



Preoperative Prediction of Difficult Laparoscopic Cholecystectomy: A Scoring Method

KEYWORDS

Preoperative prediction, score, difficult laparoscopic cholecystectomy.

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ABSTRACT AIMS AND OBJECTIVE: To identify various factors which can be used to predict the outcome of the laparoscopic cholecystectomy preoperatively and to devise a reliable scoring method using these factors. MATERIAL AND METHODS: The present prospective study included ultrasonographically proved 50 patients of symptomatic cholelithiasis, operated as elective cases. These patients were admitted in Surgical Wards of Adesh Institute of Medical Sciences and Research, Bathinda. Laparoscopic Cholecystectomy was performed on all the 50 patients using the standard American technique. The patients were selected randomly. Relevant history, clinical examination and investigations were recorded. Pre operative scores were given prior to surgery according to scoring sheet. The consent of all these patients were taken. All the patients were subjected to same general anaesthesia, antibiotics, perioperative analgesics and intravenous fluids. Surgery was performed by the consultants of a single unit. Exclusion criteria- Patients with history of jaundice, uncontrolled diabetes mellitus, uncontrolled hypertension & cholangitis, patients with underlying bleeding diathesis, Patients with chronic cardiac, pulmonary & renal disease, Patients with concomitant malignant disease, Patients with raised Alkaline phosphatase, SGOT, SGPT, Patients with sonographically proven choledocholithiasis or dilated common bile duct, Patients with history of drug allergy, steroids intake and chemotherapy, Patients on oral contraceptive pills & pregnancy, Patients unfit for general anaesthesia. Parameters recorded were Duration of surgery, From time of 1st trocar insertion to the last port closure, Intraoperative bile and calculus spillage, Injury to the CBD, Injury to cystic artery, Conversion to open cholecystectomy. RESULTS AND CONCLUSION ROC (Receiver operator curve) analysis of our study has shown that a score of >5 predicts difficult outcome with sensitivity of 80% and specificity of 97.5% and area under ROC (0.846) shows that preoperative scoring is a good method to predict outcome of LC (laparoscopic cholecystectomy). Hence it can be concluded that the preoperative scoring is statistically and clinically a good test for predicting the operative outcome in LC (area under ROC = 0.846). H/O hospitalisation, BMI, GB wall thickness, pericholecystic collection & impacted calculus in GB have significant bearing on the outcome.

INTRODUCTION:

Gallstone disease is one of the most common problems affecting the digestive tract. The prevalence of gallstones is related to factors like age, gender, and ethnic background. In India the prevalence is estimated to be around 4%^[1], changing incidence in India is mainly attributed to west ernization of diet, change in socioeconomic structure and availability of ultrasound as investigation in both rural and urban areas.

Cholecystectomy is the commonest abdominal surgical procedure in western world^[2]. Now, Laparoscopic Cholecystectomy (LC) is widely accepted as gold standard for treatment of symptomatic cholelithiasis.^[3] The difficult gall bladder is the most common 'difficult' laparoscopic surgery being performed by general surgeons all over the world and the potential one that places the patient at significant risk.^[4] Management of biliary tract disease offer early return to full activity, decreased post operative pain, post operative respiratory complications and wound infection, shorter hospital stay, better cosmesis, earlier return to normal activity and greater patient satisfaction.^[5] LC is usually considered to be a safer procedure than open cholecystectomy (OC) in terms of metabolic, hormonal and immunological changes.^[6] Attempts can be made in all cases of gall stone diseases with laparoscopic procedure except for patients with bleeding diathesis, carcinoma gallbladder and patients not fit for general anaesthesia.^[7]

Laparoscopic cholecystectomy though considered the gold standard technique, it is also sometimes technically challenging for the surgeons in view of difficult intraoperative anatomy, difficulty in dissecting around the calot's triangle or dense adhesions between the gall bladder and

the adjoining structures. However, compared with open cholecystectomy, the incidence of injuries to the bile duct seems to be increased.^[8,9] These problems at times compel the surgeons to perform the open cholecystectomy in the patients. However, of all Laparoscopic cholecystectomies, 1-13% requires conversion to an open for various reasons.^[10] These conversion rates are less in the centres where it is performed in the selected group of the patients. Although the rate of conversion to open surgery and complication rate are low in experienced hands, the surgeon should keep a low threshold for conversion to open surgery.^[4]

