



A CLINICAL STUDY OF GALL STONE DISEASE AND ITS SURGICAL MANAGEMENT WITH FACTORS PREDICTING DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY AND POST-CHOLECYSTECTOMY COMPLICATIONS

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ABSTRACT

Introduction-Gallstone disease remains one of the major cause of abdominal morbidity and mortality through the world, representing a major health problem. Laparoscopic cholecystectomy is the preferred procedure. Laparoscopic surgery is associated with better preservation of immune function and a reduction of the inflammatory response compared with open surgery. The rate of post operative infections seems to be significantly lower Pre-operative prediction of "difficult laparoscopic cholecystectomy" may not only improve patient safety but also be useful in reducing the overall cost of therapy. This study aims at identifying factors which can predict difficult laparoscopic cholecystectomy and correlate with postoperative complications.

Material and methods- It was prospective study. All patients undergoing Laparoscopic cholecystectomy were included in study.

Results- It can be concluded that LC is the gold standard for the management of gall stone disease. Preoperative risk factors can help to predict difficult gallbladder and conversion to OC. These factors can predict difficulty to be encountered during surgery and help in making a decision for conversion thus shortening the duration of surgery and preventing unnecessary complications.

KEYWORDS :

INTRODUCTION

Gallstone disease remains one of the major causes of abdominal morbidity and mortality through the world, representing a major health problem. Gallstone disease and cardiovascular disease, common diseases worldwide, are strongly associated and have considerable economical impact. The highest prevalence of gallstone disease is noted in Native American Indians (Pima) in Arizona. The lowest frequencies are in Black Africans (<5%) the best studied being the Masi tribe and the Bantu, in whom the entity is virtually non-existent. Prevalence of cholelithiasis in India is more in females than men. The prevalence is more common in Northern Indians than Southern Indians followed by Maharashtra particularly from coastal region. The adage 'fair, fat, fertile, female and forty' is only part of the story. Other risk factors include: increasing age, positive family history, sudden weight loss - eg, after obesity surgery, loss of bile salts - eg, ileal resection, terminal ileitis, diabetes - as part of the metabolic syndrome, oral contraception - particularly in young women. Increase in incidence in India partially attributed to widespread use of ultrasonography (USG) in the last two decades but changing socio-economic structure and changes in various other epidemiological factors including diet may also be responsible. The ratio of incidence of cholelithiasis in non-vegetarians and vegetarians was found to be 8:2. The cause could be due to the consumption of high protein and fat. The findings were similar in a study done by Maskey et al. in 1990 AD in Nepal where incidence of cholelithiasis was found more frequently among the people who consumed more fat and protein. Laparoscopic cholecystectomy is the preferred procedure. A Cochrane review found that there was no difference in mortality, postoperative complications, or operative time compared with open cholecystectomy. However, hospital stay was shorter and recovery time was quicker. Laparoscopic surgery is associated with better preservation of immune function and a reduction of the inflammatory response compared with open surgery. The rate of post operative infections seems to be significantly lower. Pre-operative prediction of "difficult laparoscopic cholecystectomy" may not only improve patient safety but also be useful in reducing the overall cost of therapy. Preoperative prediction of possible difficulties may help a surgeon in deciding the approach (open /laparoscopic) most

suitable for a particular patient, counseling the patient about it, thereby reducing the morbidity, complication, rate of conversion, and overall cost of therapy. Patients with a high predicted risk of conversion could be operated on either by or under the supervision of a more experienced surgeon. This study aims at identifying factors which can predict difficult laparoscopic cholecystectomy and correlate with postoperative complications.

MATERIALS AND METHODS

After approval from the Institutional Ethical Committee, all patients of both sex who underwent laparoscopic cholecystectomy were studied. The study was conducted from June 2015 to May 2017 in tertiary care level hospitals in India. It was a longitudinal observational study. Written informed consent was obtained from all the patients or their guardians/legal representatives. Sample size was 241 patients.

All patients presenting with symptoms suggestive of gallstone disease were screened with ultrasonography (USG). Those confirmed as having cholelithiasis on ultrasound, was subjected to routine hemogram, liver and kidney function tests, coagulation profile, and biochemical investigations. Laparoscopic cholecystectomy was offered to patients with no contradiction to surgery/laparoscopic surgery.

