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A Study On Predicting Difficult Laparoscopiccholecystectomy Using History Of Cholecystitis, Body Mass Index, Total Leukocyte Count, Gallbladder Wall Thickness & Impacted Stone At The Neck Of Gall Bladder In Ultrasonography

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Abstract

Background: Cholelithiasis is a common problem in day-to-day surgical practice, which has a prevalence of 10-15%. Laparoscopic cholecystectomy is the gold standard procedure for gall stone diseases. Out of many complications, one of the most important complications of laparoscopic cholecystectomy is bile duct injury, particularly in difficult cases.

Aim & Objectives: To determine whether the preoperative factors, History of cholecystitis, BMI, TLC, Gallbladder wall thickness, impacted stone at the neck of the gallbladder can predict difficult laparoscopic cholecystectomy.

Materials & Methods: this study was conducted over 2 years from 1st September 2017 to 31st August 2019 during which patients meeting the inclusion criteria were taken for laparoscopic cholecystectomy. A detailed proforma was developed to record information on demographics, history, physical findings, laboratory investigations, ultrasound findings, unfavourable intraoperative findings, and complications.

Results: Out of 150 patients a total of 34 (22.7%) patients had Gallbladder wall thickness > 4mm. Among these patients undergoing LC, only 10 cases became difficult. And out of 116 patients with Gallbladder wall thickness <, 4mm, 7 cases became difficult. The difference between these two groups was found to be statistically significant ($p < 0.001$). Gallbladder wall thickness < 4mmand Gallbladder wall thickness > 4mm. 58.8% (n=10) of difficult LC cases occurred in patients whose Gallbladder wall thickness was> 4mm. And 82% (n=109) of easy LC cases had Gallbladder wall thickness < 4mm. Out of 150 patients, a total of 20 (13.3%) patients had impacted stone at the neck of the gallbladder. Among these patients undergoing LC, only 5 cases became difficult. And out of 130 patients without an impacted stone at the neck of the gallbladder, 12 cases became difficult. The difference between these two groups was statistically significant ($p = 0.038$).it is shown that further analysis of the factor impacted stone at the neck of gallbladder revealed that as a predictor of difficult LC, it had a sensitivity of 76.5%, specificity of 94%. The positive predictive value (PPV) and negative predictive value (NPV) of this factor were 61.9% and 96.9% respectively.

Conclusion: Based on these findings we can ascertain the risk of difficult LC preoperatively and counseling the patient on the high likelihood of conversion to OC thereby allowing him or her to remain mentally prepared for morbidities resulting from the open conversion, to prepare for the necessary equipment and staffs should the surgeon encounter complications in LC, to predict the approximate total duration of the surgery to plan the schedule of operations in a given day in an institution where time is an important factor for the next surgery, to

formulate certain surgical methods or techniques and also to recommend designs of new instruments to help tackle particular intraoperative complications laparoscopically in future, providing a chance of avoiding conversion

Keywords: Cholecystectomy, gallbladder disease, laparoscopy, predictive value, ultrasonography