It has been mentioned in previous studies, there are some factors which can be assessed preoperatively to reliably predict the feasibility of successful laparoscopic cholecystectomy or the requirement for the conversion to open cholecystectomy. Patients with long-standing disease and previous bouts of cholecystitis or pancreatitis are at higher risk of experiencing a difficult procedure or conversion and may be at increased risk of bile duct injury or injury to the adjoining viscera.^[8] Age above 60 makes LC difficult.^[11] Significantly high mortality and conversion rate has been reported in male sex.^[12] It has been found that acute cholecystitis in obese has been the most important factor for conversion.^[13] Ultrasound findings (GB wall thickness, impacted stone) can be used as predictors of potential operative difficulties when selecting patients for laparoscopic cholecystectomy.^[14] Clinically palpable GB has been found to be a predictor of difficult LC in a study.^[15] Upper abdominal surgery is reported to have high rate of conversion and attributed to dense adhesions.^[16] Knowledge of these factors may be used for the preoperative counselling of the patients regarding the successful outcome of the surgery as well as to predict the risk of conversion

preoperatively for selected patients, prepare the patient psychologically, arrange operating schedules accordingly, and minimize the procedure-related cost and help overcome financial constraints, which is a significant problem in developing countries so that needful arrangements can be made by the patients.^[14]

It has been shown that the duration of hospital stay and the postoperative complications are more in the conversion as compared to the open & laparoscopic cholecystectomy.^[17] Hence in our study we want to assess the reliability of various preoperative factors which can predict difficult LC and devise a scoring system based on reliable factors.

MATERIAL AND METHODS:

The present prospective study included ultrasonographically proved 50 patients of symptomatic cholelithiasis, operated as elective cases. These patients were admitted in Surgical Wards of Adesh Institute of Medical Sciences and Research, Bathinda. Laparoscopic Cholecystectomy was performed on all the 50 patients using the standard American technique. The patients were selected randomly. Relevant history, clinical examination and ultrasound abdomen was done. Pre operative scores were given prior to surgery according to scoring sheet^[15]

SCORING SHEET

History	Age	<50 yr (0)	>50 yr (1)	1
	Sex	Female (0)	Male (1)	1
	H/O hospitalisation	No (0)	Yes (4)	4
Clinical	BMI	<25 (0)	25-27.5 (1) >27.5 (2)	2
	Abd. Scar	No (0)	Infraumbilical (1) Supraumbilical (2)	2
	Palpable G/B	No (0)	Yes (1)	1
Sonography	GB Wall thickness	Thin (0)	Thick \geq 4 mm (2)	2
	Pericholecystic collection	No (0)	Yes (1)	1
	Impacted Stone	No (0)	Yes (1)	1

EASY/DIFFICULT/VERY DIFFICULT

1.	Easy (0-5)	Time taken < 40 min, No Bile/ calculus spillage, No injury to CBD/ cystic artery
2.	Difficult (6-10)	Time taken to 40-60 min, Bile/ calculus spillage /Injury to cystic artery. No injury to CBD
3.	Very difficult (10-15)	Time > 60 min, Bile / calculus spillage, Injury to cystic artery, CBD injury Requiring conversion

The consent of all these patients were taken. All the patients were subjected to same general anesthesia, antibiotics, perioperative analgesics and intravenous fluids. Surgery was performed by the consultants of a single unit.

Patients with following criteria were excluded from the study:

- Patients with history of jaundice, uncontrolled diabetes mellitus, uncontrolled hypertension & cholangitis.
- Patients with underlying bleeding diathesis
- Patients with chronic cardiac, pulmonary & renal dis

ease.

