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RESEARCH ARTICLE

STUDY ON PREOPERATIVE PREDICTORS OF DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY USING CLINICO-SONOGRAPHIC SCORING

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) has become the gold standard treatment for gallstone disease. Though mostly safe occasionally it can be difficult due to various problems faced during surgical procedure. Anticipation of likely difficulty can help in avoiding complications. **Methods:** With the aim of identifying various predictors of difficulty and their correlation with likely difficulty this prospective study on 50 adults undergoing laparoscopic cholecystectomy for symptomatic cholelithiasis was undertaken. Various clinical, radiological and biochemical predictors and frequency and type of intraoperative difficulty was recorded. **Results:** In present study adverse clinical factors only showed significant predictive value (p value - 0.005). Adverse radiological predictors although showing trend towards, did not achieve statistical significance (p value 0.065). In clinical predictors duration of symptoms >1yr, History of acute cholecystitis and BMI >30 showed statistically significant association. Age >50yrs, Male gender, radiological predictors (Thickened gall bladder wall, small contracted gall bladder, Single large impacted stone) and deranged LFT did not show significant predictive value. **Conclusions:** Clinical predictors are most reliable factors. Use of good clinical judgement regarding possibility of and likely difficulty along with understanding of available resources is important in making decision in each case.

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INTRODUCTION

Cholelithiasis is one of the most common problems affecting the digestive tract. In India its prevalence is estimated to be around 4%.[1] Westernization of diet, socioeconomic changes and widespread availability of ultrasonography have contributed in increased prevalence. Minimal postoperative morbidity resulting from minimal invasiveness along with safety and efficacy have made laparoscopic cholecystectomy gold standard treatment for symptomatic cholelithiasis. It has now become the most common operation performed by general surgeons.[2] Currently around 80% of cholecystectomies are performed using laparoscopic approach.[3] Almost every laparoscopic surgeon performs and usually starts his career with this surgery. Laparoscopic cholecystectomy though mostly safe and uneventful can be difficult at times. Approximately 2% to 15% of patients require conversion to open surgery for various reasons.[4,5] Most of the beginner laparoscopic surgeons in the country work with very basic instrumentation and infrastructure. Expertise of senior laparoscopic surgeons also may not be readily available. With increasing experience selection criteria for laparoscopic cholecystectomy has become more liberal. It is being used in more and more earlier contraindicated situations.

In these circumstances a lot of problems can be avoided by correct preoperative prediction of difficult cholecystectomy. It may help in making arrangements for specialized instrumentation, expertise or timely referral thus avoiding many complications. These days laparoscopic cholecystectomy is considered as a day care surgery and patient's expectations are also accordingly. These patients can also be counselled regarding postoperative morbidity by correctly predicting difficult cholecystectomy.

AIMS AND OBJECTIVES

- The aim of this study is to preoperatively predict difficult laparoscopic cholecystectomy by using clinico-songraphic parameters.
- Ultrasound scoring for the following factors:
- Gall bladder status
- Pericholecystic collections
- Number of gallbladder stones
- Size of gallbladder stones
- Impacted stones
- Gall bladder wall thickness

- Age, sex, BMI, palpable gallbladder,previous surgery.
- To correlate the clinico-sonographic scoring with intraoperative findings

MATERIALS AND METHODS

TOOLS AND TECHNIQUE:

Site of study: The study was conducted in PIMS ;UDAIPUR

Type and duration of study: The study was prospective analysis of laparoscopic cholecystectomy by predicting its difficulty using ultrasonographic parameters and its correlation with intraoperative findings. The duration of study was 9 months from SEPTEMBER 2020 to MARCH 2022.

Sample size and study population: Total number of sample size=39

METHODOLOGY

All patients under the study were preoperatively evaluated by ultrasound abdomen, clinical examinations as per clinico-sonographic parameters given below. Each parameters are given scoring values in numerical. These patients underwent laparoscopic cholecystectomy after routine investigations and informed consent. The intraoperative events are noted as per intraoperative parameters given below. The clinico-sonographic parameters were compared against the intraoperative parameters. Each parameters are compared and p-values were calculated for each parameters.

