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Preoperative Predictors for Conversion in Laparoscopic Cholecystectomy

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Abstract

Introduction: *Laparoscopic cholecystectomy has rejuvenated general surgery and in very short time has become the gold standard operation for benign gallbladder disease, but the procedure is technically more demanding than the classical open cholecystectomy. Although introduction of laparoscopic cholecystectomy has dramatically affected the management of patients with biliary disease, but even today there are numerous challenges and unanswered questions that remain, regarding issues related to application of laparoscopic techniques to this very common clinical disorder. Greater chances of damage to the common bile duct and surrounding viscera exist.*

Aims and Objectives: *The aim of our study was to evaluate some preoperative factors, which can reliably predict the chances of conversion to the open procedure and the complications during laparoscopic cholecystectomy. This may benefit the patients because beforehand information about the possibility of complications and conversion to the open procedure can be made available. The patient can be mentally prepared and can adjust his or her expectations accordingly. 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.*

Material and Methods: *This prospective study was conducted on 250 patients undergoing laparoscopic cholecystectomy in the department of Surgery, VIMSAR, BURLA, and over a period of 24 months from november2015 to november 2017, to evaluate and correlate the clinical, biochemical and ultrasonographic findings with the operative findings for anticipating difficult laparoscopic cholecystectomy. The parameters which were studied are age ≥ 65 years, sex, acute cholecystitis, number of acute attacks in the past, history of upper abdominal surgery, WBC count (≥ 10000), total bilirubin (≥ 1.5 mg/dl), ALP (≥ 310 IU/L), gallbladder wall thickness (≥ 4 mm), pericholecystic collection, gallbladder size (contracted gallbladder), stone impaction at neck/cystic duct and Mirizzi's syndrome.*

The risk of organ injury was minimized in our study by using open trocar placement (a Hasson cannula was used). Patients with previous lower abdominal surgeries were also included in our study.

The operative parameters taken to assess the difficulty of the laparoscopic cholecystectomy were total time taken to operate from the insertion of the trocar to the extraction of the gallbladder (more than 90 mins), tear of gallbladder with spillage of bile and stones, and conversion to open cholecystectomy. The surgeons experienced in laparoscopic cholecystectomy performed the surgeries.

Results: *In this study the rate of conversion was found to be 7.2%, Male to female ratio was 1:5.62. The majority of patients were in the age group of 41 – 50 years. The mean age was 41.9 with standard deviation*

of 9.9. The conversion rate is highest in the age group of 51 -60 years. Overall 46 out of 250 patients were predicted to be difficult cases based on clinical parameters out of which 30 were difficult on surgery and 18 out of the 46 cases got converted. Out of 250 patients 13 patients were predicted to be difficult based on biochemical parameters of which 10 were difficult on surgery. Out of 10 difficult cases 4 got converted to open procedure. Out of 250 patients 30 were predicted to be difficult of which 23 were found to be difficult on ultrasonographic parameters. Out of these 23 difficult cases 13 got converted to open procedure. In this study, on multivariate logistic regression analysis male sex, acute cholecystitis, WBC more than 10000/cumm, contracted gallbladder and stone impaction at neck region were found to be significant predictive factors for conversion of laparoscopic cholecystectomy to open cholecystectomy. Most common reason for difficult laparoscopic cholecystectomy and conversion to open procedure was adhesions in the Calot's triangle and with the surrounding structures. The intra-operative complications that occurred in this study were cystic artery tear, bleeding from gallbladder bed, tear of gallbladder and spillage of stones and bile.

Conclusion: *From this study, we can conclude that preoperative clinical, biochemical and ultrasonographic parameters are good predictors of difficulty in laparoscopic cholecystectomy in the majority of cases and should be used as a screening procedure. It can help surgeons to get an idea of the potential difficulty to be faced in a particular patient.*

Introduction

Cholecystectomy is the most common elective procedure performed on the biliary tract and the second most common abdominal operation performed today.[1] Over the past years, removal of gall bladder has been the primary mode of therapy for gall stone disease. Alternative modes include gall bladder dissolving agents, biliary lithotripsy and percutaneous cholecystolithotomy. The main disadvantage with these techniques is that the stone forming organ i.e gall bladder is left in situ resulting in recurrence.

With more and more endeavors being made in the field of laparoscopy, more and more complicated cases which were relatively contraindicated a few years ago are now being tackled laparoscopically. However one should be very careful in the cases with complicated gallstone disease to avoid any disastrous complication. Safe dissection is the key to complete laparoscopic cholecystectomy successfully. Every case should be considered as difficult until completed successfully. Level of difficulty may vary with the skill and experience of the surgeon. An inexperienced surgeon ascending the learning curve may find conditions like intra abdominal adhesions, acutely inflamed friable gall bladder, gangrenous gall bladder and fibrotic Calot's triangle to be of insurmountable difficulty. However some conditions are really difficult to tackle irrespective of the experience and skill of the surgeon. Though there is no consistent definition for difficult Laparoscopic cholecystectomy, many studies have considered Laparoscopic cholecystectomy to be difficult when we encounter 1) dense adhesions at the triangle of Calot's (frozen triangle of Calot's prohibiting proceeding laparoscopically without risk), 2) contracted and fibrotic gallbladder, 3) previous upper abdominal surgery, 4) gangrenous gallbladder, 5) acutely inflamed gallbladder, 6) empyema gallbladder including Mirizzi's syndrome 7) previous cholecystostomy and 8) cholecystogastric or cholecystoduodenal fistula.[2,14]

Access to the peritoneal cavity to create the pneumoperitoneum may be difficult in the previously operated cases. In such cases, creating pneumoperitoneum by open technique or use of veress needle through the Palmer's point (2 cm below the left costal margin in the mid clavicular line) may be the useful alternatives to the umbilical point.

The safest entry can be made into the peritoneal cavity by adhering to the basic principle of lifting the anterior abdominal wall with the help of two towel clips placed on the either side of umbilical incision into the rectus sheath and then pushing the spring loaded veress needle through the sheath.

Anatomic variations in the cystic duct and hepatic ducts are common. This variation should be bourne in mind during dissection of the hepatocystic Triangle.