- Patients with concomitant malignant disease.
- Patients with raised Alkaline phosphatase, SGOT, SGPT.
- Patients with sonographically proven choledocholithiasis or dilated common bile duct.
- Patients with history of drug allergy, steroids intake and chemotherapy
- Patients on oral contraceptive pills & pregnancy
- Patients unfit for general anaesthesia.

Following parameters were recorded as per the proforma attached.

- Duration of surgery, from time of 1st trocar insertion to the last port closure
- Intraoperative bile and calculus spillage
- Injury to the CBD
- Injury to cystic artery.
- Conversion to open cholecystectomy

OBSERVATION AND RESULTS

LC was performed in all the selected 50 patients. Following observations were made:

AGE AND GENDER-The age of our patients ranged from 23 to 70 years and mean was 44.30 years. The age of the female patients ranged from 23 to 62 years and the mean age was 42.95 years. The age of the male patients ranged from 39 to 70 years and the mean age was 50.44 years. The total number of males in our study were 9 (18%) and total number of females were 41 (82%).

Gender	N	Age (years)	
		Range	Mean \pm SD
Male	9	39-70	50.44 \pm 9.37
Female	41	23-62	42.95 \pm 11.12
Total	50	23-70	44.30 \pm 11.13

Table- 1

BODY MASS INDEX (BMI)

The BMI (kg/m²) of the patients ranged from 22 to 29 and the mean BMI was 25.826. The BMI of the female patients ranged from 22 to 29 and the mean BMI was 25.65. The BMI of the male patients ranged from 22.5 to 29 and the mean BMI was 26.61

Gender	N	BMI (kg/m ²)	
		Range	Mean \pm SD
Male	9	22.5-29	26.611 \pm 1.99
Female	41	22-29	25.654 \pm 2.67
Total	50	22-29	25.826 \pm 2.57

Tab-2 BMI (kg/m²) of patients

DURATION OF SURGERY

Total time taken ranged from 29-90 minutes and mean was 44.88 minutes. In the female patients total time taken ranged from 29-90 minutes and mean was 44.90 minutes. In the male patients total time taken ranged from to 35-60 minutes and mean was 44.78 minutes.

Sex	N	Duration of Surgery (mins)	
		Range	Mean ± SD
Male	9	35-60	44.78±9.17
Female	41	29-90	44.90±12.20
Total	50	29-90	44.88±11.63

Table- 3

PRE OPERATIVE SCORE

The preoperative score in all the patients ranged from 0-11 with a mean of 2.46. In the female patients preoperative score ranged from 0-11 with a mean of 2.27. In the male patients preoperative score ranged from 0-9 with a mean of 3.33.

Sex	N	Pre-Operative Score	
		Range	Mean ± SD
Male	9	0-9	3.33±2.73
Female	41	0-11	2.27±2.82
Total	50	0-11	2.46±2.80

Table- 4

The previous H/O hospitalization was noted in 9(18%) patients. The abdominal scar due to previous abdominal surgery was noted in 5(10%) patients. The gall bladder was clinically not palpable in any of the patients.

GALL BLADER THICKNESS

Thick GB wall was noted in 5(10.0%) patients and thin GB wall was noted in 45(90.0%) patients.

Pericholecystic collection was noted in 2(4.0%) patients.

There was calculus impacted at the neck of the gall bladder in 3(6.0%) patients. The bile spillage during surgery was noted in 9(18.0%) patients. The intraoperative injury to the cystic artery was noted in total 2(4%) patients. Injury to CBD occurred in 2 (4%) patients. None of the cases were converted to open cholecystectomy. Patients with Easy outcome of LC were 40(80.0%), patients with Difficult outcome of LC were 8(16.0%), patients with very difficult outcome of LC were 2(4.0%).

Distribution of cases according to Final outcome of LC

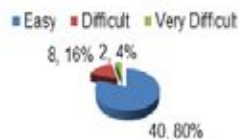


Fig-1
CORRELATION OF FACTORS WITH FINAL OUTCOME OF LC

Patients with age less than 50 years with easy outcome were 23(76.7%), while 7(23.3%) had difficult outcome.