Ultrasound abdomen parameters			
	0	1	2
Gallbladder status	normal	distended	Contracte d
Gallbladder wall thickness	≤3mm	>3mm-4mm	>4mm
Number of stone(s)	single	multiple	

Impacted stone	No	Yes	
Stone size	<5mm	5mm-1cm	>1cm
Pericholecystic collections	Absent		Present
Maximum score=10			

Clinical parameters			
	0	1	2
Age	<50yrs	>50yrs	
Sex	Female	Male	
Body Mass Index	≤25	>25	

Previous abdominal surgery		infraumbilical	supraumbilical
Palpable gallbladder	No	Yes	
Maximum score=6			

Grading of scores: Easy=0-5 Difficult=6-10
Very Difficult=11-16

Intraoperative parameters			
	Easy	Difficult	Very Difficult
Duration of surgery	<60mins	60-120mins	>120mins
Bile/stone spillage	No	Yes	Yes
Injury to duct/artery	No	Duct only	Both
FrozenCalot's triangle	No	yes	Yes
Conversion to open	No	No	Yes

INCLUSION CRITERIA

- Patients presenting with cholelithiasis diagnosed by ultrasound abdomen or other imaging modalities.
- Patients undergoing laparoscopic cholecystectomy for Gallbladder calculus.

EXCLUSION CRITERIA:

- Patients with CBD calculus who needs CBD exploration Patients with features of obstructive jaundice
- Gallbladder malignancy
- Patient unfit for laparoscopic surgery.

Preoperative risk factors assessed were clinical (age, gender, duration of symptoms, BMI, H/O attack of acute cholecystitis, past history of abdominal surgery), radiological (on USG gall bladder wall thickness >3mm, single large stone in Hartmann's pouch, small contracted gall bladder) and biochemical (deranged LFT)

EQUIPMENTS:

Laparoscopic instruments (1)

- Atraumatic grasper
- Locking tooth jaw grasper
- Dissectors- curved, right angle, straight
- Scissor
- L-hook

- Clip applicator
- Stone retrieval grasper
- Light source
- Veress needle
- Trocar cannula
- Insufflator

Camera processing unit and monitor: Energy source-diathermy unit (monopolar/ bipolar) Conventional instruments for wound closure

Definition of difficult cholecystectomy

Access related: More than 2 veress needle attempts or alternate methods like open technique to be used.

Identification of gallbladder: If gall bladder covered with omentum/bowel loops and adhesions have to be divided (not separable by pulling) by the use of electro-cautery.

Grasping of gallbladder: Need of special instruments (with bigger jaw) for grasping or need of evacuation of gall bladder before grasping required.

Adhesiolysis: Adhesions requiring cutting by electro-cautery. Flimsy/ easily separable adhesions by pulling were not included.

Calot's triangle dissection: More than 20 min time needed for calot's triangle dissection.

Duct clipping: Wide/short duct requiring suture rather than clipping or inadequate length to put two proximal and one distal clip.

Duct clipping: Wide/short duct requiring suture rather than clipping or inadequate length to put two proximal and one distal clip.

Dissection from liver bed: Dissection of gall bladder from liver bed requiring more than 20 min. or perforation of gall bladder.

Extraction of gallbladder: Skin incision needs to be increased, piecemeal removal of gall bladder, spillage of stones/ bile during extraction.

Time was calculated from veress needle insertion till port closure. Overall time >60 min was also considered as difficult laparoscopic cholecystectomy. All surgeries were done under GA by standard four port technique. CO2 pneumoperitoneum at 12mm Hg was used.