Laparoscopic cholecystectomy may need conversion in the following conditions:

1. Unclear anatomy
2. Failure to progress in dissection
3. Injury to major blood vessel
4. Injury to abdominal viscous
5. Injury to bile duct
6. Doubtful pathology

A recent report emphasizes the fact that the outcome of the patient is not influenced by the rank of the surgeon performing the surgery.[15] However, the consensus has been that every surgeon has to undergo a learning curve for the laparoscopic procedure and develop his dexterity in laparoscopy.[2-14]

In spite of increasing expertise and advances in technology, conversion rate is still 1.5 to 35% in different centers.[2-14] This conversion is neither a failure nor a complication, but an attempt to avoid complications. Conversion from laparoscopic to open cholecystectomy is required when safe completion of the laparoscopic procedure cannot be ensured. The identification of parameters predicting conversion would be useful to improve preoperative patient counseling, provide for better perioperative planning, optimize operating room efficiency, and to avoid laparoscopic- associated cost & complications by performing an open operation when appropriate.

This study has been conducted on certain clinical and investigation parameters to look for their reliability as predictors of difficult laparoscopic cholecystectomy.

Aims and Objectives
Pre-operative prediction of difficult laparoscopic cholecystectomy using clinical, biochemical & ultrasonographic parameters.

Materials and Methods
1) **Study Area**: Department of General Surgery

2) **Study Population**: All patients admitted for laparoscopic cholecystectomy

3) **Study Period:** November 2015 to November 2017

4) **Sample Size**: 250 patients

5) **Sample Design:** All indoor patients admitted for laparoscopic cholecystectomy during the study period

Inclusion Criteria
All patients with symptomatic gall stone disease admitted for laparoscopic cholecystectomy.

Exclusion Criteria
- Patients with common bile duct stone
- Patients with known carcinoma GB
- Acute cholecystitis more than 72 hours
- Patients with history of cholangitis
- Combined with other surgeries
- ASA score III/IV
- Instrument failure

6) **Study Design:** Descriptive prospective cross-sectional study

7) **Parameters Studied**: The following parameters of the study sample was studied to predict a difficult laparoscopic cholecystectomy:

- Age
- Sex
- Present acute attack
- Number of attacks
- Past upper abdominal operation
- Total & differential WBC count
- Alkaline phosphatise levels
- Total bilirubin
- USG findings

Age $\geq$ 65 Yrs, Male gender, Acute cholecystitis, $\geq$ 2 previous acute attacks, past upper abdominal surgery, WBC $\geq$10000/cumm, raised alkaline phosphatase > 310 IU/L, raised total bilirubin > 1mg/dl and USG findings of pericholecystic fluid collection, GB wall thickness $\geq$ 4mm, contracted GB, stone impaction at neck/cystic duct, Mirizzi's syndrome were considered as predictors of difficult laparoscopic cholecystectomy in this study. Cases which got converted to open

cholecystectomy were considered as difficult cases.

8) Study Tools

- Predesigned pretested schedule
- Laboratory reports
- Abdominal USG reports
- Individual patient file
- Discharge certificates

9) Study Techniques: The indoor patients admitted for laparoscopic cholecystectomy were included in this study. Informed consent was taken from the sample group after explanation and before inclusion into the study. Then after interviewing the patient a predesigned pretested schedule as given in the annexure was filled in.

10) Plan for Analysis of Data: The collected data was compiled in a Microsoft Excel sheet, and subsequently suitable multivariate logistic regression analysis using SPSS 16.0 version was

done accordingly with different appropriate statistical methods.

Results and Analysis

A series of 250 cases undergoing laparoscopic cholecystectomy for gall stone disease were selected for study. All the cases were predicted to be either difficult or easy for laparoscopic cholecystectomy based on preoperative clinical, biochemical and USG parameters. Causes of conversion to open cholecystectomy were assessed and analysed both preoperatively and peroperatively. Results of the study were analysed as follows:-

1) Total incidence of conversion

Table- I

| Total no of cases	No of conversion	Percentage
250	18	7.2

Total incidence of conversion
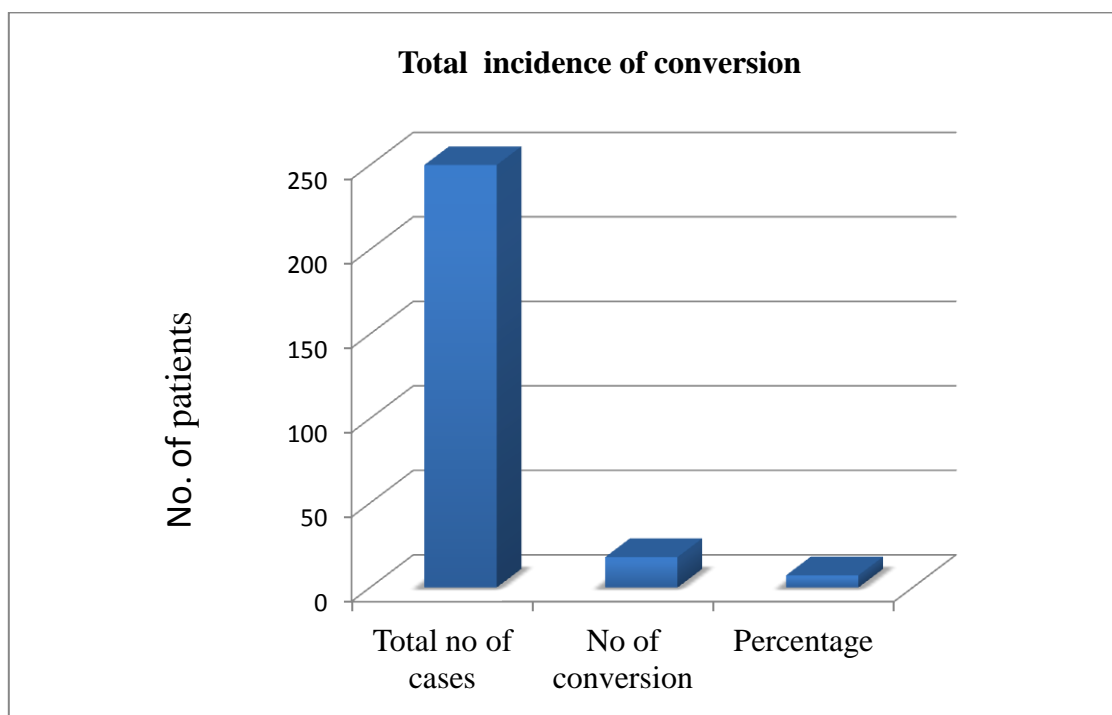
In this study a case series of 250 patients who underwent laparoscopic cholecystectomy were prospectively analysed. Laparoscopic cholecystectomy was successfully carried out in 232 patients and 18 patients needed conversion to open cholecystectomy. Rate of conversion was 7.2%.