Patients with age more than 50 years with easy outcome were 17(85.0%), while 3(15%) had difficult outcome.

Taking into account chi-square value to be 0.521 and p value to be 0.470, there is no significant association of age with final difficult outcome of LC in our study.

Male patients with easy outcome were 7(77.8%), while

2(22.2%) had difficult outcome.

Female patients with easy outcome were 33(80.5%), while 8(19.5%) had difficult outcome.

Taking into account chi-square value to be 0.034 and p value to be 0.854, there is no significant association of gender with final difficult outcome of LC in our study.

Patients having no previous history of hospitalization with easy outcome were 39(95.1%), while 2(4.9%) had difficult outcome.

There was only 1(11.1%) patient with history of hospitalization who had easy outcome, while 8(88.9%) patients had difficult outcome.

Taking into account chi-square value to be 32.554 and p value to be 0.000, there is high significant association of h/o hospitalisation with final difficult outcome of LC in our study.

Tab 5: Association of H/O hospitalization with final outcome of LC

H/O Hospitalization	Final Outcome of LC		Total
	Easy	Difficult	
NO	39(95.1%)	2(4.9%)	41(100%)
YES	1(11.1%)	8(88.9%)	9(100%)
Total	40(80%)	10(20%)	50(100%)

$\chi^2 = 32.554$; $df = 0$; $p = 0.000$; Significant

Patients with BMI less than 27.5 with easy outcome were 32(88.9%), while 4(11.1%) had difficult outcome.

Patients with BMI more than 27.5 with easy outcome were 58(57.1%), while 6(42.9%) had difficult outcome.

Taking into account chi-square value to be 6.349 and p value to be 0.012, there is no significant association of BMI with final difficult outcome of LC in our study.

Tab 6: Association of BMI with final outcome of LC

BMI(kg/m ²)	Final Outcome of LC		Total
	Easy	Difficult	
<27.5	32(88.9%)	4(11.1%)	36(100%)
>=27.5	8(57.1%)	6(42.9%)	14(100%)
Total	40(80%)	10(20%)	50(100%)

$\chi^2 = 6.349$; $df = 1$; $p = 0.012$; Significant

Patients having no abdominal scar with easy outcome were 36(80.0%), while 9(20.0%) had difficult outcome.

There were 4(80.0%) patients with abdominal scar who had easy outcome, while 1(20.0%) patient had difficult outcome.

Taking into account chi-square value to be 0.000 and p value to be 1.000, there is no significant association of abdominal scar with final difficult outcome of LC in our study.

Patients having thick GB wall with easy outcome were

1(20.0%), while 4(80.0%) had difficult outcome.

Patients having thin GB wall with easy outcome were 39(86.7%), while 6(13.3%) had difficult outcome.

Taking into account chi-square value to be 12.500 and p value to be 0.000, there is high significant association of GB wall thickness with final difficult outcome of LC in our study.

Tab 7: Association of GB wall thickness with final outcome of LC

GB Wall thickness	Final Outcome of LC		Total
	Easy	Difficult	
Thick(>4mm)	1(20%)	4(80%)	5(100%)
Thin	39(86.7%)	6(13.3%)	45(100%)
Total	40(80%)	10(20%)	50(100%)

$\chi^2 = 12.500$; $df = 1$; $p = 0.000$; Significant

Patients having no pericholecystic collection with easy outcome were 40(83.3%), while 8(16.7%) had difficult outcome.

There was no patient with pericholecystic collection who had easy outcome, while 2(100.0%) patient had difficult outcome.

Taking into account chi-square value to be 8.333 and p value to be 0.004, there is significant association of pericholecystic collection with final difficult outcome of LC in our study.

Patients having no impacted stone with easy outcome were 39(83.0%), while 8(17.7%) had difficult outcome.

There was 1(33.3%) patient with impacted stone who had easy outcome, while 2(66.7%) patient had difficult outcome.

Taking into account chi-square value to be 4.334 and p value to be 0.037, there is significant association of impacted stone with final difficult outcome of LC in our study.