The selected patients were evaluated for the following risk factors: age, sex, history of duration of symptoms, previous hospitalization, body mass index (BMI), presence of any supraumbilical or infraumbilical abdominal scar, palpable gallbladder, gallbladder wall thickness, pericholecystic collection, and impacted stone. Following workup and evaluation the patient were subjected to laparoscopic cholecystectomy. Time taken, biliary/stone spillage, bleeding during surgery, calots triangle dissection, gall bladder bed dissection, anatomical variation, injury to duct / artery, difficult extraction of gall bladder, extension of incision, need for conversion were noted and operating surgeon grading it: easy or difficult, duration of hospital stay, necessity for interventional procedure were recorded.

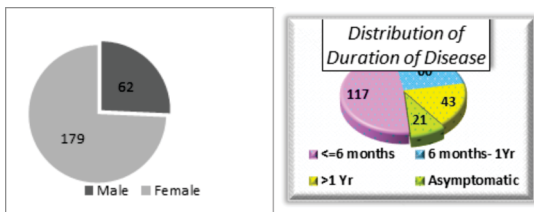
Statistical Analysis

After data collection, data entry was done in Excel. Data

analysis is done with the help of SPSS Software version 21. Qualitative data like age groups gender etc was presented with the help of Frequency and Percentage table, association among difficulty level of survey and surgeon opinion type of surgeon etc is assessed with the help of Chi-Square test and Fisher Exact test for 2x2 tables. Quantitative data was presented with the help of Mean, standard Deviation, Median and IQR, comparison between study group is done with the help of Unpaired T test or Mann-Whitney test as per results of Normality test. P value less than 0.05 is taken as significant level".

RESULTS

A total of 241 patients had laparoscopic cholecystectomy during the study period. Average age was 44.07 years ± 14.232. 25.7% were males and remaining were females. Most patients were in age group 41-60 years age group (44.8%). Similar number of patients has been in age group 21-40 yrs constituting 41.1 %.

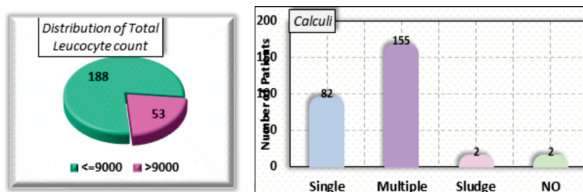


Most of the patients presented with Right upper quadrant pain, Biliary colic and Dyspepsia. Some patients had history of jaundice also (5.8%). Most patients have found to be symptomatic for less than a year (177). Around 21 patients were asymptomatic but underwent Lap cholecystectomy for other indications.

Most of the patients belong to north and north east region constituting nearly 72% that too mainly belong to 03 states i.e. Uttar Pradesh (69), Bihar (55) and Maharashtra (41). Most patients have no comorbidity (61.4%). Hypertension and DM II are the most prevalent comorbidities among the patients.

Previous abdominal surgeries were absent in 73.40% of cases. But lower segment caesarian section (8.30%) and total abdominal hysterectomy (4.60%) were the most common procedures previously done in cases.

Most patients have TLC within normal range. Around 53 patients have found to have >9000 TLC Count. 17 patients have found to have deranged liver function test, around 27 patients have hyperglycemia at the time of surgery. On USG most of the patients have multiple calculi (64.3%). 82 patients have single calculi, 21 patients have impacted stone and 02 of them have suspected to have mucocele on imaging.



Most patients found to have GB wall thickness less than 3 mm. Most patients were accepted in ASA I and ASA II. One patient has multiple comorbidity and was accepted in ASA IV.

There have been nearly equal distribution of patients operated by General and GI surgeon. There have been no difficulty during port entry in most of the patients except in 06 patients who were obese.

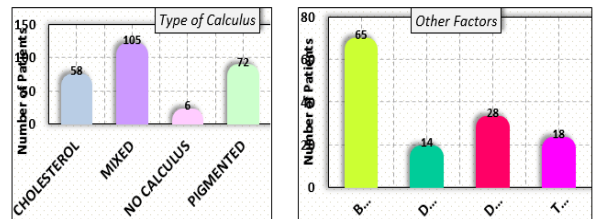
Distended gallbladder was seen in 19.90% of cases, mucocoele of gall bladder seen in 10% of cases and normal

gall bladder seen in around 60.60% of cases. Normal gall bladder wall thickness was seen in 67.60% of cases, thickened gall bladder wall seen in 32% of cases.