2) Age distribution

Table – II

| Age	No of patients (%)	No of conversions (%)
21 -30	39 (15.6)	2 (0.8)
31 -40	70 (28)	2 (0.8)
41 -50	95 (38)	3 (1.2)
51 -60	42 (16.8)	7 (2.8)
61 -70	3 (1.2)	3 (0.8)
70 -80	1 (0.4)	1 (0.4)
Total	250	18 (7.2)

Age Incidence
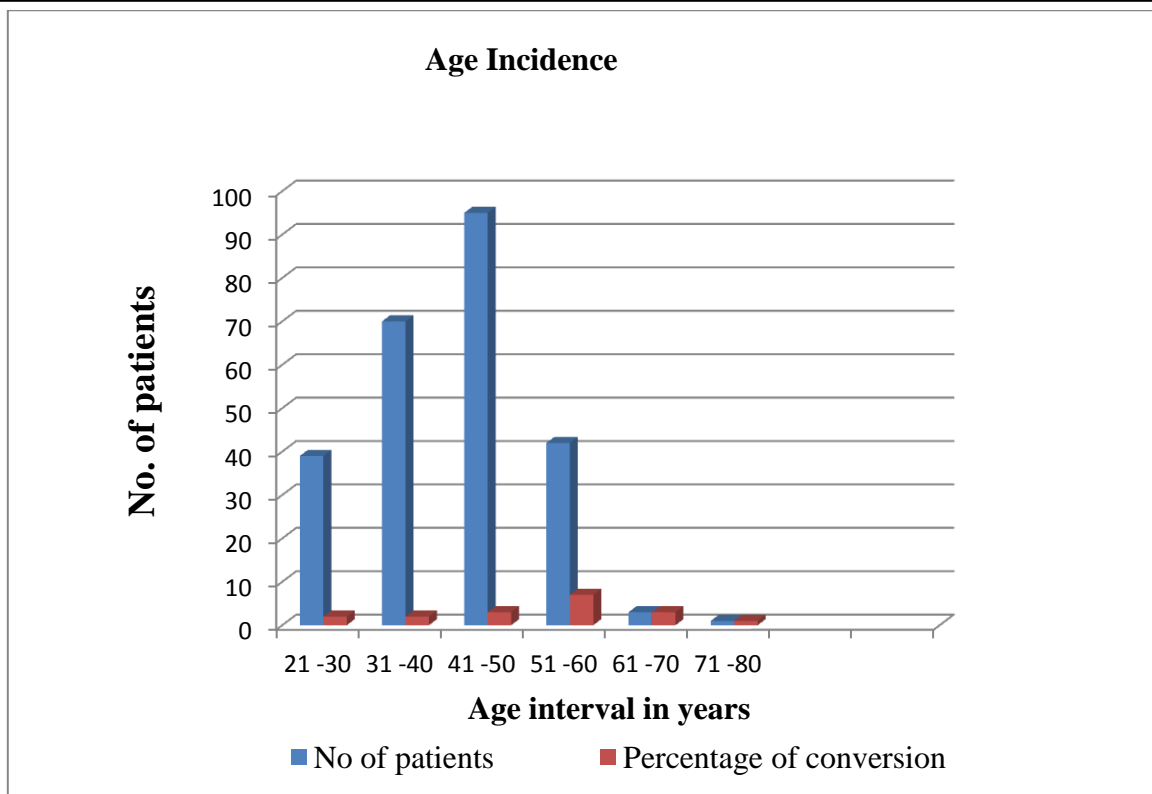
In the series of 250 cases the age of patients varied from range of 21 –74 years. The majority of patients were in the age group of 41 – 50 years. The mean age was 41.9 with standard deviation of 9.9. The conversion rate is highest in the age group of 51 -60 years. The conversion rate in the age group of ≥60 years in this study is 100%. So it is observed that with increasing age risk of conversion increases.

3) Sex Ratio

Table – III

|	Number of Patients (%)	Number of Conversion (%)
Male	39 (15.6)	8 (3.2)
Female	219 (84.4)	10 (4.0)
Total	250	18 (7.2)

Sex Ratio
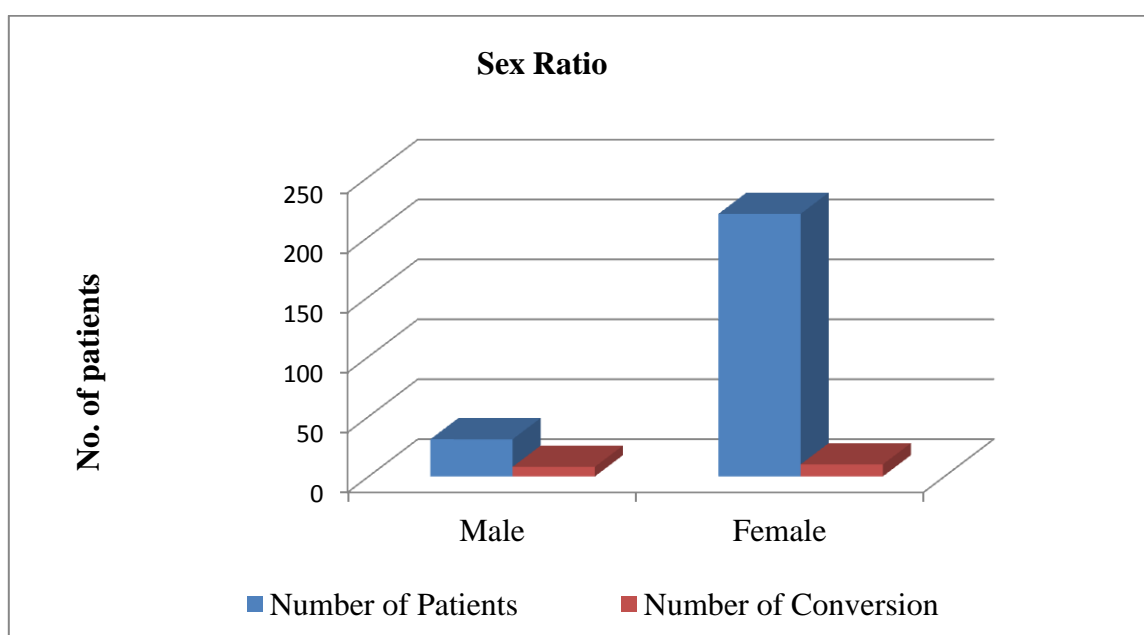
Out of 250 patients, 39 were male and 219 were female. Male: Female = 1: 5.62. Out of 18 converted patients 8 (3.2% of 250) were males and 10 (4% of 250) were female patients. Out of 39 male patients 8 got converted which accounts for 20.5% of male patients whereas out of 219 females 10 got converted which accounts for 4.5% of female patients. From this we can conclude that conversion rate is 4.5 times higher in male patients in this study.