Patients with easy predicted outcome having easy final outcome were 39(95.1%), while 2(4.9%) had difficult final outcome.

1(12.5%) Patient with difficult predicted outcome had easy final outcome, while 7(87.5%) had difficult final outcome.

None of the patients with very difficult predicted outcome had easy final outcome, while 1(100.0%) patient had difficult final outcome.

Taking into account chi-square value to be 32.641 and p value to be 0.000, there is high significant association of predicted outcome with final outcome of LC in our study.

Tab 8: Association of predicted outcome with final outcome of LC

Predicted outcome	Final Outcome of LC		Total
	Easy	Difficult	
EASY	39(95.1%)	2(4.9%)	41(100%)

DIFFICULT	1(12.5%)	7(87.5%)	8(100%)
VERY DIFFICULT	0(0%)	1(100%)	1(100%)
Total	40(80%)	10(20%)	50(100%)

$\chi^2 = 32.641$; $df = 2$; $p = 0.00$; Significant

Patients with easy predicted difficulty having easy final outcome were 39(95.1%), while 2(4.9%) had difficult final outcome.

1(11.1%) Patient with difficult predicted outcome had easy final outcome, while 8(88.9%) had difficult final outcome.

Taking into account kappa value to be 0.805 and p value to be 0.000, there is high significant association of predicted difficulty with final outcome of LC in our study.

Tab 9 : Association of predicted difficulty with final outcome of LC

Predicted difficulty	Final Outcome of LC		Total
	Easy	Difficult	
EASY	39(95.1%)	2(4.9%)	41(100%)
DIFFICULT	1(11.1%)	8(88.9%)	9(100%)
Total	40(80%)	10(20%)	50(100%)

kappa= 0.805 ; $p = 0.000$; Significant

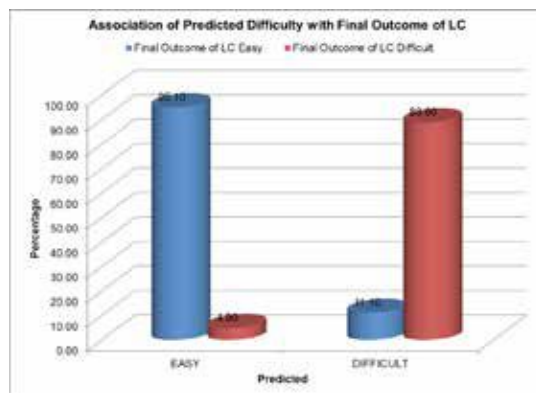


Fig -2

ROC ANALYSIS

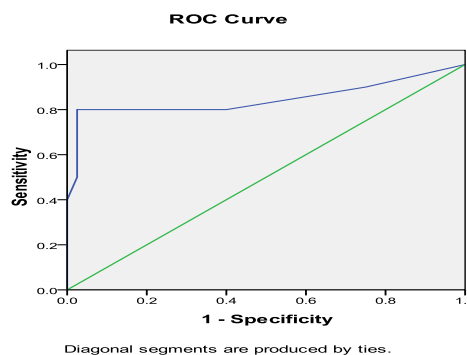


Fig -3

The area under curve is 0.846.

Pre-operative score cut-off of 5.00 has 80% sensitivity and 97.5% specificity.

Hence, a preoperative score of more than 5 is considered to have difficult outcome of LC.

Discussion:

Cholecystectomy is the mainstay for the treatment for gall stones. Laparoscopic Cholecystectomy has become the new gold standard for the treatment of cholelithiasis^[3]. In order to understand about the various factors which may be determinant for the outcome of the LC factors such as Age, Gender, BMI, H/O previous hospitalization for biliary pain, abdominal scar due to previous surgery, gall bladder lump and USG parameters including GB wall thickness, pericholecystic fluid collection and impacted calculus in the GB have been studied. This study evaluates these parameters before during and after the surgery in laparoscopic and open cholecystectomy. In this study randomly selected 50 patients underwent LC. The outcome of the LC was then compared with the preoperatively determined scores.

