ORIGINAL ARTICLE

Assessment of Risk Factors for Conversion from Difficult Laparoscopic to Open Cholecystectomy - A Hospital Based Prospective Study

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Abstract:

Background: Laparoscopic cholecystectomy is the gold standard in the treatment of gallstones. It has proved to be an effective and safe procedure both in elective and emergency conditions; however, conversion to open surgery is inevitable in some cases. Hence the present study was carried out to identify various factors which can predict the difficult laparoscopic cholecystectomy so that an early conversion to open cholecystectomy can be considered. *Material and Methods:* A prospective study was conducted from 1st February 2011 to 31st January 2012 that included 63 patients of all age groups and both sexes who were found to have symptomatic gallstones and were scheduled for laparoscopic cholecystectomy at Nepalgunj Medical College and Teaching Hospital, Nepal. Age, sex, body mass index, previous abdominal surgery and past history of acute attack of cholecystitis of the patients were recorded. A pre-operative ultrasound was performed just prior to surgery, and three ultrasonographic parameters were analyzed, namely gall bladder wall thickness, number of stones and stone impacted in Hartmann's pouch. Intra-operative causes for difficult laparoscopic cholecystectomy like adhesions in Calot's triangle and gall bladder perforation with bile leak were also evaluated. *Results:* Total number of patients in this study was 63; out of which difficult laparoscopic cholecystectomy was seen in 25(39.7) patients and 7(11.1) patients required conversion to open cholecystectomy. Ultrasonography was good at predicting difficulty in each component with exception of gall bladder wall thickness which was not statistically significant. *Conclusion:* BMI, ultrasonographic finding of presence of multiple stone or stones impacted in Hartmann's pouch, adhesion in Calot's triangle and gall bladder perforations are predictors of difficult laparoscopic cholecystectomy.

Keywords: Cholecystectomy, Conversion, Difficult cholecystectomy, Laparoscopy, Ultrasonography.

Introduction:

Mouret performed the first laparoscopic cholecystectomy (LC) in 1987 [1]. It has rapidly replaced open cholecystectomy (OC) as the standard treatment of symptomatic uncomplicated gallstone disease [2]. Less post-operative pain, early oral intake after surgery, shorter hospital stay, early resumption of normal activities and improved cosmesis have been well recognized advantages of LC [3, 4]. Thus performance of LC enables hospitals to treat more patients of gall stone disease at a lower cost with better patient satisfaction as compared to OC [1]. However LC may be rendered difficult by various problems encountered during surgery, such as in accessing the peritoneal cavity, creating pneumoperitoneum, dissecting the gall bladder (GB) from its bed or extracting the excised GB [5]. Age, sex, obesity, duration of gallstone disease, number of attacks of cholecystitis, previous abdominal surgery and liver function tests with elevated alkaline phosphatase have been considered as factors responsible for difficult LC. Similarly, intra-operative findings like adhesions, diseases

of liver, abnormal anatomy of GB and biliary tract, complication during dissection like bleeding, bile duct injury, GB perforation, stone loss and also visceral injury may render laparoscopic surgery difficult. Hence in 2% to 15% of patients LC is converted to OC because of technical difficulty or intra-operative complications [6, 7].

Therefore pre-operative prediction of difficult laparoscopy is an important aspect of planning LC. Identification of risk factors helps to predict the risk of conversion for selected patients, prepare the patient psychologically for surgery, arrange operating schedule accordingly, minimize the procedure related cost and help overcome financial constraints which is an important aspect in developing country [1]. While most of the previous studies in the literature were retrospective and evaluated various risk factors in terms of conversion to OC, our is a prospective study analyzing these risk factors as pre-operative predictors on clinical evaluation and ultra-sonographic parameters. Additional objectives of our analysis included correlating these predictors with operative findings and surgical outcomes.

Material and Methods:

The present study was a hospital-based interventional study conducted in the Department of Surgery and Department of Radio-diagnosis, Nepalgunj Medical College and Teaching Hospital, Kohalpur, Nepal from 1st February 2011 to 31st January 2012. The study was approved by the institutional review board. A total of 63 patients of all age group and both sexes who were found to have symptomatic gallstones and were scheduled for laparoscopic cholecystectomy were included in the study. Patients with the following criteria were excluded from this study: (i) associated chronic diseases like diabetes mellitus, significant cardiac, renal or pulmonary diseases; (ii) hepato-biliary malignancies; (iii) positive history of pregnancy; and (iv) presence of acute cholecystitis, choledocholithiasis or portal hypertension.

A detailed history was taken and thorough clinical examinations of all the patients were performed. Information about age, sex and body mass index (BMI) of the patients; previous abdominal surgery and past history of acute attack of cholecystitis; ultrasonographic findings was noted. Pre-operative ultrasonography was performed on the morning of the surgery. Three ultrasonographic parameters were studied, namely GB wall thickness (more than 3mm thick GB wall thickness was predicted to be a difficult laparoscopic cholecystectomy); number of stones ≥ 2 and stone impacted in Hartmann's pouch; and intra-operative causes for the conversion of LC to OC namely: Adhesions in Calot's triangle and gall bladder perforation with bile leak were evaluated.

All routine investigations including liver function test and coagulation profile were done. The selected patients were then told about the procedure and written informed consent was taken. Patients were also informed about the conversion to OC.