Introduction

The laparoscopic cholecystectomy offers a lot of advantages over open cholecystectomy like the earlier return of bowel function, less postoperative pain, improved cosmesis, shorter length of hospital stay, earlier return to full activity, and decreased overall cost.[1] With the advantages observed, it became evident that the laparoscopic approach led to an increased rate of cholecystectomies with lower clinical thresholds for operative therapy of gallstones.[2]Indeed, laparoscopic cholecystectomy as a mature model of therapy at present has introduced the general surgical world to the revolutionary advantages and unique perspectives and concerns of minimal access surgery.Indications oflaparoscopiccholecystectomy are symptomatic cholelithiasis (Biliary colic, Acute cholecystitis, Gallstone pancreatitis), asymptomatic cholelithiasis (Sickle cell disease,total parenteral nutrition,chronic immunosuppression,no immediate access to health care facilities, incidental cholecystectomy for patients undergoing a procedure for other indications,acalculous cholecystitis (biliary dyskinesia), gallbladder polyps >1 cm in diameter, porcelain gallbladder.[3]Contraindications to laparoscopic cholecystectomyare unable to tolerate general anesthesia, refractory coagulopathy,suspicion of gallbladder carcinoma, and relative contraindications like cholangitis, diffuse peritonitis,cirrhosis and/or portal hypertension, chronic obstructive pulmonary disease, cholecystoenteric fistula, morbid obesity, pregnancy.[4] The technique of LC requires a profound knowledge of biliary anatomy and its anomalies as well as general abdominal anatomy. The surgeon should be well-versed with the use of laparoscopic instruments and obtain enough dexterity in handling those instruments. It is the expertise that a surgeon should strive hard to achieve to tackle the intraoperative complications which may result. [5] The classic biliary anatomy is found in only 30% of the population necessitating a good knowledge of the anomalies in preventing untoward accidents in operative steps.Anomalies of the cystic duct are varied and may pose difficulty in surgery. These can bethe low junction between the cystic duct and common hepatic duct, cystic duct adherent to the common hepatic duct,the high junction between the cystic and the common hepatic duct, cystic duct drains into the right hepatic duct, the long cystic duct that joins common hepatic duct behind the duodenum, absence of cystic duct, cystic duct crosses posterior to common hepatic duct and joins it anteriorly, cystic duct courses anterior to common hepatic duct and joins it posteriorly.[6]Anomalies of the hepatic artery and the cystic artery are also quite common, occurring in as many as 50% of cases.[7] These can be two right hepatic arteries, one arises from the common hepatic artery and the other arises from the superior mesenteric artery, right hepatic artery arises from a superior mesenteric artery, right hepatic artery coursing anterior to the common bile duct, right hepatic artery running parallel to the cystic duct or in the mesentery of the gallbladder, the cystic artery may arise from the left hepatic, common hepatic, gastroduodenal or superior mesenteric arteries.and insufflating carbon dioxide.With the closed technique,the Veress needle is inserted into the peritoneal cavity and used for insufflation. [8] Once an adequate pneumoperitoneum is established, a 10-mm trocar is then inserted through a supraumbilical incision.[9] In the open technique, the supraumbilical incision is carried through the fascia and ultimately into the peritoneal cavity and a special blunt cannula (Hasson cannula) is inserted into the peritoneal cavity and anchored to the fascia.Both techniques have their advantages and disadvantages.[10]Laparoscopic ultrasound is gaining popularity. It can repeat the examination during difficult dissections and takes less time required for completion, with lower overall cost while

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disadvantages include technical difficulties, inability to confirm the flow of bile into the duodenum, and the experience required to learn the technique of examination and image interpretation. [11,12]

Materials & Methods:

This study was conducted over 2 years from 1st September 2017 to 31st August 2019 in Jawaharlal Nehru Institute of Medical Sciences Imphal, India during which patients meeting the inclusion criteria were taken for laparoscopic cholecystectomy. A detailed proforma was developed to record information on demographics, history, physical findings, laboratory investigations, ultrasound findings, unfavourable intraoperative findings, and complications.Inclusion criteria: All patients admitted for elective LC for symptomatic cholelithiasis. Gallstone disease with a well-controlled chronic illness like diabetes, hypertension, thyroid dysfunction, asthma.3) All patients who are fit for general anaesthesia. EXCLUSION criteria: Patientswith a 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 sonographically proven choledocholithiasis or dilated common bile duct. LC did along with common bile duct exploration. LC with other interventionsin the same setting. Patients with features of acute pancreatitis.patientpreparation:Elective cases were admitted one to three days before surgery. Detailed history, findings in general and systemic examination and investigation reports were obtained from each patient. Patients taken for elective laparoscopic cholecystectomy were counseled on the surgical procedure. They were informed of the probable risk of being converted to an open procedure based on complications encountered intraoperatively. Patients willing to undergo surgery and his or her relative were required to sign in the form for consent for the procedure.