1 -AGE & GENDER-

The age of our patients ranged from 23 to 70 years and mean was 44.30 years. The similar age group has been mentioned in the study of Randhawa JS et al^[15] as the mean age in their patients varied from 9 to 70 years and the mean was 44.37 years which is comparable to our study. The maximum number of the patients were in the age of 26 -50 years which is comparable with the study of Kama et al^[11]. The total number of males in our study were 9 (18%) and total number of females were 41 (82%) and this is in accordance with the fact that most commonly-females are affected by the symptomatic cholelithiasis. Kama NA^[11] et al in their study have proved age above 60 years to be a predictor of difficult Laparoscopic Cholecystectomy.

Increased age is attributed to multiple attacks of cholecystitis and increased frequency of upper abdominal surgeries leading to increased fibrosis.^[18]

In a study by Russel JC^[12] et al found Laparoscopic Cholecystectomy difficult in male gender and consequently higher conversion rates and mortality in men following Laparoscopic Cholecystectomy. It was suggested that it is due to men paying less attention to subtle symptoms and therefore presenting at an advanced stage.

Similarly, YolS^[19] et al found that men are more prone to inflammation and fibrosis with the same disease intensity which makes the dissection difficult. Higher amount of collagen, hydroxyproline, mast cells, macrophages and eosinophils in gall bladder wall and pericholecystic tissue explained the male fibrogenic propensity.

However no significant association was found in our study between Age & Gender and outcome of LC (p value 0.470 & 0.854 respectively) which is in accordance with study done by Randhawa et al^[15].

2. H/O HOSPITALISATION

History of hospitalization for right upper abdomen pain/ acute cholecystitis has been found to be a strongly significant factor (p value 0.000) in determining the outcome of the Laparoscopic Cholecystectomy as shown in our study. The same has been mentioned in the study of Alponat M et al^[16]. Acute cholecystitis causes changes in the gall bladder wall and due to inflammation adhesions may form

in the Calot's triangle as well as between gall bladder and adjoining structures, all leading to difficulty in dissection and also sometimes leading to inadvertent injury to the cystic artery or CBD.^[18]

3. BMI

Obesity has been found to have a significant association with outcome of the Laparoscopic Cholecystectomy as there is abundant fat laden tissue in the Calot's triangle which leads to difficult dissection. The creation of pneumoperitoneum is also a difficult task in the obese patients. In the present study BMI above 27.5 kg/m² was found to have a statistically significant association (p value 0.012) with the outcome of the Laparoscopic Cholecystectomy. This has been shown in the study of Hutchinson CH et al^[11,20,21,22].

Nachnani et al^[23] found that umbilical port entry and creation of pneumoperitoneum was difficult in patients with BMI > 30.

4. ABDOMINAL SCAR

The abdominal scar due to previous surgery is shown to make Laparoscopic Cholecystectomy difficult in the study of Liu C et al^[24,25], as it may cause formation of intra-abdominal adhesions in the region of GB fossa and between the parietal wall & peritoneum which may cause difficulty in creating the pneumoperitoneum & a working space in the abdomen.

The abdominal scar in our study has not been a significant association (p value 1.000) with the outcome of Laparoscopic Cholecystectomy which is in accordance with the study of Hutchinson et al^[20], in which no relation was noted between the successful LC and the abdominal scar due to previous surgery. It may be due to increased experience on adhesiolysis and advanced laparoscopic surgery.

5 . GB WALL THICKNESS

Wall thickness above 4 mm was taken as the thickened gall bladder in our study as has been done by Randhawa JS et al^[15]. The gall bladder thickness more than 4 mm has been strongly significant (p value 0.000) in our study and the same has been shown in the various literatures as that of Hutchinson CH et al^[20,26,24,]. Singh K et al^[4] in their study found significant association between inflamed gall bladder and difficulty in grasping.

Lal P. et al^[27] in their study proved increased gall bladder wall thickness on preoperative ultrasonography to be a significant predictor of difficult Laparoscopic Cholecystectomy.