Operative Procedure

Patients underwent LC by the same surgical team that was blinded to the results of the pre-operative ultrasonography. LC was performed by trained general surgeons under supervision. Difficulties were assessed in terms of age, sex, BMI, number of attacks of acute cholecystitis, GB wall thickness, number of GB stones, biliary anatomy, adhesions, unclear Calot's anatomy and bleeding or perforation during peeling off GB from the bed. Time was not considered as a factor to define difficult surgery.

Statistical Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS version 19). A value of $p<0.05$ was considered statistically significant derived by Chi-square test.

Results:

The study was conducted in a total of 63 patients.

(a) Age distribution

Age of patient ranged from 20 to 69 years with mean age of 37.76±11.88 years. Fifty one (81%) patients were <50 years of age out of which 21 (41.2%) patients had difficult LC and 5 (9.8%) patients required conversion. Twelve (19%) patients were >50 years of age and difficult LC was seen in 4 (33.3%) patients with 2 (16.7) patients requiring conversion. This was statistically insignificant (p=0.864) (Fig. 1a, 1b and 1c).

(b) Gender distribution

There were 53 (84.1) female and 10 (15.9) male patients, with female: male ratio 5.3:1. Out of 53 female, difficult LC was encountered in 22 patients (41.5) and only 7 (13.2) patients required