4) Acute Cholecystitis
Table – IV

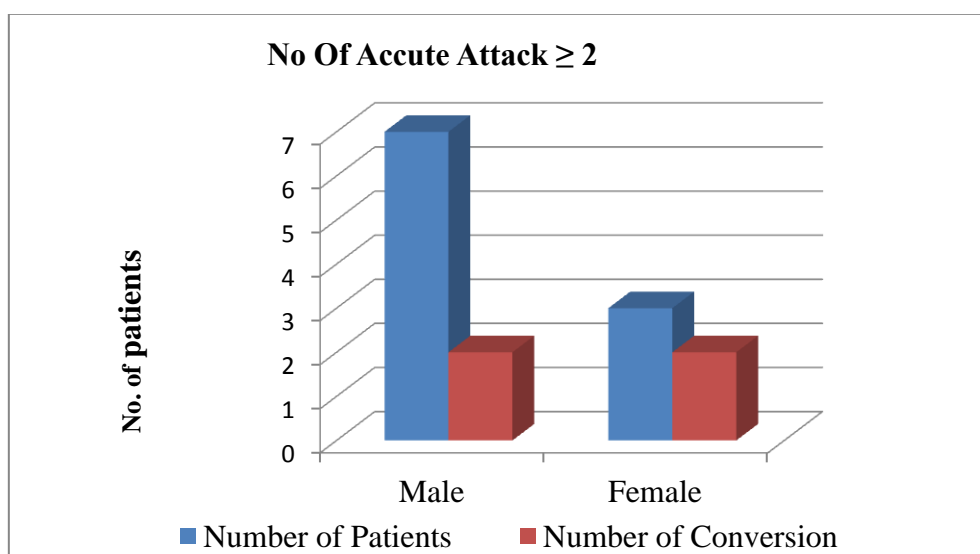|	Number of Patients (%)	Number of conversion (%)
Male	4 (1.6)	2 (0.8)
Female	7 (2.8)	1 (0.4)
Total	11 (4.4)	(1.2)
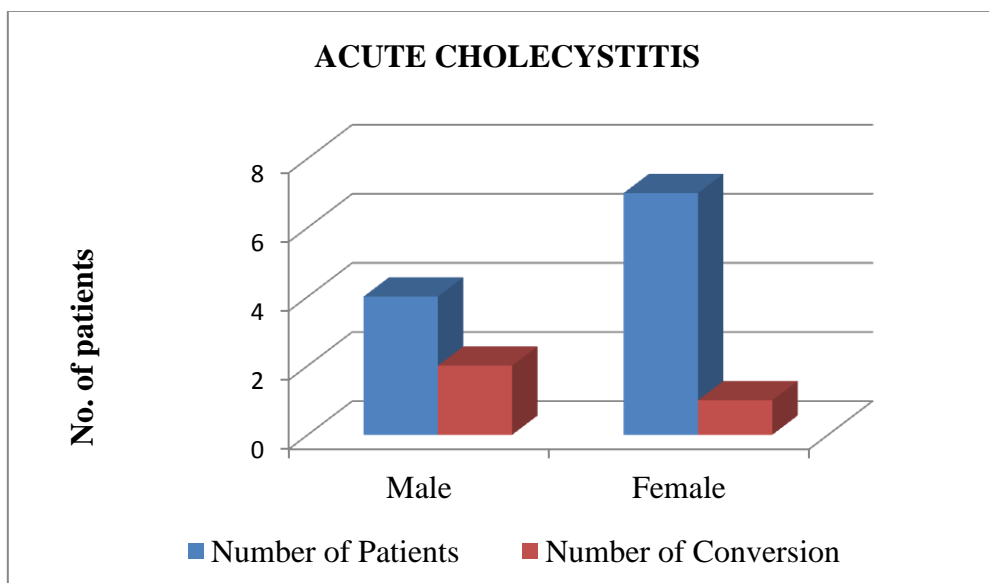
Out of 11 patients who presented with acute cholecystitis 4 were male and 7 female. Among these 2 male patients and 1 female patient got converted to open cholecystectomy. Overall 3 out of 11(27.27% of 11) patients got converted.

5) No of Acute attacks (≥ 2)
Table - V

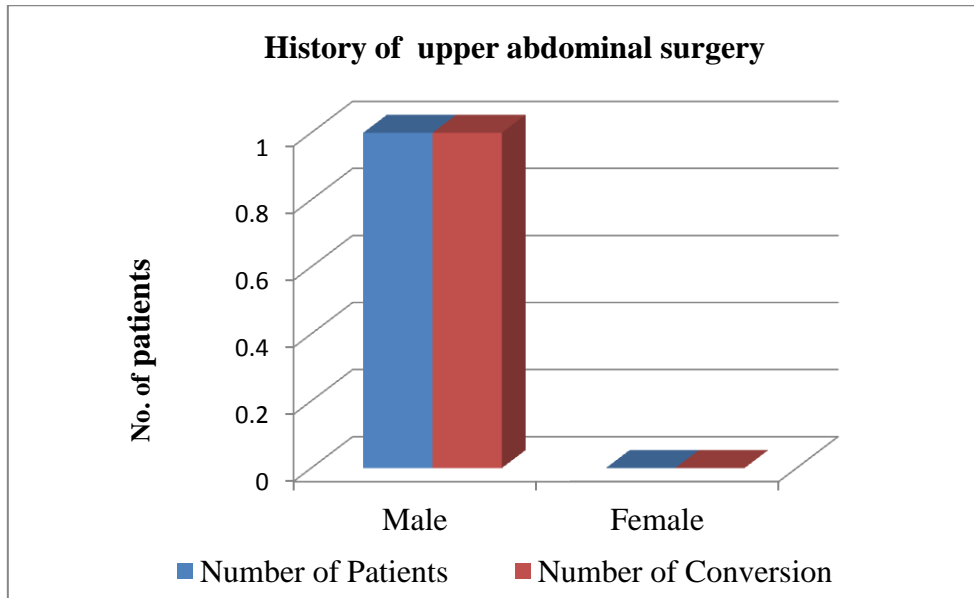|	Number of Patients	Number of Conversion
Male	7	2
Female	3	2
Total	10	4

Out of 250 patients 10 had ≥ 2 acute attacks of which 7 (2 conversions) were male and 3 (2 conversions) female. 40% (4 out of 10) of the patients with ≥ 2 acute attacks got converted.