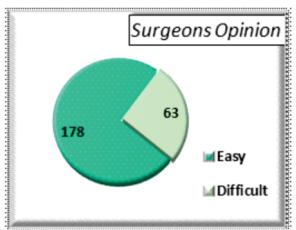
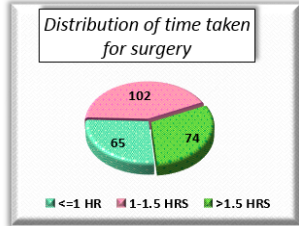
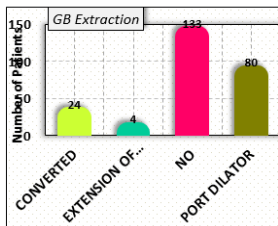
Gall Bladder	Number	Percent
Contracted	20	8.30%
Distended	48	19.90%
Emphyema	3	1.20%
Mucocoele	24	10.00%
Normal	146	60.60%
Wall thickness	Number	Percent
GB polyp	1	0.40%
Normal	163	67.60%
Thickened	77	32.00%
Cystic duct	Number	Percent
Normal	192	79.70%
Short/ wide	49	20.30%
Mucosa	Number	Percent
Cholesterosis	6	2.50%
Fibrotic	10	4.10%
GB polyp	1	0.40%
Unremarkable	224	92.90%
Calculi	Number	Percent
Absent	6	2.5%
Multiple	155	64.3%
Single	82	34.0%
Sludge	2	0.80%
Calculi mobility	Number	Percent
Absent	6	2.5%
Impacted	35	14.50%
Mobile	201	83.40%
Calculi type	Number	Percent
Absent	5	2.50%
Cholesterol	58	24.1%
Mixed	105	43.6%
Pigmented	72	29.9%
CBD	Number	Percent
Dilated	21	8.7%
Normal	220	91.3%

Cystic duct was short and wide in 20.30% cases while in 79.70% of patients' cystic duct was normal in caliber. 92.90% of patients had an unremarkable gall bladder mucosa whereas only around 4.10 % cases had a fibrotic mucosa.

Multiple calculi were seen in 64.30% cases, while single calculi were 34.0%. Most of the calculi were mobile (83.40%). Mixed type of calculi were more in number (43.6%). Common bile duct was seen dilated in only 8.70% cases. In 21 patients there was dilatation of CBD. In 65 patients there was spillage of bile either at the time of surgery or during extraction. In most patients liver was normal in appearance, but in 14 patients liver was cirrhotic or fatty liver, or shrunken.



Drain was put in around 28 patients postoperatively, most of them were those which were converted to open i.e. 24. In 04 patient the incision at epigastric port was to be extended to deliver the GB. In 80 patients GB was easily extracted by using port dilator. Most surgeries were performed within 90 minutes, however in 74 cases the time taken extend more than 90 minutes most of which were either converted or were difficult, in some cases the initial step of port entry and initial dissection was done by residents also.



Postoperatively most patients have uneventful postoperative period except in one patients who have soakage at epigastric port.34 patients have shoulder tip pain and 13 patients have developed ecchymoses of abdominal wall.05 patients have developed SSI at operated site all of them were who underwent lap converted to open cholecystectomy.out of these 05 patients 02 patients have developed hypertrophic scar and one patients have incisional hernia at follow up.

Out of 62 male patients 22 have difficult cholecystectomy which constitute 34.9% of total male patients where as only 41 female patients have difficult cholecystectomy out of 179 patients.Statistically no significant difference was found based on sex about difficulty lap cholecystectomy.But it was found that age of the patient have impact on the difficulty level.It was found that mean age >48.29 years was associated with difficulty during lap cholecystectomy.

Difficulty level	Difficult (n=63)			Easy (n=178)			t	df	p value
	Mean	Median	SD	Mean	Median	SD			
AGE	48.29	50.00	13.97	42.54	43.00	13.86	2.82	239.00	0.005

Comorbidities and association with difficult laparoscopic cholecystectomy

Obesity and Hypertension have significant association with difficult laparoscopic cholecystectomy, but No significant association was found with patient with comorbidity like DM, Hypothyroidism.But association between difficulty level was found to be significant if the patient have both HTN as well as DM in the same patient.