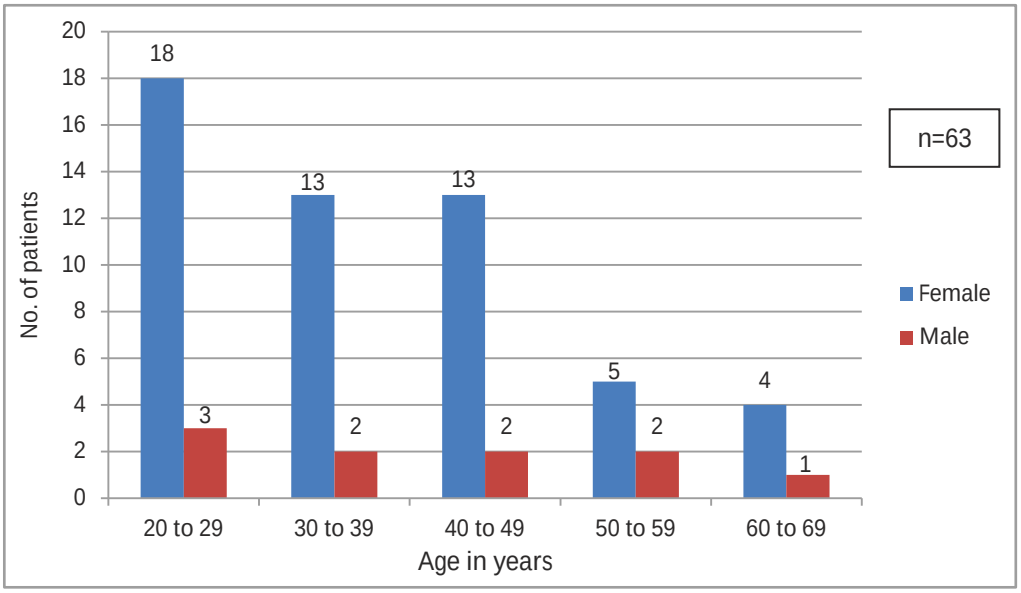

Fig.1a: Age-distribution of Patients

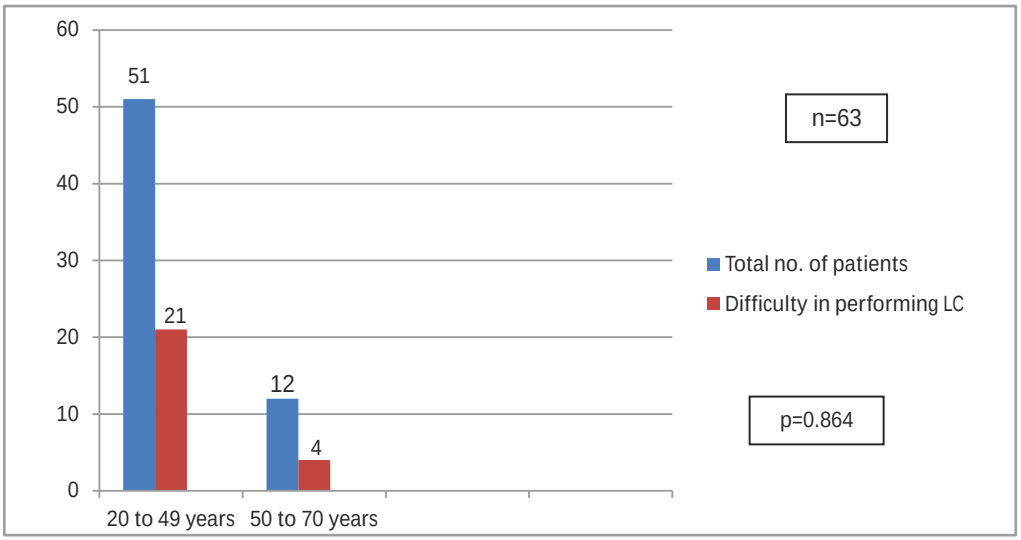

Fig. 1b: Age-wise Distribution of Difficult Cholecystectomy

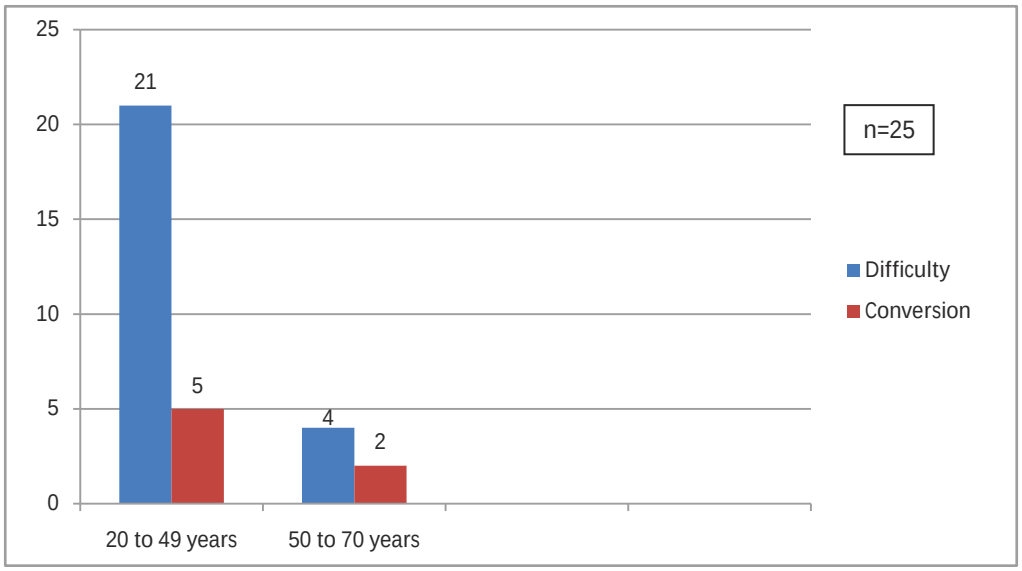

Fig. 1c: Age-wise Distribution of Difficult and Open Cholecystectomy

conversion. Out of 10 male patients, difficulty was seen in patients 3 (30), however no patients required conversion. Thus the incidence of difficult cholecystectomy was more in female as compared to male, being 41.5% and 30% respectively. It was not statistically significant (Table 1).

Table 1: Gender Distribution and Relationship with Difficult Cholecystectomy

Gender	Difficulty	Conversion
Male (n=10)	3 (30%)	0 (0%)
Female (n=53)	22 (41.5%)	7 (13.2%)

(c) BMI findings

BMI of patient was assessed as shown in Table 2a. BMI in this study group ranged from 15.60 to 28 kg/m^2 with mean of 22.07±2.87. Out of 63 patients, 53 (84%) had normal BMI of 25 kg/m^2. In this group there were 18 (34%) patients with difficult LC, out of which only 4 (7.6%) patients required conversions. BMI of 25.1 to 30 kg/m^2 was seen in 10 (16%) patients where 7 (70%) patients had difficulty LC and 3 (30%) patients required conversion. There was no case with BMI ≥30.1 kg/m^2 in this study. These findings were statistically significant (p-value=0.033 and 0.038 respectively) (Table 2).

Table 2: Relationship between BMI, Difficult LC and Conversion to OC

BMI (kg/m2)	Difficulty LC		Total (%)	p value	Conversion to OC		Total (%)	p value
	Yes (%)	No (%)			Yes (%)	No (%)		
Normal weight (18.1-25)	18 (34)	35 (66)	53 (84)	0.033	4 (7.6)	49 (92.4)	53 (100)	0.038
Over weight (25.1-30)	7 (70)	3 (30)	10 (16)		3 (30)	7 (70)	10 (100)	
Obese (≥30.1)	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	0(0)	
Total	25 (39.70)	38 60.30)	63 (100)		7 (11.2)	56 (88.8)	63 (100)	