Table- VI

	Number of Patients	Number of Conversion
Male	1	1
Female	0	0
Total	1	1

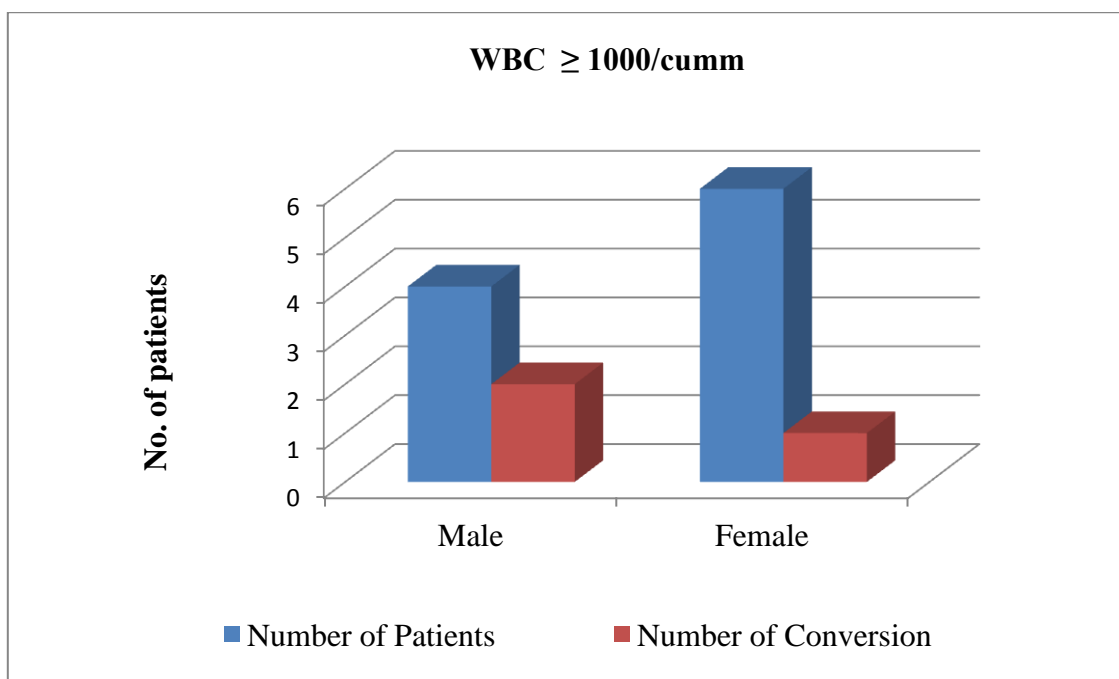## 6) History of Upper Abdominal Surgery

History of upper abdominal surgery

Out of 250 patients only 1 male patient had history of upper abdominal operation which got converted due to dense adhesions.

White Blood Cell ≥ 10000/cumm

Table-VII

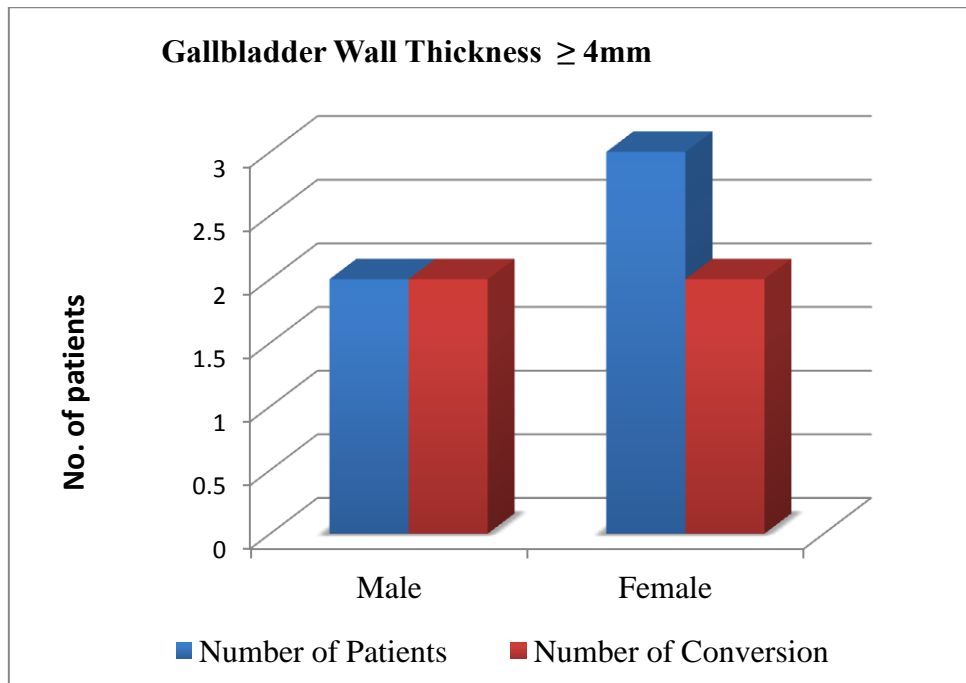|	Number of patients	Number of conversion (%)
Male	4	2 (0.8)
Female	6	1 (0.4)
Total	10	3 (1.2)

WBC ≥ 1000/cumm

Out of 250 patients 10 had WBC ≥ 10 000cu/mm of which 3 (1.2% of 250) patients got converted to open cholecystectomy.

8) Gall Bladder Wall Thickness ≥ 4mm

Table-VIII

	Number of Patients	Number of Conversions (%)
Male	2	2 (0.8)
Female	3	2 (0.8)
Total	5	4 (1.6)

Gallbladder Wall Thickness ≥ 4mm

Out of 250 patients 5 had GB wall thickness ≥ 4mm of which 4 (1.6%) got converted to open cholecystectomy.