6. PERICHOLECYSTIC COLLECTION

Pericholecystic collection was taken as an ultrasonography indicator of features of acute cholecystitis and was found to have statistically significant association (p value 0.004) with difficult LC in our study and the same has been elucidated in the Schrenk P et al^[5,25,28,29].

7. IMPACTED CALCULUS

Calculus impacted in the neck of the gall bladder was a factor implicated in difficulty in carrying out Laparoscopic Cholecystectomy as it posed difficulty in holding the gall bladder while carrying out the dissection and during the extraction of the gall bladder from the port. In our study we also found it to be a significant determinant (p value 0.037) and the same has been noted in the literature of the Randhawa JS et al^[15].

in their study mentioned that presence of large stone in the gall bladder neck causes distension of gall bladder and hence makes it difficult to grasp.

8 . TIME TAKEN FOR SURGERY

Total time taken ranged from 29 to 90 minutes and mean was 44.88 minutes. In the female patients total time taken ranged from 29 to 90 minutes and mean was 44.90 minutes. In the male patients total time taken ranged from 35 to 60 minutes and mean was 44.78 minutes. The duration of surgery is greatly influenced by the patient related factors and the surgical experience of the operating surgeon and it also varies from institution to institution.

9. BILE & STONE SPILLAGE

Bile and stone spillage have been taken as a criteria as it may lengthen the time of surgery for the removal of the spilled stones. The same has been considered in the study of Randhawa JS et al^[15,27, 30] and the same has been determined in the present study. The extraction of a single calculus although takes little time but in case of multiple stones spillage the efforts may become cumbersome and operative time is increased.

10. CYSTIC ARTERY INJURY

In our study when cystic artery injury occurred the operative time increased and thus it had a significant impact on the operative time and the same has been reported in the study carried out by Randhawa JS et al^[15].

11. CBD INJURY

In our study CBD injury occurred in two patients which was diagnosed in the post operative period and the patients were managed conservatively hence could not be studied as a criteria for difficult Laparoscopic Cholecystectomy or conversion.

CBD injury if diagnosed intraoperatively has to be repaired in the same surgery after converting it into open surgery.

Singh K et al^[4] in their study reported CBD injury in 3 cases out of 6147 which were diagnosed intraoperatively and managed in the same sitting by converting to open. This was attributed to contracted gall bladder and dense adhesions in Calot's triangle by them.

12. PREOPERATIVE SCORE AND PREDICTED DIFFICULTY

In our study preoperative score > 5 (97.5% specific and 80% sensitive) has been found to be statistically significant for prediction of difficult LC(area under ROC 0.846). The predicted difficulty is also significant(kappa value 0.805) in our study. This is in accordance with the study done by Randhawa JS et al^[15].

Augustine AJ et al^[8] also studied various pre operative factors and gave total score of 44. A score of 9 or above was found to be significantly associated with difficult Laparoscopic Cholecystectomy in their study.

Conclusion

Preoperative scores were given to each patient and the possible outcome was predicted as per the score sheet (mentioned in material and methods)

The operative outcome was noted and the score was then compared to the outcome.

Statistical analysis was done using Chi square test/ Fis

cher exact test and ROC. The study has shown that H/O hospitalisation, BMI, GB wall thickness, pericholecystic collection & impacted calculus in GB have significant bearing on the outcome. ROC analysis of our study has shown that a score of >5 predicts difficult outcome with sensitivity of 80% and specificity of 97.5% and area under ROC (0.846) shows that preoperative scoring is a good method to predict outcome of LC.

Hence it can be concluded that the preoperative scoring is statistically and clinically a good test for predicting the operative outcome in LC (area under ROC = 0.846).

ABBREVIATIONS

ASA	American society of anesthesiologist
CBD	common bile duct
DOA	date of admission
GB	gall bladder
Inj.	Injury
LC	laparoscopic cholecystectomy
OC	open cholecystectomy
PRE-	OP preoperative
ROC	Receiver operator curve
SD	standard deviation
X ²	Chi square

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