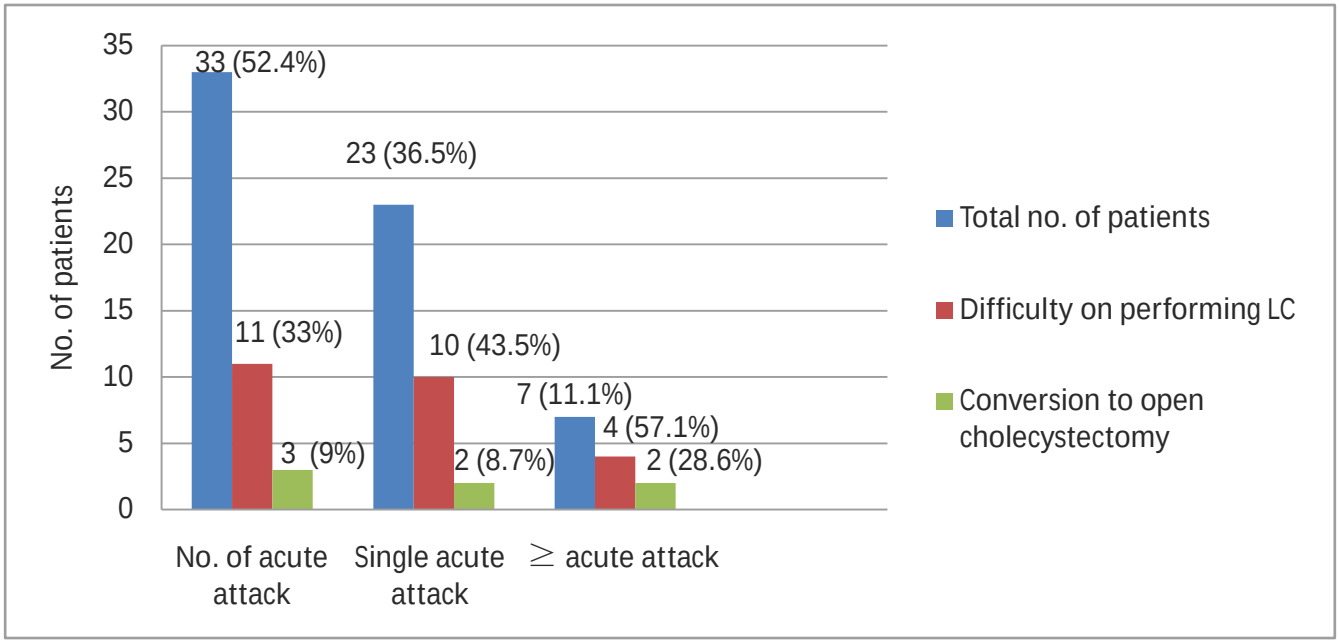

Fig. 2: Relationship between Number of Attack of Acute Cholecystitis, Difficult LC and Conversion to OC

(d) Number of attacks of acute cholecystitis

Out of 63 patients, there was no history of acute cholecystitis in 33 (52.4%) patients. In this group difficult LC were encountered in 11 (33%) patients and 3 (9%) patients required the conversion. Single attack of acute cholecystitis was seen in 23 (36.5%) patients and out of which 10 (43.5%) patients had difficult LC and 2 (8.7%) patients required conversion. Two or more attacks of acute cholecystitis were seen in 7 (11.1%) patients with 4 (57.1%) patients having difficulty LC and in 2 (28.6%) patients, conversion was done. (Fig. 2)

(e) GB wall thickness

There were 19 (30.2%) patients with GB wall thickness ≥3mm. Among them 10 (52.6%) patients had difficulty during the procedure and 5 (26.3%) patients required conversion to OC. Rest of the 44 (69.8%) patients had GB wall thickness <3mm, out of which 15 (34%) patients had difficult LC and 2 (4.5%) patients required conversion to OC.

(f) Number of GB stones

Multiple stones were found in 47 (74.6%) patients and 19 (40.4%) patients had difficult LC and 6 (12.8%) patients required conversion. Single stone was seen in 16 (25.4%) patients and 6 (37.5%) patients had difficulty during the procedure, while only 1 (6.3%) patient had to be converted to OC. We also encountered stone impacted at Hartmann's pouch in 10 (15.8%) patients out of which difficulty during the procedure was found in 7 (70%) patients and 2 (20%) patients were converted to OC.

GB wall thickness, number of stones and stone in Hartman's pouch were the parameters based on which prediction of difficulty in performing LC was made. Ultrasonography was good at

Table 3a: Relationship between Risk Factor with Relative Risk (RR) for Difficult LC and RR for Conversion to OC

Risk Factor	Exposure Number %	RR for Difficult LC	CI	RR for Conversion to OC	CI
Age ≥50	12	0.8095	0.3409-1.923	1.7	0.3737-7.733
Sex Female	53	1.3836	0.5093-3.759	-	-
BMI ≥25	10	2.0611	1.086-3.583*	3.975	1.045-15.121*
Presence of acute attack	30	1.4	0.7562-2.592	1.3333	0.3258-5.457
GB wall thickness ≥ 3mm	19	1.5439	0.8538-2.792	5.7895	1.230-27.261*
No of gall stones ≥ 2	47	1.078	0.5238-2.218	2.0426	0.2656-15.710
Stones in Hartmans pouch	10	2.0611	1.186-3.583*	2.12	0.4756-9.449
Difficulty predicted by USG	12	2.3906	1.420-4.026*	5.6667	1.456-22.052*
Biliary Anatomy	6	2.375	1.436-3.927*	1.5833	0.2268-11.053
Short cystic duct	5	2.2095	1.267-3.852*	15.4667	4.723-50.646*
Intraoperative causes	14	2.75	1.634-4.628*	0.5833	0.07642-4.453