Difficulty level	n	OBESITY		Total
		ABSENT	PRESENT	
Difficult	n	57	6	63
	%	90.5%	9.5%	100.0%
Easy	n	173	5	178
	%	97.2%	2.8%	100.0%
Total	n	230	11	241
	%	95.4%	4.6%	100.0%
	Value	df	p value	
Pearson Chi-Square	4.816α	1	.028	
Likelihood Ratio	4.194	1	.041	

Difficulty level	n	HTN		Total
		No	Yes	
Difficult	n	46	17	63
	%	73.0%	27.0%	100.0%
Easy	n	151	27	178
	%	84.8%	15.2%	100.0%
Total	n	197	44	241
	%	81.7%	18.3%	100.0%
	Value	df	p value	
Pearson Chi-Square	4.353α	1	.037	
Likelihood Ratio	4.089	1	.043	

Difficulty level		DM WITH HTN		Total
		No	Yes	
Difficult	n	54	9	63
	%	85.7%	14.3%	100.0%
Easy	n	167	11	178
	%	93.8%	6.2%	100.0%
Total	n	221	20	241
	%	91.7%	8.3%	100.0%
	Value	df	p value	
Pearson Chi-Square	4.018α	1	.045	
Likelihood Ratio	3.629	1	.057	

TLC Count :

The mean TLC count in difficult cases was 8065 /cu mm.As all our cases have undergone interval choecystectomy we have taken normal but higher TLC count i.e. 9000/cu mm as cut off and we found that TLC more than 9000 have significant association with difficult lap cholecystectomy.It was seen that 68.3% of difficult lap cholecystectomy has TLC count more than 9000.

Difficulty level		TLC		Total
		>9000	<9000	
Difficult	n	20	43	63
	%	31.7%	68.3%	100.0%
Easy	n	33	145	178
	%	18.5%	81.5%	100.0%
Total	n	53	188	241
	%	22%	78%	100.0%
	Value	df	p value	
Pearson Chi-Square	4.731α	1	.030	
Likelihood Ratio	4.484	1	.034	

USG factors and association with difficult lap cholecystectomy

Number of calculus: No significant association of number of stones and difficulty level was found in the study. But strong association between impacted stone and GB wall thicknes (>3.94 mm) was found.Also association was seen between the size of calculus and the difficulty level.Mean stone size of more than 14.65 mm have been found to be associated with difficult lap cholecystectomy.

Difficulty level	n	IMPACTED STONE		Total
		No	Yes	
Difficult	n	45	18	63
	%	71.4%	28.6%	100.0%
Easy	n	175	3	178
	%	98.3%	1.7%	100.0%
Total	n	220	21	241
	%	91.3%	8.7%	100.0%
	Value	df	p value	
Pearson Chi-Square()	42.285α	1	.000	
Continuity Correctionb	38.973	1	.000	
Likelihood Ratio	36.776	1	.000	

Difficulty level	Difficult (n=63)	Easy (n=178)	t	df	p value				
LARGEST CALCULUS	14.65	14.30	6.02	10.67	11.00	5.35	4.89	234.00	0.000
GB WALL THICKNESS	3.94	3.00	1.56	3.07	3.00	1.11	4.42	197.00	0.000

Preanaesthetic check up(ASA grade) :

It was found that ASA level of the patient has association with the difficulty level. It was found that 74.6% of difficult Lap chole was associated with ASA II and higher ASA level. Strong association found between the abnormal i.e dilated CBD and difficult lap cholecystectomy. There has been more incidence of Bile and stone spillage in difficult cases as compared to easy one.

Difficulty level		CBD		Total
		NORMAL	ABNORMAL	
Difficult	n	53	10	63
	%	84.1%	15.9%	100.0%
Easy	n	167	11	178
	%	93.8%	6.2%	100.0%
Total	n	220	21	241
	%	91.3%	8.7%	100.0%
	Value	df	p value	
Pearson Chi-Square	5.496α	1	.019	
Likelihood Ratio	4.922	1	.027	

Difficulty level		BILE/STONE SPILLAGE DIFFICULTY		Total
		DIFFICULTY	NORMAL	
Difficult	n	36	27	63
	%	57.1%	42.9%	100.0%
Easy	n	140	38	178
	%	78.7%	21.3%	100.0%
Total	n	176	65	241
	%	73.0%	27.0%	100.0%
	Value	df	p value	
Pearson Chi-Square	10.929α	1	.001	
Likelihood Ratio	10.346	1	.001	

Adhesions at calots triangle has strong association with the difficulty level. Around 70 % of the cases with adhesions have difficulty during surgery and some of them have been converted also. It has been observed that nearly 24 cases out of 63 difficult cases were converted to open cholecystectomy. Also significant association has been seen with the use of port dilator and the difficulty level, i.e most difficult cases GB have to be delivered via port dilator. It has been found that mean time taken in difficult cases was 02 hours , where as in easy cases time taken for surgery was around 67 minutes.