Criteria For Difficult Laparoscopic Cholecystectomy:

Intraoperative findings which were used to label difficult laparoscopic cholecystectomy in this study are 1. Prolonged operative time more than (80 min) measured from the insertion of port to create CO2 pneumoperitoneum till the removal of the last port. 2. Excessive bleeding during surgery 3. Bile leak mainly following peeling off the gallbladder from its bed or spillage of calculi to peritoneal cavity with difficulties in retrieval. 4. Dense adhesions at the triangle of calot (frozen triangle of calot prohibiting laparoscopic dissection without significant risk) 5. Chronic cholecystitis with contracted and fibrotic gallbladder. 6. Previous upper abdominal surgery with adhesions to the anterior abdominal wall.

Statistical Analysis:

Statistical testing was conducted with the statistical package for the social science system version SPSS 21. Continuous variables are presented as mean ± SD, and categorical variables are presented as absolute numbers and percentages. The comparison of normally distributed continuous variables between the groups was performed using Student's t-test. Nominal categorical data between the groups were compared using the Chi-squared test. P-value <0.05 was considered statistically significant.

Results

Table 1: Total Number Of Easy Lc And Difficult LC

Difficult Laparoscopic cholecystectomy	Frequency	Percentage
Yes	17	11.3
No	133	88.7
Total	150	100

Table :1 Out of 150 cases taken for LC, 17 (11.3%) cases were defined as difficult LC as per the predetermined criteria.The mean age of patients with difficult LC i.e. 48.76 years with a standard deviation of 12.85 was more compared to that of patients with

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easy LC which was 41.95 years with a standard deviation of 14.35.

Table 2: Comparison Between Cases With Leukocytosis (Tlc > 11,000/Mm^3) And Those Without Leukocytosis (Tlc < 11,000/Mm^3) With Difficult Lc

TLC	Difficult laparoscopic cholecystectomy				P-Value
	Yes	%	No	%	
< 11,000/mm^3	6	35.3%	102	76.7%	<0.001
> 11,000/mm^3	11	64.7%	31	23.3%	
Total	17	100%	133	100%	

Table:2 TLC was taken as a dichotomous variable as shown in Table 2. Out of 150 patients, a total of 42 (28%) patients had TLC>11,000/mm^3. Among these 42 patients undergoing LC, 11 cases became difficult. And out of 108 patients with TLC<11,000/mm^3, 6 cases became difficult. The difference between these two groups was found to be statistically significant (p <0.001).

TABLE 3: COMPARISON BETWEEN CASES WITH BMI < 30 kg/m^2 AND BMI > 30 kg/m^{2}WITH DIFFICULT LC

BMI	Difficult laparoscopic cholecystectomy				P-Value
	Yes	%	No	%	
< 30 kg/m^2	13	76.5%	117	88%	0.189
> 30 kg/m^2	4	23.5%	16	12%	
Total	17	100%	133	100%	

BMI was taken as a dichotomous variable as shown in **Table 3.** Out of 150 patients a total of 20 (13.3%) patients had BMI > 30 kg/m^2. Among these 20 patients undergoing LC, only 4 cases became difficult. And out of 130 patients with BMI < 30 kg/m^2, 13 cases became difficult. The difference between these two groups was not found to be statistically significant (p = 0.189)

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TABLE 4: COMPARISON BETWEEN CASES WITH GALLBLADDER WALL THICKNESS (<4mm) AND GALLBLADDER WALL THICKNESS (>4mm) WITH DIFFICULT LC

Gallbladder wall thickness	Difficult laparoscopic cholecystectomy				P-Value
	Yes	%	No	%	

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< 4mm	7	41.2%	109	82%	<0.001
> 4mm	10	58.8%	24	18%	
Total	17	100%	133	100%	

Gallbladder wall thickness was taken as a dichotomous variable as shown in **Table 4.** Out of 150 patients, a total of 34 (22.7%) patients had Gallbladder wall thickness > 4mm. Among these patients undergoing LC, only 10 cases became difficult. And out of 116 patients with Gallbladder wall thickness <, 4mm, 7 cases became difficult. **The difference between these two groups was found to be statistically significant (p < 0.001)**.