**-Significant*

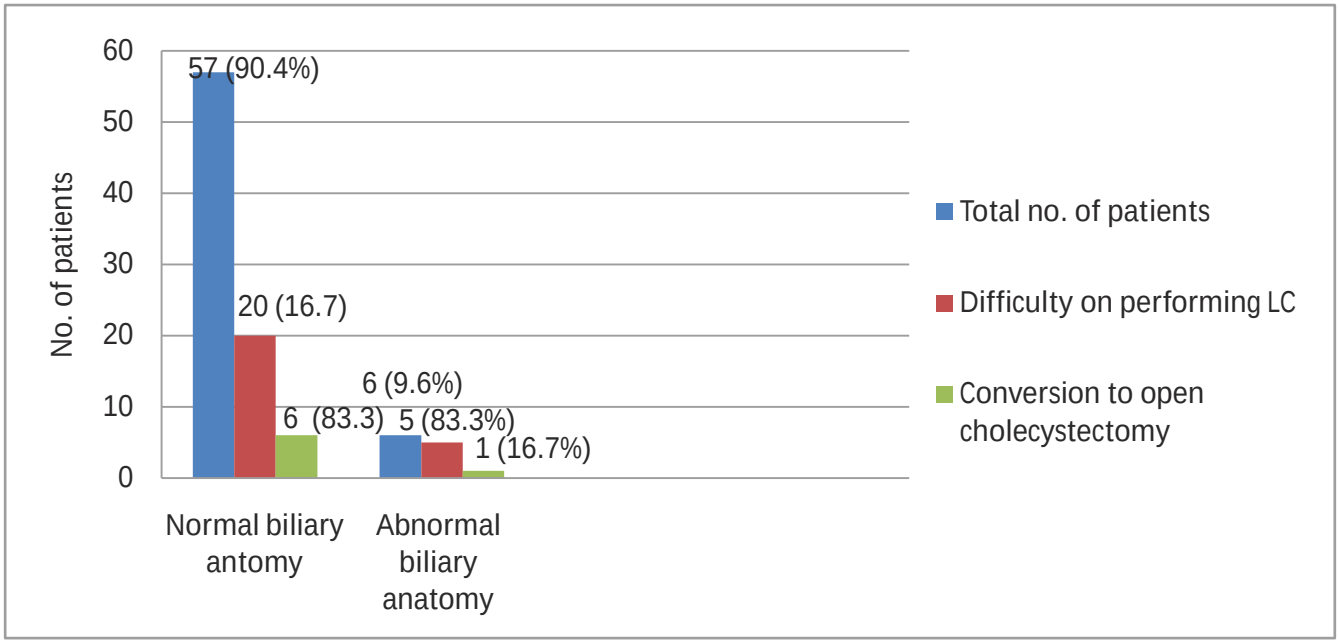

Fig. 3: Relationship of Biliary Anatomy, Difficult LC and Conversion to OC

predicting difficulty in each component with exception of wall thickness which was not statistically significant. Relationship between Risk Factor with Relative Risk (RR) for Difficult LC and RR for Conversion to OC shown in Table 3a.

Thus ultrasonographic findings revealed that out of 63 patients, 12 (19%) patients had difficult cholecystectomy. Among them 9 (75%) patients had difficulty during the procedure and 4 (33.3%) patients underwent conversion to open procedure. Fifty-one (81%) patients were predicted as easy cholecystectomy, 16 (31.4%) patients had difficult LC and 3 (5.9%) patients had conversion to OC. This was statistically significant (p=0.001) (Table 3b).

(g) Biliary anatomy

Abnormality of biliary anatomy including cystic duct anatomy was predictor of difficult LC. Out of 63 patients, 6 (9.6%) patients had abnormal biliary anatomy, 5 (83.3%) patients had difficulty

Table 3b: Predictive Value of Ultrasonography on Observations

GB wall thickness (n=63)	Difficult LC		Conversion to OC	
	Yes (%)	No (%)	Yes (%)	No (%)
<3mm (n=44)	15 (34)	29 (66)	2 (4.5)	42 (95.5)
≥3mm (n=19)	10 (52.6)	9 (47.4)	5 (26.3)	14 (73.7)
p-value	0.167		0.012	
No. of GB stones				
Single (n=16)	6 (37.5)	10 (62.5)	1 (6.3)	15 (93.7)
Multiple (n=47)	19 (40.4)	28 (59.6)	6 (12.8)	41 (87.2)
p-value	0.0001		0.0001	
Stone in Hartman's pouch				
Present (n=10)	7 (70)	3 (30)	2 (20)	8 (80)
Absent (n=53)	18 (34)	35 (66)	5 (9.4)	48 (90.6)
p-value	0.0001		0.0001	
Overall difficulty prediction with USG				
Difficult LC (n=12)	9 (75)	3 (25)	4 (33.3)	8 (66.7)
Easy LC (n=51)	16 (31.4)	35 (69.6)	3 (5.9)	48 (94.1)
p-value	0.0001		0.0001	

during procedure and among them 1 (16.7%) patient was converted to OC. Though more patients with conversion were in patients with normal anatomy, the ratio of conversion was more in abnormal anatomy group of 1:5 as compared to 1:8.5 in normal anatomy group. Fig.3.

(h) Length of cystic duct

Out of 63 patients, normal length of cystic duct was seen in 54 (85.7%) patients, long duct in 4 (6.4%) patients and short duct was present in 5 (8%) patients. In normal cystic duct group, 21 (38.9%) patients out of 54, and in short cystic duct group, 4 (80%) out of 5 patients had difficult LC whereas no patient with long cystic duct had any difficulty in LC. In short cystic duct group all 4 patients with difficult LC had conversion, while 3 patients out of 21 in normal cystic duct had conversion OC. (Fig. 4a and b)