9) Contracted gallbladder

Table-IX

	Number of Patients (%)	Number of Conversion (%)
Male	10 (4.0)	5 (2.0)
Female	11 (4.4)	5 (2.0)
Total	21 (8.4)	10 (4.0)

Gallbladder Contracted
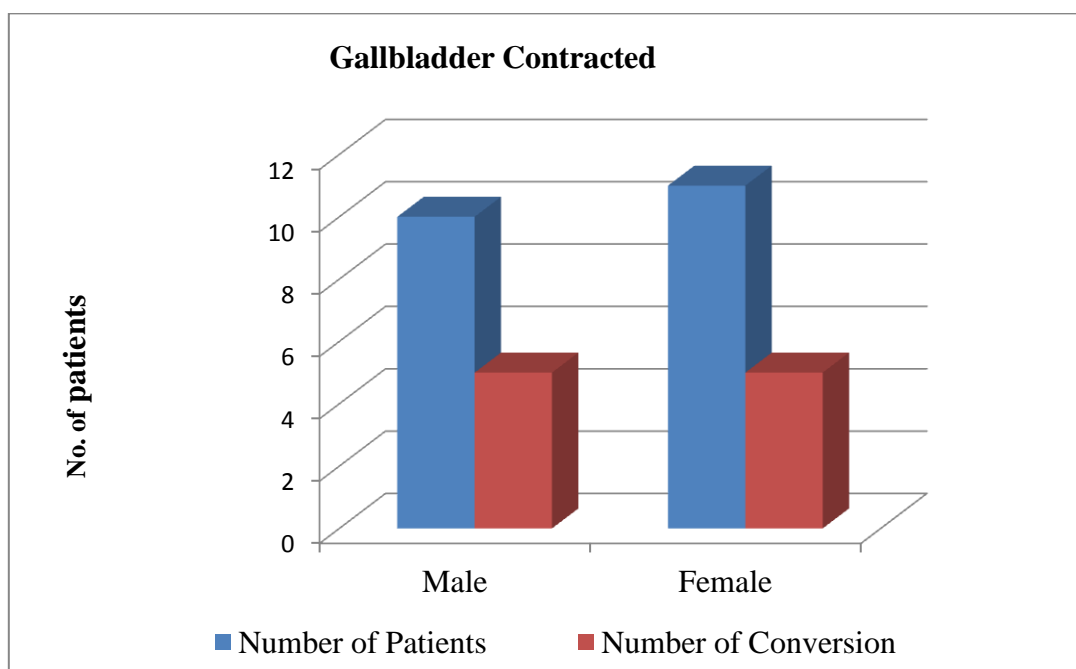
Out of 250 patients 21(8.4%) had contracted GB of which 10 (4.0%) got converted to open cholecystectomy.

10) Stone Impacted at Neck/Cystic Duct:

Table – X

	Number of Patients	Number of Conversions
Male	3	1
Female	6	1
Total	9	2
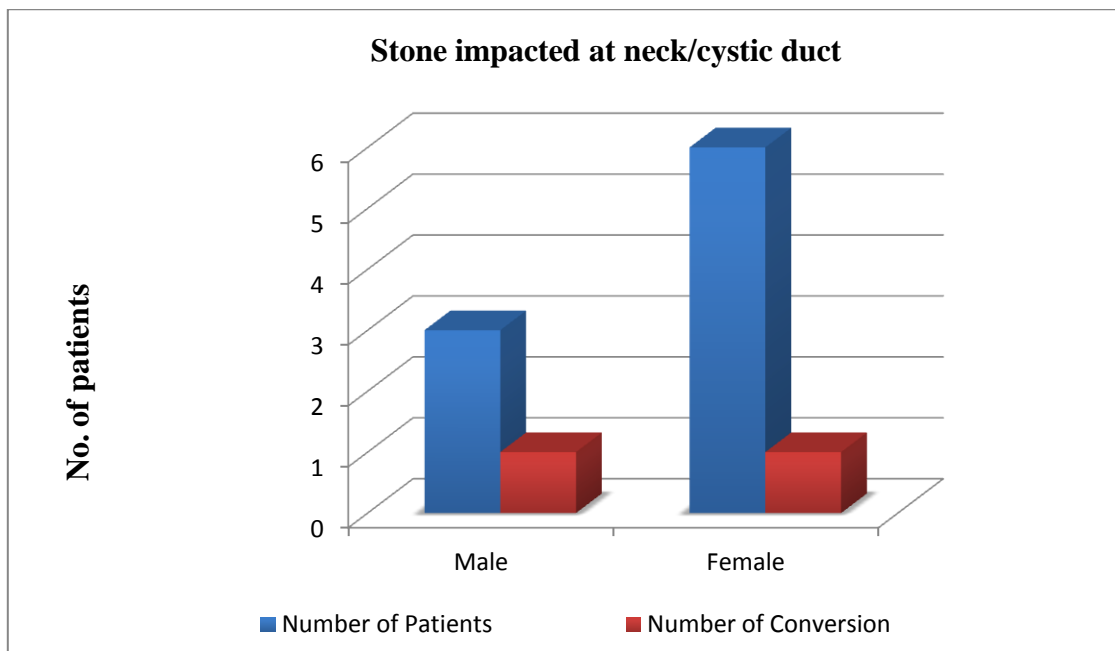
Out of 250 patients 9 had stone impacted at neck/cystic duct on USG of which 2 got converted to open cholecystectomy.