TABLE 5: COMPARISON BETWEEN CASES WITH AND WITHOUTIMPACTED STONE AT THE NECK OF GALLBLADDER WITH DIFFICULT LC

Impacted stone at the neck of the gallbladder	Difficult laparoscopic cholecystectomy				P-Value
	Yes	%	No	%	
No	12	70.6%	118	88.7%	0.038
Yes	5	29.4%	15	11.3%	
Total	17	100%	133	100%	

Impacted stone at the neck of the gallbladder was taken as a dichotomous variable as shown in **Table 5** Out of 150 patients a total of 20 (13.3%) patients had impacted stone at the neck of the gallbladder. Among these patients undergoing LC, only 5 cases became difficult. And out of 130 patients without an impacted stone at the neck of the gallbladder, 12 cases became difficult. **The difference between these two groups was statistically significant (p = 0.038).**

TABLE 6: COMPARISON BETWEEN CASES WITH AND WITHOUT A HISTORY OF CHOLECYSTITIS WITH DIFFICULT LC

History of Cholecystitis	Difficult laparoscopic cholecystectomy				P-Value
	Yes	%	No	%	
No	4	23.5%	125	94%	<0.001
Yes	13	76.5%	8	6%	
Total	17	100%	133	100%	

Table:6 History of cholecystitis was taken as a dichotomous variable as shown in **Table 6.** Out of 150 patients, a total of 21 (14%) patients had a history of cholecystitis. Among these patients

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undergoing LC, 13 cases became difficult. And out of 129 patients without a history of cholecystitis, 4 cases became difficult. **The difference between these two groups was found to be statistically significant ($p < 0.001$).**

TABLE 7: FREQUENCY DISTRIBUTION OF EACH CASE OF PRESENCE OF PAIRED FACTORS UNDERGOING DIFFICULT AND EASY LC

Combined factors	Difficult LC (n=17)		Easy LC (n=133)		P Value
	Frequency	%	Frequency	%	
TLC > 11,000/mm^3& Body mass index > 30 kg/m^2	3	17.6%	7	5.3%	0.054
TLC > 11,000/mm^3& Gallbladder wall thickness >4mm	9	52.9%	5	3.8%	<0.001
TLC > 11,000/mm^3& Stone impacted at the neck of gallbladder	3	17.6%	6	4.5%	0.032
TLC > 11,000/mm^3& History of cholecystitis	9	52.9%	3	2.3%	<0.001
Body mass index > 30 kg/m^2 & Gallbladder wall thickness >4mm	3	17.6%	4	3%	0.007
Body mass index > 30 kg/m^2 & Stone impacted at the neck of gallbladder	0	0%	4	3%	0.469
Body mass index > 30 kg/m^2& History of cholecystitis	3	17.6%	1	0.8%	<0.001
Gallbladder wall thickness >4mm & Stone impacted at the neck of gallbladder	1	5.9%	8	6%	0.983
Gallbladder wall thickness >4mm & History of cholecystitis	9	52.9%	5	3.8%	<0.001
Stone impacted at the neck of gallbladder & History of cholecystitis	2	11.8%	2	1.5%	0.013