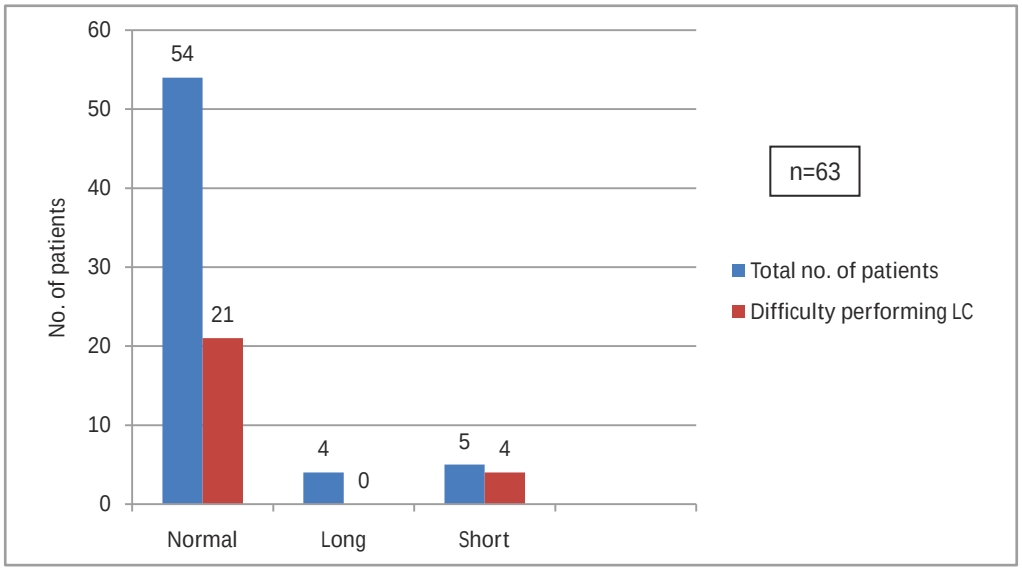

Fig. 4a: Relationship of Cystic Duct Anomalies and Difficult LC

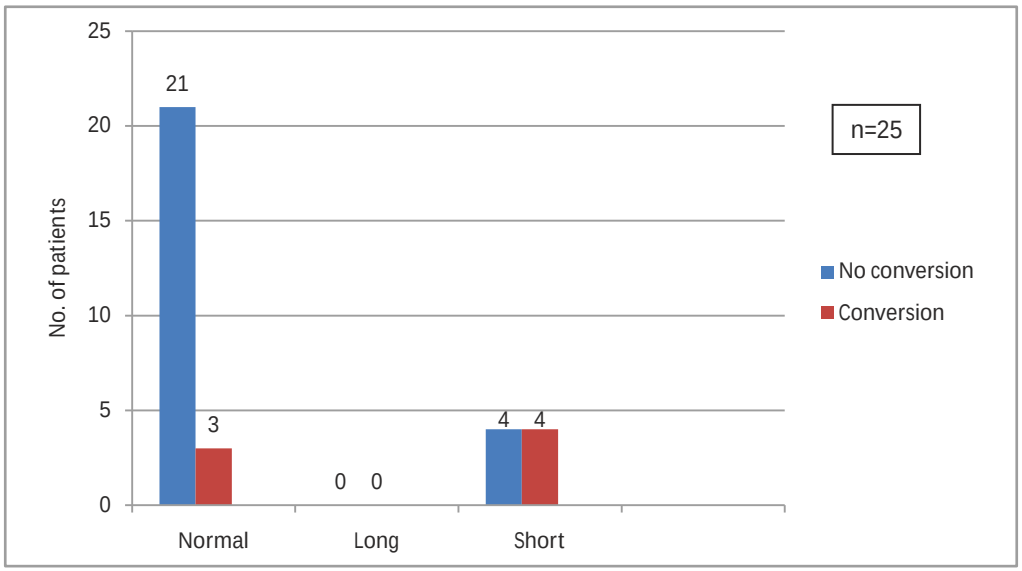

Fig. 4b: Relationship of Anomalies of Cystic Duct with Conversion

(I) Intra-operative causes for difficult LC

Adhesions in Calot's triangle was present in 8 (12.7%) patients out of 63 patients, where difficult LC was encountered in 5 (62.5%) patients and only 1 (12.5%) patient was converted to OC whereas in the group where adhesion was absent, 20 (36.4%) patients out of 55 patients had difficult LC and 6 (11%) patients had conversion. GB perforation with bile leak occurred in 4 patients while 2 patients had dropped stones. Even though all the 6 patients had difficult LC, none of them were converted to OC (Table 4a and b).

(j) Conversion to open cholecystectomy

Total number of patients in this study was 63 out of which difficult LC was seen in 25 (39.7%) patients and 7 (11.1%) patients required conversion to OC.

Discussion:

Evident benefits of LC such as reduction in post-operative disability, cosmesis and early return to work have rendered it the procedure of choice for symptomatic cholelithiasis. With more frequent application of the procedure, it is expected that greater number of procedure would be difficult and might have to be converted to open cholecystectomy [6]. The chance of unwanted "surprise" waiting for surgeon during LC, such as dense adhesions and aberrant anatomy, are the same as those encountered during OC. However, conversion to open procedure is inevitable in some case of LC when surgeon faces difficulty. If there is benefit of reliable preoperative predictive factors, difficulty during procedure and chance of

Table 4a: Adhesion and Difficult LC and Conversion to OC

Adhesion (n=63)	Difficult LC		Conversion to OC	
	Yes (%)	No (%)	Yes (%)	No (%)
Absent (n=55)	20 (36.4)	35 (63.6)	6 (11)	49 (89)
Present (n=8)	5 (62.5)	3 (37.5)	1 (12.5)	7 (87.5)
p-value	0.305		1.00	

Table 4b: GB Perforation and Difficult LC and Conversion to OC

GB perforation	Difficult LC		Conversion to OC	
	Yes (%)	No (%)	Yes (%)	No (%)
No perforation	19 (33.3)	38 (66.7)	7 (12.3)	50 (87.7)
Bile leak only	4 (100)	0 (0)	0 (0)	4 (100)
Dropped stone	2 (100)	0 (0)	0 (0)	2 (100)
p-value	0.006		0.661	

conversion can be estimated and patient can be informed of these possibilities and can be mentally prepared [4].