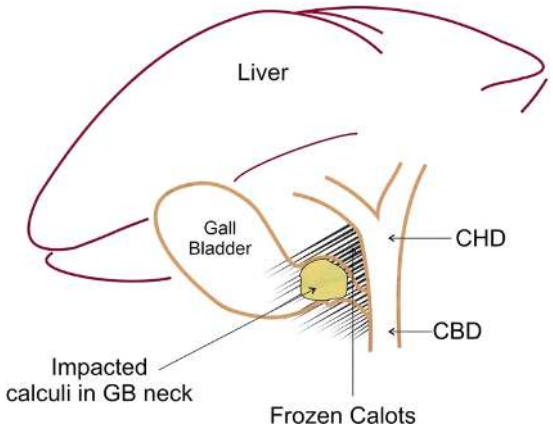


Figure 1

TYPE II SUBTOTAL CHOLECYSTECTOMY RECONSTITUTING TYPE IN FROZEN CALLOTS

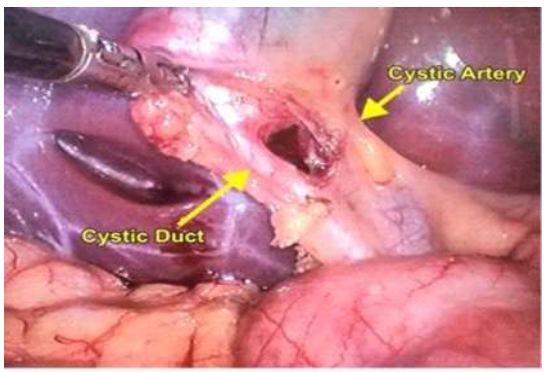


Figure 2

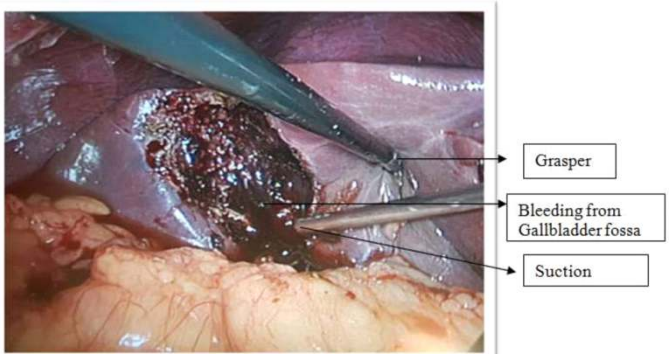


Figure 3

Figure 4.

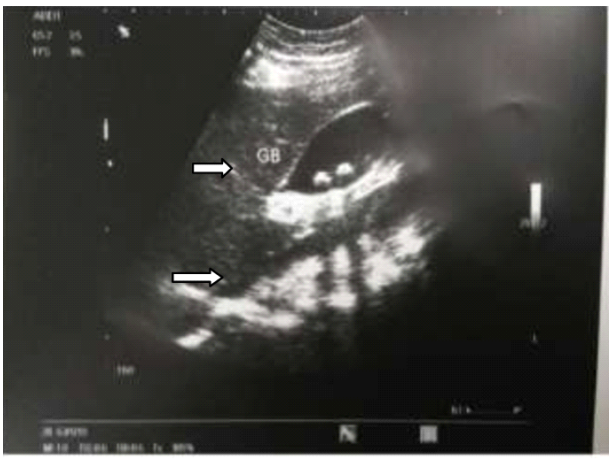
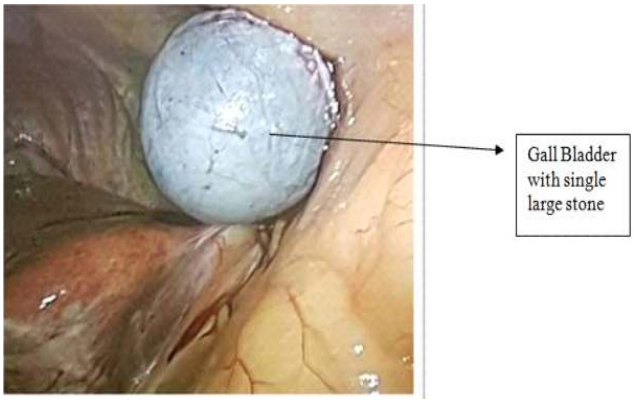


Figure 5.

Figure 6.



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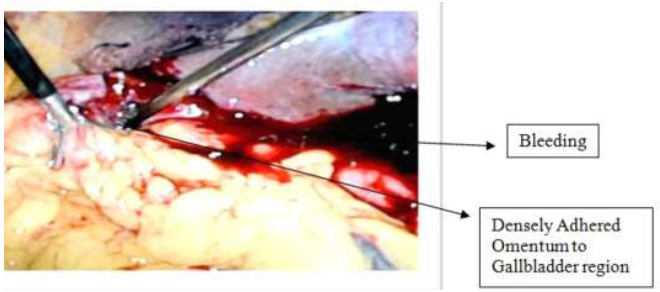

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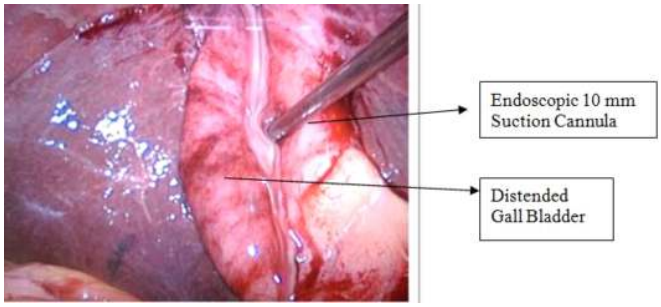