Difficulty level		ADHESIONS			Total
		NO	MINIMAL	YES	
Difficult	n	10	9	44	63
	%	15.9%	14.3%	69.8%	100.0%
Easy	n	104	55	19	178
	%	58.4%	30.9%	10.7%	100.0%
Total	n	114	64	63	241
	%	47.3%	26.6%	26.1%	100.0%
	Value	df	p value		
Pearson Chi-Square	84.962α	2	0.0001		
Yates Continuity Correction	80.036	2	0.0001		
Likelihood Ratio	78.817		0.0001		

Difficulty level		GB EXTRACTION				Total
		CONVERTED	EXTENSION OF INCISION	NO	PORT DILATOR	
Difficult	n	24	3	12	24	63
	%	38.1%	4.8%	19.0%	38.1%	
Easy	n	0	1	121	56	178
	%	0.0%	0.6%	68.0%	31.5%	
Total	n	24	4	133	80	241
	%	10.0%	1.7%	55.2%	33.2%	
	Value	df	p value			
Pearson Chi-Square	93.559α	3	.000			
Continuity Correction	94.071	3	.000			

Surgeon Opinion	Difficult (n=63)			Easy (n=178)			t	df	p value
	Mean	Median	SD	Mean	Median	SD			
TIME TAKEN	120.48	120.00	22.64	67.89	70.00	16.89	-19.33	239.00	0.000

Postop complications

It has been found that patient who have difficult lap cholecystectomy or who have underwent conversion to open cholecystectomy have complications like tachycardia, hypertension or SSI in the postop or followup period. Patient who have difficult lap cholecystectomy are comparatively more prone for complications like SSI, one patient have developed incisional hernia and another 02 patients have hypertrophic scar on follow up at 06 months.

Difficulty level		POSTOP SCAR			Total
		HEALING D	HYPERTROPHIC SCAR	INCISIONAL HERNIA	
Difficult	n	60	2	1	63
	%	95.2%	3.2%	1.6%	100.0%
Easy	n	178	0	0	178
	%	100.0%	0.0%	0.0%	100.0%
Total	n	238	2	1	241
	%	98.8%	0.8%	0.4%	100.0%
	Value	df	p value		
Pearson Chi-Square	8.583α	2	0.014		
Likelihood Ratio	8.158	2	0.017		
Yates Continuity Correction	7.054		0.017		

Hospital stay:

The mean days of hospital stay in easy cases was 2.08 days as compared to 4.06 days in patients who have difficult laparoscopic cholecystectomy which is statistically significant. Although now a days Lap cholecystectomy done as a day care surgery in most part of world, in our hospital setting, the patient were kept for observation on POD-1, the discharge process gets completed by next day evening ie on POD-2. In patients who have difficult lap cholecystectomy patient were discharged on POD-2 or POD-3, but patients who underwent conversion were discharged on POD-5 or later depending upon complications, so the mean hospital stay in case of these patients have come up as 4.06 days.

Surgeon Opinion	Difficult (n=63)			Easy (n=178)			t	df	p value
	Mean	Median	SD	Mean	Median	SD			
DISCHARGE RGE	4.06	2.00	2.96	2.08	2.00	0.64	8.44	239.00	0.000

Demographic study of type of calculus

Mixed type of calculi are the most common type of stone noted in the study population (43.6%) followed by Pigmented (29.9%) and cholesterol (24.1%). No significant difference noted between sex and type of calculus. There was no association of type of calculus with presenting symptoms , although it is seen that pigmented stones were more commonly associated with biliary colic, and also patient with history of jaundice have pigmented calculi more common than other type of calculi. Mixed calculi are found to have Dyspepsia as common presenting symptoms than other type of calculus, but it is statistically insignificant. Also no significant difference noted between age of the patient and type of calculus.

Intraop calculi	Frequency	Percentage
CHOLESTEROL	58	24.1%
MIXED	105	43.6%
NO CALCULUS	6	2.5%
PIGMENTED	72	29.9%
Total	241	100.0%

HPE correlation:

Out of 241 patients, their HPE report shows chronic cholecystitis in 207 cases; in 26 patients it shows chronic cholecystitis with cholesterosis. 04 GB sent for HPE shows acute on chronic cholecystitis. One of them have spongoid hyperplasia, 02 shows follicular cholecystitis and 01 patient have xanthogranulomatous cholecystitis.