While most of the previous studies in the literature were retrospective and evaluated various risk factors in terms of conversion to OC, our is a prospective study analyzing these risk factors as pre-operative predictors on clinical evaluation and ultrasonographic parameters. In the present study, a total of 63 patients were included and various variable analysed for difficult LC were age, sex, BMI, attacks of cholecystitis, ultrasonographic finding including thickness of GB, size and number of stones in GB and adhesions encountered during surgery.

Many researchers have found age >60 years as predictor of difficult cholecystectomy [6, 8]. Kama *et al* [6] reviewed 1000 patients of cholelithiasis and found that 41.7% patients were >60 years of age and had conversion rate of 7% as compared to 3.9% in patients <60 years of age. Most of the patients (51(81) patients) in the present study were <50 years and only 12(19) patients were >50 years of age. Difficult LC was seen in 4 (33.3%) patients and conversion rate was 16.7% in patients >50 years of age as compared to 9.8% in patients <50 years of age. Many authors have suggested that the reason for older age being at risk is due to a longer history of gallstones and increased number of acute attacks of cholecystitis. Besides, elderly patients have a higher likelihood of complicated biliary pathology [9-11].

Many investigators have reported higher incidence of difficult LC and higher conversion rate in male patients [6, 12-13]. Kama *et al* [6] reported incidence of conversion in 32% male and 11.2% female. Similar results were reported by Nachnani *et al* [12] and Lipman *et al* [14]. However Kumar *et al* [7], Liu *et al* [8] and Rosen *et al* [15]did not find significant difference in conversion rate in either sex which ranged from 10.41 to 41% in male as compared to 7.18 to 59% in female. No convincing explanation has been put forward for difficulty in LC in male by those who reported higher incidence of conversion in male as compared to female. However Kama *et al* suggested that male patients had more intense inflammation or fibrosis resulting in more difficult dissection both in Calot's triangle and through the plane between GB and liver, when compared with female patients with similar history [6]. The finding of present study revealed higher incidence of difficult LC in female patients (41.5%) as compared to the male patients (30%). Also the conversion was not required in any male patients but 7 patients out of 53 females required conversions. This may be explained by the fact that sample size of male patients was small in the present study.

Many researchers have reported higher conversion rate with difficult LC in obese patients [8, 12, 16-17]. Liu *et al* reported 25% of conversion in patients with morbid obesity, whereas Nachnani *et al* noticed BMI >30 kg/m^2 as significant predictor of difficult cholecystectomy [8, 12]. However in our study there were no patients with BMI ≥30 kg/m^2. Most of the patients (84%) in the present study had BMI between 18-25 kg/m^2 and 18(34) patients of these had difficult cholecystectomy, and 4(7.6) patients required conversion. Thus overweight patients i.e. BMI >25 kg/m^2 is a predictor of difficult LC. However, studies conducted by Alponat *et al* and Kama *et al* did not reveal higher conversion rate in obese patients. The criterion taken for obesity in their study was body weight ≥80 kg. Patient were considered as non-obese with weight <80 kg. This may be the reason for the discrepancy in their result as compared to other workers who based obesity upon BMI [4, 6].

Kumar *et al* while reviewing 512 patients undergoing LC reported that 150 (35.15) patients had previous history of acute cholecystitis. The conversion rate was 15.6% as compared to 3.6% in group without previous attack of cholecystitis [15]. Similarly, Tayeb *et al* [18] observed conversion rate with past history of cholecystitis as 8.2% as compared to 4.1% in patients without history of cholecystitis. In the present study, out of 63 patients, 30 patients had history of previous attack of cholecystitis and difficult LC was encountered in 46.7% patients. The conversion to OC was required in 13.3% patients. Among the patients with ≥2 attacks of acute cholecystitis in past, 7(57.1) patients had difficult LC, whereas conversion to open procedure was required in 28.6% patients. This observation is consistent with those reported in literature indicating that past history of cholecystitis is a predictor for difficult LC.

The relationship between number of attack of cholecystitis and difficulty encountered during surgery is more specific. In the previous studies the difficulty during LC and conversion rate was found to be less in patients with one attack of cholecystitis as compare to those who had two or more attacks. Out of 63 patients in present series, single attack of cholecystitis was seen in 23(36.5) patients, out of which 10 (43.5) patients had difficult LC and 2(8.7) patients required conversion, as compared to 7 (11.1) patients who had more than one attack and difficulty was encountered in 4 (57.1) patients and 2 (28.67) patients required conversion. Thus past history of cholecystitis and number of attack of cholecystitis is significant predictors of difficult LC.