11) Peroperative causes of conversion

Table-XI

Peroperative causes of conversion	No. of conversions (%)
Dense adhesions around Calot's triangle	7 (38.88%)
Anatomic variation of cystic duct	1 (5.55%)
Uncontrolled bleeding	3 (16.66%)
Distended Hartman's pouch with adhesions	2 (11.11%)
Contracted GB	3 (16.66%)
Wide and short cystic duct	2 (11.11%)
Total cases converted	18 (100%)
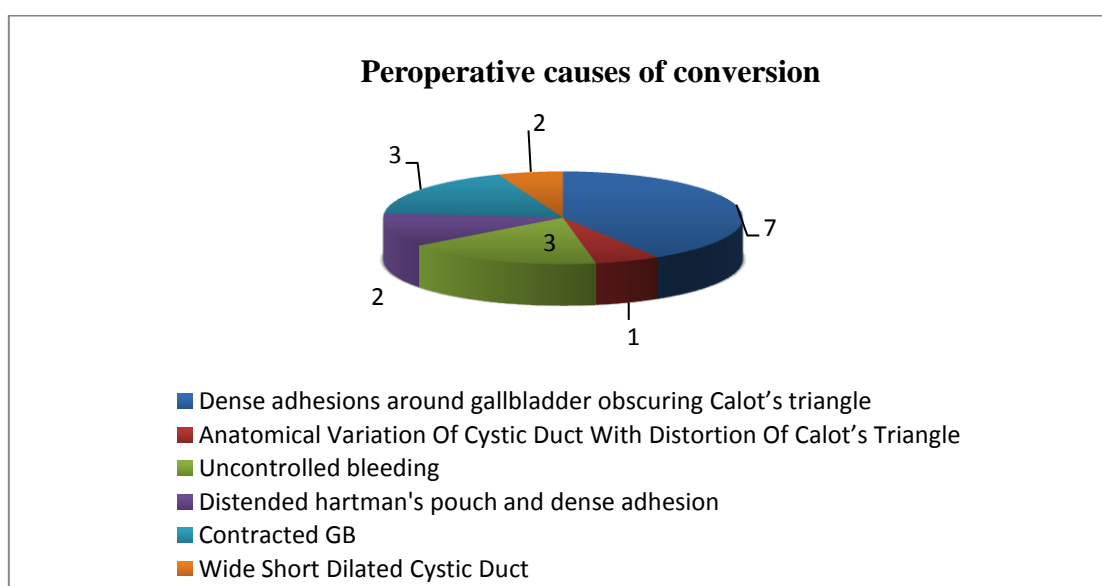
In the study of 250 cases, 18 cases were converted to open cholecystectomy. Causes of peroperative conversion were as given above.

12) Preoperative prediction with clinical parameters:
Table-XI

Preoperative parameters	Predicted as difficult	Concluded as difficult	Conversion
Clinical	46	30	18
Age (≥65 years)	4	4	4
Sex (Male)	31	19	8
Acute cholecystitis	11	7	3
No of acute attack(≥2)	10	10	4
H/o upper abd. surgery	1	1	1

Overall 46 out of 250 patients were predicted to be difficult cases out of which 30 were difficult on surgery and 18 out of all difficult cases got converted.

13) Preoperative prediction with biochemical parameters
Table-XIII

Preoperative parameters	Predicted as difficult	Concluded as difficult	Conversion
Biochemical	13	10	4
WBC(≥ 10000/cumm)	10	7	3
Total Bilirubin (≥1mg/dl)	1	1	0
ALP (>310IU/L)	2	2	1

Out of 250 patients 13 patients were predicted to be difficult based on biochemical parameters of which 10 were difficult on surgery. Out of 10 difficult cases 4 got converted to open procedure.

14) Preoperative prediction with USG parameters
Table- XIV

Preoperative parameters	Predicted as difficult	Concluded as difficult	Conversion
Ultrasonography	30	23	13
Pericholecystic collection	1	1	1
GB wall thickness (≥4mm)	5	4	4
Stone impaction at neck	9	7	2
Mirizzi's syndrome	1	1	0
GB contracted	21	17	10

Out of 250 patients 30 were predicted to be difficult of which 23 were found to be difficult on laparoscopic cholecystectomy. Out of these 23 difficult cases 13 got converted to open procedure. There were 5 cases with GB wall thickness ≥ 4mm of which 4 were found to be difficult on surgery and were converted to open procedure. Out of 9 cases of stone impaction at neck/cystic duct 7 were predicted to be difficult of which 2 were converted to open procedure. There were 21 cases of contracted GB out of 17 were difficult on surgery and 10 got converted to open procedure. There was only 1 case of Mirizzi's syndrome which was found to be difficult but did not need conversion.

15) Association of clinical findings with difficult laparoscopic cholecystectomy using multivariate logistic regression analysis
Table-XV

Clinical parameters	Odds ratio (OR)	95% CI OR	p value
Age in years < 65 years	Reference		
≥ 65 years	NA		>0.05
Sex Female	Reference		
Male	0.044	0.013 – 0.144	0.000
Acute cholecystitis No	Reference		
Yes	0.021	0.004 – 0.111	0.000
No of acute attacks < 2	Reference		
≥ 2	NA >0.05		
H/o upper abd. Surgery No	Reference		
Yes	NA >0.05		

The table above shows the male sex and acute cholecystitis to be the significant predictors of difficult laparoscopic cholecystectomy among the clinical parameters.

16) Association of biochemical parameters with difficult laparoscopic cholecystectomy using multivariate logistic regression analysis
Table- XVI

Biochemical parameters	Odds ratio (OR)	95% CI OR	p value
WBC			
Normal		Reference	
Raised	0.055	0.013 – 0.225	0.000
Total bilirubin (1mg/dl)		NA	>0.05
Alkaline phospatase(310 IU/L)		NA	>0.05

The above table shows only raised WBC count to be significant predictive factor among the biochemical parameters. Total bilirubin and alkaline phosphatase has p value > 0.05 which is insignificant.

17) Association of USG parameters with difficult laparoscopic cholecystectomy using multivariate logistic regression analysis
Table- XVII

USG parameters	Odds ratio (OR)	95% CI OR	p value
Stone impaction in neck / cystic duct			
No		Reference	
Yes	0.023	0.004 – 0.127	0.000
GB contracted			
No		Reference	
Yes	0.019	0.005 – 0.067	0.000
GB wall thickness			
< 4mm		Reference	
≥ 4mm	0.052	0.004 – 0.765	0.031
Mirizzi's syndrome	NA		>0.05
Pericholecystic collection	NA		>0.05

The above table shows contracted GB and stone impaction at neck/cystic duct to be highly significant predictive factor followed by GB wall thickness. Mirizzi's syndrome and pericholecystic collection were not shown to be significant factors for conversion.

Discussion

Gall stone disease is indeed a very common disease and the incidence of the disease is on the rise. Cholecystectomy is the second most common operation performed in the United Kingdom, being only marginally exceeded by appendicectomy (Maingot 1774)[1] and it remains the gold standard for treatment of gallstone disease. The classical open cholecystectomy is performed through 10 to 15 cm incision either through the Kocher's sub-costal incision or through the right para-median incision. Few of the disadvantages of classical open cholecystectomy are increased postoperative pain, ugly scar and increased recovery time as compared to laparoscopic cholecystectomy. Laparoscopy has seen maximum progress in the last decade. Laparoscopic cholecystectomy has now become the gold standard for the treatment of symptomatic gallstone disease. In VIMSAR, BURLA also it is one of the most common operations performed. The main aim of the study is to detect preoperative predictors and the rate of conversion of laparoscopic cholecystectomy to open cholecystectomy in our institute.