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Table 7 shows the frequency distribution of each case of the presence of paired factorsundergoing difficult and easy LC. As easily seen in the table, 9 out of 14 cases with paired factors of TLC > 11,000/mm^3& Gallbladder wall thickness >4mm had difficult LC making this combination a significant predictor ($p < 0.001$). Also significant predictors were the presence of both TLC > 11,000/mm^3& Stone impacted at the neck of gallbladder ($p=0.032$) and of both TLC > 11,000/mm^3& History of cholecystitis ($p < 0.001$). 3 out of 7 cases with paired factors of Body mass index > 30 kg/m^2 & Gallbladder wall thickness >4mm had difficult LC making this combination a significant predictor ($p=0.007$). Body mass index > 30 kg/m^2& History of cholecystitis ($p < 0.001$), Gallbladder wall thickness >4mm & History of cholecystitis ($p < 0.001$) and Stone impacted at the neck of gallbladder & History of cholecystitis ($p=0.013$) were also significant combined predicting factors.Also seen in the table, there were 10 cases with the combined presence of TLC > 11,000/mm^3& Body mass index > 30 kg/m^2 out of which 3 undergone difficult LC. When compared with cases with the presence of one of the factors, the p-value was 0.054 showing that the combined presence of the 2 factors does not necessarily result in a significant prediction of difficult LC. Similarly the combined presence of Body mass index > 30 kg/m^2 & Stone impacted at the neck of the gallbladder ($p=0.469$) and Gallbladder wall thickness >4mm & Stone impacted at the neck of the gallbladder ($p=0.983$) didn't yield a significant prediction of difficult LC.

TABLE 8: SENSITIVITY, SPECIFICITY, PPV, NPV OF PAIRED FACTORS

Combined factors	SENSITIVITY (%)	SPECIFICITY (%)	PPV (%)	NPV (%)
TLC > 11,000/mm^3& Body mass index > 30 kg/m^2	17.6%	94.7%	42.86%	90%
TLC > 11,000/mm^3& Gallbladder wall thickness >4mm	52.9%	96.2%	64.29%	94.12%
TLC > 11,000/mm^3& Stone impacted at the neck of gallbladder	17.6%	95.5%	50%	90.07%
TLC > 11,000/mm^3& History of cholecystitis	52.9%	97.7%	75%	94.20%
Body mass index > 30 kg/m^2 & Gallbladder wall thickness >4mm	17.6%	97%	42.86%	90.21%
Body mass index > 30 kg/m^2 & Stone impacted at the neck of gallbladder	0%	97%	0%	88.36%

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Body mass index > 30 kg/m^2& History of cholecystitis	17.6%	99.2%	75%	90.41%
Gallbladder wall thickness >4mm & Stone impacted at the neck of the gallbladder	5.9%	94%	11.11%	88.65%
Gallbladder wall thickness >4mm & History of cholecystitis	52.9%	96.2%	64.29%	94.12%
Stone impacted at the neck of gallbladder & History of cholecystitis	11.8%	98.5%	50%	89.72%

Table :8 On further analysis, all the significant combined factors (TLC > 11,000/mm^3& Gallbladder wall thickness >4mm, TLC > 11,000/mm^3& Stone impacted at the neck of gallbladder, TLC > 11,000/mm^3& History of cholecystitis, Body mass index > 30 kg/m^2 & Gallbladder wall thickness >4mm, Body mass index > 30 kg/m^2& History of cholecystitis, Gallbladder wall thickness >4mm & History of cholecystitis, Stone impacted at the neck of gallbladder & History of cholecystitis) showed low sensitivity in predicting difficult LC although having specificity >90%

TABLE 9: FREQUENCY DISTRIBUTION OF INTRAOPERATIVE FACTORS

Intra Operative Factors	Frequency	%
Operative time > 80 minutes	17	11.3%
Excessive bleeding	12	8%
Intraoperative bile leak	6	4%
Intraoperative stone spillage	4	2.7%
Dense adhesions at Calot's triangle	13	8.7%
Contracted/Fibrotic gallbladder	9	6%
Previous abdominal surgery	-	-
Gangrenous / Emphysematous gallbladder	-	-

Table 9shows the occurrence of intraoperative factors. Dense adhesion around the Calot's triangle was the most common intraoperative finding (n=13). The next common findings were excessive bleeding

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(n=12) and contracted or fibrotic gallbladder (n=9). Intraoperative bile leak (n=6) and intraoperative stone spillage (n=4) were also found. Operative time was >80 minutes in 17 cases which constitutes 11.3% of total cases.