Dense adhesion and oedematous or friable GB were the main causes of difficult LC as reported in the past. Alponat et al observed that oedematous inflamed GB made exposure of Calot's triangle poor. Another problem interfering with good exposure was highly vascular adhesions present in this area [4]. Many investigators have reported that thick-walled GB was strongly associated with higher conversion rate during LC [7-8, 12, 19]. Minimal GB wall thickness beyond which there is increased incidence of conversion was reported to be 4mm, by Kumar *et al* and others [7, 15]. However Kama *et al* [6] considered GB wall thickness of 3mm as significant. The reported incidence of conversion rate varies from 29.4% by Kumar *et al* [15], 30.8% by Kama *et al* [6] and 32.8% by Rosen *et al* [7]. Slightly lower incidence reported by Kumar *et al* [15] can be explained as these workers considered 4mm thickness as compared to others who considered 3mm thickness as significant [6, 11, 15]. In our study, out of 63 patients, 19 (30.2) patients had evidence of GB wall thickness ≥ 3mm, out of which 10 (52.6) patients had difficulty during procedure and 5 (26.3) patients were converted to OC. This finding is in agreement with those reported in literature by various authors. The conversion rate in series of Liu *et al* was reported to be 13.1% in thick walled GB as compared to 7.2% in normal GB; however, they considered GB wall thickness as 4mm as significant [8].

There are conflicting reports between number of stones and conversion rate. According to Kumar *et al* [15], single stone has more chances of conversion than those with multiple, incidence being 13.3% and 5.2% respectively. However subsequent studies by Gabriel *et al* [20] reported higher incidence of conversion in multiple stones as compared to single stone. In the present study, 47 (74.6) patients had multiple stones, where difficulty during LC was encountered in 19 (40.4) patients while conversion rate was 12.8% as compared to 6.3% in patients with single stones. These results are comparable to others [18, 20].

Jansen *et al* reported size of stone >20mm and those impacted at Hartmann's pouch were associated with difficult LC [21]. We also encountered stone impacted at Hartmann's pouch in 10(15.8) patients out of which difficulty during the procedure was found in 7(70) patients and 2(20) patients were converted to OC. Impacted stones at Hartmann's pouch makes dissection difficult because of difficulty in holding GB at Hartmann's pouch.

Adhesion in Calot's triangle results in disturbed anatomy of the area where difficulty occurs in identifying the cystic artery and cystic duct. Various authors have reported incidence of 27.9% to 78.9% conversion rate in presence of adhesions in Calot's triangle and inability to identify anatomy correctly [20, 22-23]. In the present study there were 8(12.7) patients where adhesions were present in Calot's triangle. Out of these, 5 (62.5) patients had difficult LC but conversion to OC was required only in 1(12.5) patients. The lower rate of conversion in this study may be due to the fact that most patients belonged to young age group and had single attack of cholecystitis in past.

Chances of injury to GB during surgery occurs due to inability to hold GB with grasping forcep because of oedematous, friable or thin walled GB. Incidence of spillage of bile and dropped stones has been reported as 0.57% to 7% in literature. Though spillage of bile and dropped stones leads to difficulty in LC, however conversion is rarely required [24-25]. In our study we had bile leak in 4 patients and bile leak with dropped stone in 2 patients leading to difficult LC. However none of these patients were converted to OC.

In our study difficult LC was seen in 25(39.7) patients and 7(11.1) patients required conversion to OC. Thus a conversion rate of 11.1% was observed. This is inconsistent with the previous studies where the conversion rates observed was 3 to 5% [1].

Summary:

A total of 63 patients undergoing LC were studied for various factors leading to difficult laparoscopic surgery and conversion to OC. The following observations were drawn from this study.

1. Difficult LC was seen in 41.7% patients below 50 years of age and 33.3% patients above 50 years of age. However, the conversion rate in difficult LC was much higher in patients above 50 years of age as compared to patients below 50 years age, being 50% and 23.8% respectively.
2. Overweight patients i.e. BMI between 25-30 kg/m^2 had 70% difficult LC and conversion rate was 30% as compared to 34% and 7.55% respectively in normal weight patients i.e. BMI between 18-24.9 kg/m^2.
3. Patients with multiple GB calculi had difficulty during LC in 59.6% and conversion to OC was required in 12.8% in comparison to 37.5% difficult LC and 6.3% conversion in patients with single calculi.
4. Patients with stone impacted in Hartmann's pouch had difficulty in 70% patients while 20% patients were converted to open procedure. Whereas in patients where there was no impaction of stone in Hartmann's pouch, the difficulty was encountered in 34% and conversion in 9.4%.
5. Patients with adhesions in Calot's triangle had 62.5% difficult LC with conversion in 12.5% patients as compare to 36.5% difficult and 11% conversion in patients with no adhesion in Calot's triangle.

6. Difficulty was encountered in all patients who had GB perforation with bile leak and or dropped stone.
7. GB perforation with bile leak (4 patients) and stone dropped (2 patients) in peritoneal cavity caused difficulty in performing LC. However conversion was not required in any case.
8. A score of 12 for difficult LC and a score of 30 for conversion was found by significant RR value.

Conclusion:

BMI, ultrasonographic finding of presence of multiple stone or stones impacted in Hartmann's pouch, adhesion in Calot's triangle and gall bladder perforation is predictors of difficult LC. Thus, need for conversion to open procedure is neither a failure nor a complication, but an attempt to avoid morbidity and mortality and ensure patients safety. It would also help to assemble more experience surgical team if difficulty is pre-operatively anticipated. Different researchers have considered different variables and have not considered the RR of theses valuables. Ours was a prospective study and we have computed RR with CI which can be useful for finding out risk scores for difficult LC and conversion to OC. These scores may be better predictors of difficult LC and conversion to OC resulting in better care and avoiding emergency conversion.

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