DISCUSSION

Now-a-days Laparoscopic cholecystectomy considered as a gold standard for the treatment of symptomatic gallstones, but the procedure is technically more demanding than the classical OC especially in difficult cholecystectomy. On the part of patients benefit, they can be informed of possibility of complications and conversion to the open procedure. In addition, the surgeon can directly perform the classical open cholecystectomy in the patients with presumed difficult surgery thus saving operating time and the conversion rate. Some series like Fried, et al in 1994 and Brodsky A et al in 2000 suggest that male gender is a risk factor of difficult cholecystectomy unlike our study. This finding was in conformity with that of Schrenk, R. Woisetschlager, et al. Fried et al⁵ and Brodsky et al⁶ noted that increasing age was associated with difficult LC and increased conversion rate. Similar association found in our study (p-0.005). We found that age more than >48 years is associated with increased difficulty, Randhawa et al have found age more than 50 years associated with difficulties. Duration of disease: Most studies have found significant association between duration of symptoms in the form of dull aching pain in Rt hypochondrium, biliary colic and dyspepsia, as shown in recent series by Dhiraj Agarwal et al in 2015. But we didn't find any correlation between duration of symptoms and difficult LC, it is in conformity with the results of Alponat et al and SK Mohanty et al (2017). Obesity is known to be associated with difficult surgery and increased risk for conversion as seen in many studies like one by Liu, et al in 1996, Fried et al⁵ in 1994, also shown in Nachnani J et al in 2005 and Ibrahim S et al in 2006. Our study have also found significant association with Obesity and difficulty in Cholecystectomy. However Partha Bhar et al in their study on 112 patients have found that there is no significant risk associated with high BMI. Partha Bhar et al¹⁵ in their study found hypertension to be a statistically significant predictor of difficult laparoscopic cholecystectomy. In our study we also find significant association. Samer A. Kanaan, Kenric M. Murayama et al in 2002 did not find any increased risk of conversion in diabetic patients similarly we also do not find any significant association between DM and difficult LC. However Partha Bhar et al¹⁵ found to have significant association between presence of DM and increased difficulty. We found in our study that although DM alone has insignificant impact on difficulty but in a patient with both DM and HTN there is significant increase in difficulty level while LC (p-0.045). Abnormal LFT and elevated amylase signify ongoing hepatitis, cholangitis and pancreatitis that pose difficulty in dissection due to oedema. Alphonat et al¹⁰, and Kama et al, have demonstrated a similar association in their study. They have also obtained elevated total count as a predictor for difficulty. Ravindra Nindoni et al in their study found that patients with TLC >11000/cu mm had significant high rates of difficulty and conversion, compared to patients with TLC <11000/cu mm. In our study we also find significant association with TLC count of >9000/cu mm (p-0.030). Other factors like deranged LFT, blood sugar level, blood group and INR were insignificant in my study.

In our study, we found a good correlation between gallbladder wall thickness with difficult LC and conversion to the open procedure accord with reports in other studies. In addition, information related to impacted gallstone, size of largest calculi and the diameter of the common duct was also good predictor of difficulties preoperatively.

The critical thickness of gall bladder associated with conversion varies from study to study. It was 3mm (Fried et al⁵, Nachnani J et al¹³) and 4mm (Kama et al¹⁷, Jansen S et al) in different studies. In present series, it was 4mm (3.94 mm). Most of the authors did not find any statistical significance with number of stones and difficult LC. [Jansen S et al¹⁹, Hutchinson CH et al]. We also did not found significant association. Many

authors found no statistical significance between size of stones and conversion [Kama et al¹⁷, Fried et al⁵]. But we found significant association between size of largest stone and difficulty level. In our study mean size of calculus associated with difficult LC was 14.65 as compared to Jansen et al¹⁹ who found that stone size >20mm was associated with difficulty and risk of conversion explaining that large stones are likely to get impacted at Hartmann's pouch, thereby making dissection difficult.