TABLE 10: COMPARISON OF CASES WITH THE INTRAOPERATIVE FACTORS UNDERGOING DIFFICULT LC

Intra Operative factors	Difficult LC (n=17)		Easy LC (n=133)		P value
	Frequency	%	Frequency	%	
Operative time > 80 minutes	17	100%	0	0%	<0.001
Excessive bleeding	7	41.2%	5	3.8%	<0.001
Intraoperative bile leak	5	29.4%	1	0.8%	<0.001
Intraoperative stone spillage	4	23.5%	0	0%	<0.001
Dense adhesions at Calot's triangle	11	64.7%	2	1.5%	<0.001
Contracted/Fibrotic gallbladder	3	17.6%	6	4.5%	<0.001
Previous abdominal surgery	0	0.0%	0	0.0%	-
Gangrenous / Emphysematous gallbladder	0	0.0%	0	0.0%	-

Table 16 shows the percentage of difficult LC in which the intraoperative factors were found. Out of 13 cases of dense adhesions, 11 cases were difficult and thus 64.7% of difficult LC occurred in event of the occurrence of dense adhesion. Out of 12 cases with excessive bleeding, 5 cases were not difficult. Intraoperative bile leak occurred in 6 patients leading to difficult LC in 5 of them. Intraoperative stone spillage was very difficult to manipulate during LC and all the cases became difficult when it happened. The contracted or fibrotic gallbladder was present in 9 cases, out of which 3 were difficult LC. There was no history of previous abdominal surgery in any of the study population. The gangrenous or emphysematous gallbladder was not found in any patients during our study period. The significance of each of these intraoperative factors was tested. All the factors had a p-value <0.001 and were significant.

Discussion

Laparoscopic cholecystectomy has become the typical surgery for treatment of symptomatic cholelithiasis as a type of minimal invasiveness surgery associated with less pain and early recovery as there is minimal trauma, ease of access without shrinking the exposure of the operative field it has the advantage of better exposure and a better view. Since 1989, cholecystectomy by laparoscopic surgery had been the standard surgery in the treatment of symptomatic gall stones but some of the scheduled LC needs conversion due to numerous factors.[13] Sometimes LC becomes difficult and takes more time