Laparoscopic cholecystectomy can be difficult in cases with dense adhesions and distorted anatomy. The various features that can increase the technical difficulty are adhesions in the Calot's triangle, distorted anatomy, empyema gallbladder, contracted gallbladder, Mirizzi's syndrome, previous upper abdominal surgery and acute cholecystitis. The conversion rates in various studies range from 1.5 to 35 %.[10-14]

In this study 250 patients have been included in which clinical, biochemical and ultrasonographic parameters for predicting difficult laparoscopic cholecystectomy were analysed.

The various preoperative parameters in literature for predicting difficult laparoscopic cholecyste-ctomy are: age, sex, acute attacks, previous upper abdominal surgery, jaundice, obesity, raised WBC, low albumin, gallstone size, gallbladder wall thickness, gallbladder volume, and number of stones, common bile duct size and stone impaction in the neck. Of these age > 65 years, male sex,

previous upper abdominal surgery, gallbladder wall thickness, contracted gallbladder and stone impaction shows the maximum correlation with difficult laparoscopic cholecystectomy and/or conversion of laparoscopic cholecystectomy to open cholecystectomy.[2-9, 11-14,]

In this study out of 250 cases 18 got converted to open cholecystectomy with conversion rate of 7.2%. This conversion rate is comparable to several other studies.[11-14,]

The age of the patients varied from 21 –74 years. The majority of patients were in the age group of 41 – 50 years. The mean age was 41.9 years with standard deviation of 9.9. The conversion rate was highest in the age group of 51 -60 years.

The conversion rate in the age group of ≥ 60 years in this study was 100%. So it is observed that with increasing age risk of conversion increases. However in this study, in multivariate logistic analysis age ≥ 65 years was not found to be a significant predictor of conversion. The observed disparity may be due to less number of patients above 65 years of age in this study. H. J. J. van der Steeg et al (2011) found age more than 65 years to be significant independent predictive factors for conversion on multivariate logistic regression analysis.

Out of 250 patients, 39 were male and 219 were female. Male: Female ratio is 1: 5.62 which corroborates with the study of Ajay Anand et al (2007) who also found female preponderance. Out of 39 male 8 got converted which accounts for 20.5% of male patients whereas out of 219 female 10 got converted which accounts for 4.5% of female patients. From this we can conclude that conversion rate is 4.5 times higher in male patients in this study which corroborates with the study of H. J. J. van der Steeg et al (2011) and Volcan et al (2011).

Overall 46 out of 250 patients were predicted to be difficult cases based on clinical parameters out of which 30 were difficult on surgery and 18 out of all difficult cases got converted. Among the clinical parameters, male sex and acute cholecystitis were found to be significant predictors on multivariate logistic regression analysis. This corroborates with the study of H. J. J. van der Steeg et al (2011) who found male sex and acute cholecystitis to be significant independent predictive factors for conversion on multivariate logistic regression analysis. Volcan et al (2011) also found male sex to be the only statistically significant risk factor for conversion in their series.

In this study number of acute attacks more than two was not significant predictor for conversion on multivariate analysis which was found to be significant in the study of Wing-Hong Li et al (2009).[9]

Among clinical parameters previous upper abdominal operation was not found to be significant in this study. However, Fanaei S A et al (2009) found previous upper abdominal operation to be significant predictive factors. This disparity may be due lesser number of cases with upper abdominal operation in this study.

Out of 250 patients 13 patients were predicted to be difficult based on biochemical parameters of which 10 were difficult on surgery. Out of 10 difficult cases 4 got converted to open procedure. Amongst the biochemical parameters taken in this study, raised WBC count was the only significant preoperative predictor on multivariate logistic regression analysis which corroborates with the study of Jeremy M. Lipman et al (2007). Raised bilirubin was not significant in this study whereas Wing-Hong Li (2009) et al found raised bilirubin to be significant in their study.[9]

Raised alkaline phosphatase was not found significant in this study however Changiz Gholipour et al (2009) found it to be significant predictor in their study.

Out of 250 patients 30 were predicted to be difficult based on ultrasonographic parameters of which 23 were found to be difficult. Out of these 23 difficult cases 13 got converted to open procedure. In this study, a good correlation between gallbladder wall thicknesses with conversion to the open procedure was found which is in accordance with reports in other

studies.[4,5,] In study by Carmody E et al (1994), however, the opposite is reported.

This study shows that stone impaction at the gallbladder neck is a good predictor of conversion to the open procedure, which is contrary to the findings in other studies in which stone impaction is shown to have a moderate correlation. 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 mucocele of the gallbladder, which is even more difficult to hold. In these cases, the gallbladder was emptied of its contents by aspirating the contents making the gallbladder more manageable.

The contracted gallbladder on ultrasonography was found to be significant predictive factor in multivariate logistic regression analysis in this study which corroborates with study of Pervez Iqbal et al (2008) who found contracted gallbladder to be significant. However pericholecystic collection and Mirizzi's syndrome was not found to be significant predictive factor in this study. This disparity was due to lesser number of cases.

Difficult dissection secondary to adhesions was the most common cause for difficult laparoscopic cholecystectomy and/or conversion to open cholecystectomy in this study. The other causes of conversion were short & dilated cystic duct leading to inability to apply clips, bleeding from gallbladder bed and tear of cystic artery, tear of gallbladder with spillage of stones and bile. These various difficulties leading to operative time more than 90 minutes were taken as difficult cases. The laparoscopic cholecystectomy in expert hands should not take more than 45 to 50 minutes.[6,]

The policy of our institute is early conversion if there is difficulty in progress in dissection of the Calot's triangle. This probably accounts for the high conversion rate in our study. Another reason for high conversion could be due to the reason that our patients usually are from the low socio-economic group and come to seek medical advices only after years of neglect of the disease and after repeated attacks. Since these surgeries were done by surgeons experienced in laparoscopic cholecystectomy of our institute, therefore the learning curve statistics do not apply to this study. This study shows that preoperative clinical, biochemical and ultrasonographic parameters can predict operative difficulty for laparoscopic cholecystectomy to a good extent. These parameters can also aid in recognition of cases where an open cholecystectomy should be considered and the patient counselled preoperatively.

Conclusion

From this study, we can conclude that preoperative clinical, biochemical and ultrasonographic parameters are good predictors of difficulty in laparoscopic cholecystectomy in the majority of cases and should be used as a screening procedure. It can help surgeons to get an idea of the potential difficulty to be faced in a particular patient.

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