In our study, we found a good correlation between radiological finding of increased GB wall thickness, impacted neck stone in predicting difficulty in LC and conversion to open Cholecystectomy. The same results were obtained in other studies (Sikora SS et al, Jansen J et al¹⁹). It is difficult to grasp the GB neck to allow adequate retraction to perform dissection at the Calot's triangle. It was found to be a statistically significant factor in predicting the difficulty of the procedure in our study. The main difficulty with stone impacted at the neck or Hartman's pouch is that it hinders holding of the gallbladder during dissection, and also due to impacted stone, the gallbladder is distended with mucus forming the mucocele of the gallbladder, which is even more difficult to hold. In our study, we found ASA class to be a statistically significant predictor (p -0.009) of difficult laparoscopic cholecystectomy. When ASA II was compared with ASA I the former was found to have a greater probability of difficult cholecystectomy. Similar results was noted by P Bhar et al¹⁵ in their study. Difficult umbilical port entry was associated pre-operatively with previous history of upper abdominal surgeries, obesity and presence of upper abdominal scars/hernias. In our study we have only 06 patients in whom we faced difficulty during port entry. Shannon et al., have found that the presence of upper abdominal surgeries and presence of upper abdominal scars or hernias as being significantly associated with difficulty in umbilical port placement. In our study we could not find any association with difficult LC, it may be because we have few patients with upper midline scars. In our study we noted that Dilated CBD results in difficulty in operating and is associated with increased risk of conversion. In our study we noted Dilated CBD in 21 cases (8.7%) out of which 10 patients have difficult lap chole, which was statistically significant (0.019). Common bile duct size also has a good correlation with conversion to the open procedure and difficulty in surgery, in accordance with findings from previous studies (Daradkeh SS et al, Corr P et al) In 65 cases we noted spillage either of bile, stone or both, which constitute 27% of total. But we found that most of them are seen in difficult cases and is statistically significant (p-0.001). Spillage of stones as a cause of conversion had been observed by Frazee R.C. et al But in our study none of the cases were converted due to this reason. Bile spillage was present in 65 cases in our study, but these cases have been categorized as difficult due to bile spillage. None of these cases were converted and all were managed by irrigation and suction. Partha Bhar et al¹⁵ in their study found adhesion has one of the most common reason for difficulties encountered during laparoscopic attempt of the patients had to be converted because of frozen Calot's triangle making visualization of duct and vessels impossible. In our study we found that adhesions at calots have difficulty in operating and also most have to undergo conversion.

Difficulty in gallbladder extraction was associated with distended gallbladder and presence of large stones. A distended gallbladder or the presence of large stones leads to difficulty in the extraction of the specimen through the small incision thus leading to the need to aspirate the gallbladder, extend the epigastric port and the increased probability of gallbladder perforation during these maneuvers. Singh et al., also have supported the same in their study. In our study out of 63 difficult cases 24 undergo conversion for various reasons

mentioned in result .In 3 cases we have to extend the epigastric incision to deliver the GB, while 24 GB were easily extracted using port dilator. Lal et al and colleagues suggest that a difficult cholecystectomy is one taking longer than 90 minutes, tearing the gallbladder, spending more than 20 minutes dissecting the gallbladder adhesions, or more than 20 minutes dissecting Calot's triangle. While time to dissection of Calot's triangle will vary on surgical skills and level of experience, it will generally be longer in patients with increasing access difficulty, inflammation and adhesion. In our study the mean time taken by surgeon in difficult cases was 120 minutes, as compared to 67 minutes taken for easy cases , clearly defining increased time required in difficult cases. Serious complications of LC occur in fewer than 2% of all cases (Gauma DJ et al) . In our study the postoperative complication rate was within the range of published reports (0-8.6%) (Ghannam W et al , Singh R et al , Kaushik R). Few patients developed Right shoulder tip pain in immediate postop period most of them in the converted group (14.1%). Ecchymoses of the abdominal skin developed in 5.4 % of patients mainly in obese group. More than 90 % patients have uneventful immediate postop period. Tachycardia and high blood pressure observed in 18 patients that settled by POD-1. Only one patient has soakage of dressing at epigastric port, rest have minimal insignificant or no soakage at optd site. Wound infection of epigastric port through which gallbladder is extracted occurs in 0.3 to 1% of cases (Vagenas K et al) . In our study it occurred in five cases (2.1%), all were treated with antibiotics and dressing. Several studies have shown that low-pressure pneumoperitoneum is feasible and safe and results in reduced postoperative pain compared with standard-pressure pneumoperitoneum [W.Ko-lam et al , J.Hua et al]. PONV(postoperative nausea and vomiting) is known to be a frequent and distressing source of discomfort during the postoperative period, especially after laparoscopic procedures, with an incidence rate as high as 70%. The use of proper antiemetic drugs during the operation might also reduce the incidence of PONV [W Ko lam et al³³]. Based on the evidence, ondansetron is more effective than metoclopramide in preventing PONV after LC. Our patient too has PONV and managed significantly with ondansetron. One of our patient developed port site hernia at umbilicus after 6 months of follow up. Other complications, such as those related to pneumoperitoneum or thermocoagulation, were not seen in our study. 02 of the converted group developed hypertrophic scar at Kocher incision site. Improvement in LC and anesthetic techniques, together with increased familiarity with the procedure, has led to progressively shorter hospital stays [F keus et al]. However, two studies have reported that LC patients fulfilling the following criteria had a significant association with longer hospital stays: patients aged more than 60 years, patients with ASA class 3, patients with complicated gallstones, patients with increased operative time, patients with intraoperative findings of thickened gallbladder wall, and patients with adhesions and perforations of the gallbladder [Y-Y Tsang et al , J U Chong et al]. In our study we noted that hospital stay have increased by 02 days in difficult group as compared to easy group, similar findings with that of J U Chong et al³⁷ .