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than expected to complete the surgery even there is bile or spillage of stone and sometimes it requires conversion to open cholecystectomy to safely finish the operation.[14] The grade of difficulties is difficult to expect but it is important to be estimated for both the surgeon to be ready to deal with a difficult case and the patient to be informed about the possibility of conversion and get an adequate explanation. It's worthy to have dependable prognostic factors for alteration or obstacles in Lap cholecystectomy. Patients can then be designated for ambulatory surgery or admission, and cases with high risk can be advised of high chances of conversion and potential complications. [15] The preparation of the operating team to perform operative cholangiograms or to change to OC if the need arises and the cost of the operation can be estimated more clearly.BMI was also analyzed as dichotomous variable (value <30 kg/m2 and > 30 kg/m2). [16] In the total of 20 patients with BMI > 30 kg/m2 difficulty was there in only 4 patients. The p-value was calculated and the value was 0.189.Thus, it is statistically proved that BMI > 30 kg/m2as a predictor of difficult LC is not significantly similar to the study by Soper Net alwhere BMI was not a significant predictor (p=0.347).BMI > 30 kg/m2 as a predictor had a sensitivity of 23.5% and specificity of 88%. It had an NPV of 90%.Similarly, analysis of gallbladder wall thickness as a dichotomous variable (value >4 mm and <4 mm) shows that a total of 10 difficult LC cases were encountered out of 34 patients with gallbladder wall thickness >4 mm. And in 116 cases with gallbladder wall thickness <4 mm, 7 cases were difficult.[17]Escarceet alalso conclude that gallbladder wall thickness as a factor that predicts difficult LC (p=0.01) and sensitivity, specificity, PPV, and NPV were 38.88%, 94.44%, 75%, 78.28% which is comparable to our study. Impacted stone at the neck of the gallbladder was also analyzed asa dichotomous variable (present and absent). Difficult LC was encountered in a total of 5 patients out of 20 cases with impacted stone at the neck of the gallbladder. In 130 cases without an impacted stone at the neck of the gallbladderundergoing LC, 12 patients had difficult LC. The difference was significant (p = 0.038). Thus, in this study,impacted stone at the neck of the gallbladder as determined by preoperative ultrasound reliably predicts the difficult LC. It had a sensitivity of 29.4% and a specificity of 88.7%. PPV was only 25% and NPV was 90.77% [18].Taking the presence of 2 factors as one-factor significance was tested in the event of difficult LC. The combination of two variables didn't always result in a greater risk of difficulty compared to cases with only one factor. As such out of 10 combinations, 7 were found to be significant–TLC > 11,000/mm3& Gallbladder wall thickness >4mm (p < 0.001)TLC > 11,000/mm3& Stone impacted at the neck of gallbladder (p=0.032).TLC > 11,000/mm3& History of cholecystitis (p < 0.001).Body mass index > 30 kg/m2 & Gallbladder wall thickness >4mm (p=0.007).[19]Body mass index > 30 kg/m2& History of cholecystitis (p < 0.001).Gallbladder wall thickness >4mm & History of cholecystitis (p < 0.001).Stone impacted at the neck of gallbladder & History of cholecystitis (p=0.013).Thus the presence of these combined factors can be used as a predictor for difficult LC. The significance of the combined presence of all five factors taken in the study could not be tested as the combined presence of these variables was not found in any of the 100 cases. Thus, due to the shortage of such cases with the presence of combined factors, a test of significance was inconclusive. [20] Lastly,an assessment of the intraoperative complications was also done. These intraoperative factors were recorded in the data form of patients.Dense adhesion around the Calot's triangle was the most common intraoperative finding (n=13). The next common findings were excessive bleeding (n=12) and contracted or fibrotic gallbladder (n=9). Intraoperative bile leak (n=6) and intraoperative stone spillage (n=4) were also found. [21] There was no mortality in the study resulting from the difficulty or due to other causes. As in any statistical analysis, this prospective study also suffered from few limitations. The sample size was small and the duration of the study was short. As a result, patients with varied indications of LC were absent in the study [22].

Conclusion

In conclusion, this prospective observational study done in our hospital for two years achieved its aim of testing the role of the 5 factors in predicting difficult laparoscopic cholecystectomy. Four out of the five preoperative factors (History of cholecystitis, Total Leukocyte Count > 11,000/mm3, Gallbladder wall thickness >4mm, Stone impacted at the neck of the gallbladder) studied were able to significantly predict

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the difficulty. Also, with further analysis of combined factors as a preoperative predictor, few of these combined presences of factors were able to providea more significant prediction of difficult LC. Based on these findings we can ascertain the risk of difficult LC preoperatively and counseling the patient on the high likelihood of conversion to OC thereby allowing him or her to remain mentally prepared for morbidities resulting from the open conversion, to prepare for the necessary equipment and staff should the surgeon encounter complications in LC, to predict the approximate total duration of the surgery to plan the schedule of operations in a given day in an institution where time is an important factor for the next surgery, to formulate certain surgical methods or techniques and also to recommend designs of new instruments to help tackle particular intraoperative complications laparoscopically in future, providing a chance of avoiding conversion.

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