecystitis and grading the degree of difficulty in performing laparoscopic cholecystectomy. It also gives indication for conversion in severe degree of cholecystitis.

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