CONCLUSION

It can be concluded that LC is the gold standard for the management of gall stone disease. With the advancement in equipment and gaining experiences in laparoscopy, most of the difficult gallbladder can be dealt laparoscopically. Preoperative risk factors can help to predict difficult gallbladder and conversion to OC. These factors can predict difficulty to be encountered during surgery and help in making a decision for conversion thus shortening the duration of surgery and preventing unnecessary complications.

investigations (USG) are no doubt good predictors of difficult laparoscopic Cholecystectomy in majority of cases and should be used as a screening procedure but more attention should be given to demographic data, history and clinical examination to predict the difficult LC. Following measures have to be taken to prevent complications:-

- **Abscess:** Thoroughly cleanse the perihepatic space of debris and stones before completing the case. Postoperative fever, tachycardia, ileus, and abdominal pain usually signal the presence of a problem at the surgical site. Surgical drainage may be needed if the symptoms do not resolve.
- **Pancreatitis:** avoid extensive tissue handling at calots triangle and in the region of duodenum and pancreas.
- **Bile duct injury :**To avoid the biliary injury, the following measures might be taken:
 - Ensure adequate skill training for the LC surgeons.
 - The retraction direction of the gallbladder neck should be vertical to the CBD, with appropriate retraction strength. During LC, the surgeons should observe the Calot's triangle carefully from different angles and distances repeatedly. When the cystic duct is completely exposed, retraction should be removed. When necessary, the gallbladder bed in the portal area should be dissected partially first in order to expose the cystic duct, cystic blood vessels and their relations with the cystic duct. The titanium clips are applied only after the confluence of cystic duct and CBD is clearly recognized.
 - In the cases of cystic duct stones incarceration, swelling of Calot's triangle, severe adhesion, misidentification of anatomical structure or variation, or uncontrollable bleeding, in all these conditions, the electric incision, electric cauterization or titanium clips should not be applied to dissect blindly, but conversion to open surgery should be immediately implemented.
 - Dissection of the cystic duct should start from the border of the gallbladder neck and cystic duct. The length of dissected cystic duct should not be too long, with 0.5 cm might be sufficient for clipping, and this is not too close to the CBD.
 - In the case of severe cystic duct swelling, 2 or 3 titanium clips might be applied in the proximal part, and make sure the clip near the CBD should not be too tight in order to avoid cystic duct necrosis and clip removal. During LC, the gallbladder bed should be cauterized thoroughly for blocking the small aberrant bile ducts, thus to avoid bile leak.
 - If necessary, a drainage tube might be placed in the gallbladder bed, this way, the bile leak can be found timely
- **Intra-abdominal Complications of Laparoscopic Surgery**
 - Maintain the best possible vision at all times
 - Avoid the use of sharp instruments unless absolutely necessary
 - Take extreme care with the use of diathermy, or ultrasonic devices (remember that the tip of the instrument may remain hot even if the power has been switched off)
 - Check that bowel has not been injured during access
 - Before leaving the abdominal cavity take care to check all areas where injury to tissue may have occurred
 - Inspect all cannulation sites after withdrawal of the cannula at the conclusion of the operation (lightly place a finger over the skin wound at the time of inspection so that any bleeding will run into the abdominal cavity and be seen easily)
 - Where necessary, use a drain Finally, ensure that all patients are given appropriate contact details and instructed to contact the hospital, rather than their GP or another hospital, of any problems occur

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