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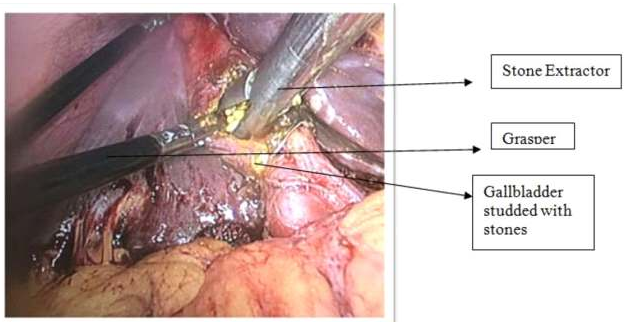

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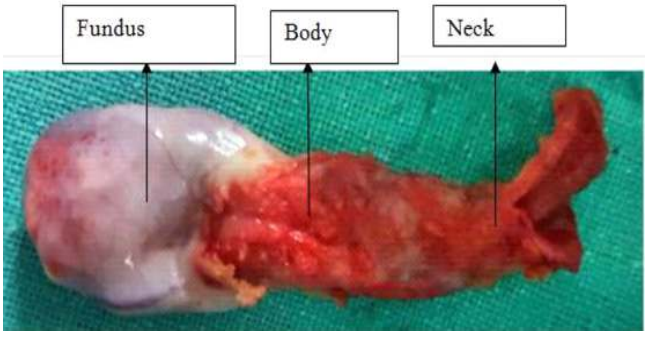
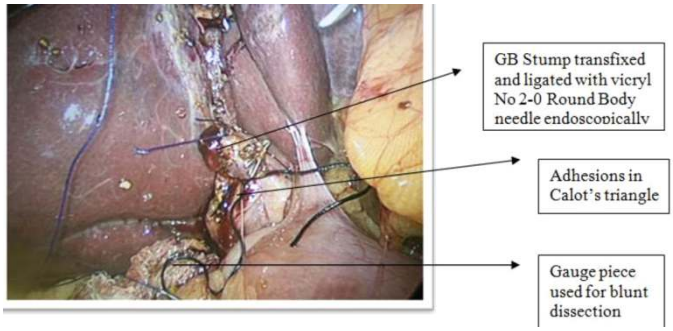


Figure 11.



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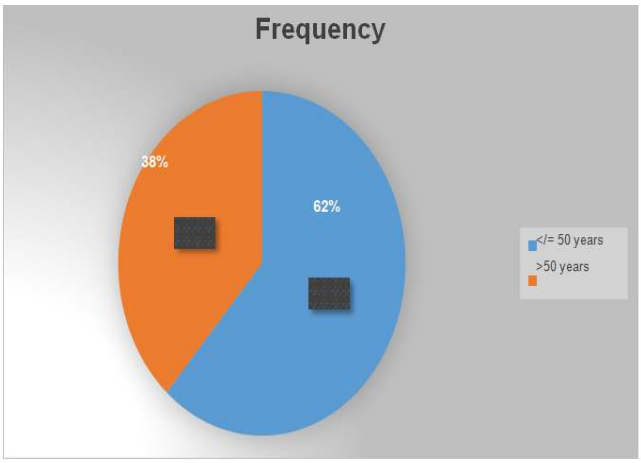
RESULTS

A total of 39 patients with gallbladder calculi who underwent laparoscopic cholecystectomy were included in the study. The mean age of the patients was 47 years (SD 13)..The age range of patient was between 24 and 75 years. 53% were female patients.

Clinical features: Of these 39 patients, 17 patients had undergone previous abdominal surgeries. Of which 13 had infra-umbilical, and 4 had supraumbilical surgeries. Obesity was present in 33.3% (95% CI 19-50). None of the patients had palpable gallbladder. None of the patients had any comorbidities.

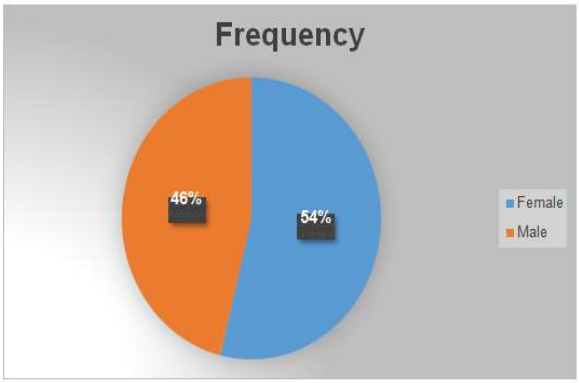
AGE FREQUENCY: Out of 39 patients included in the study, 24 patients (61.54%) were below 50years, while 15 patients were above 50 years (38.46%) as shown in the table below:

Age	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
</= 50 years	24	61.54%	44.62%	76.64%
>50 years	15	38.46%	23.36%	55.38%
TOTAL	39	100.00%		



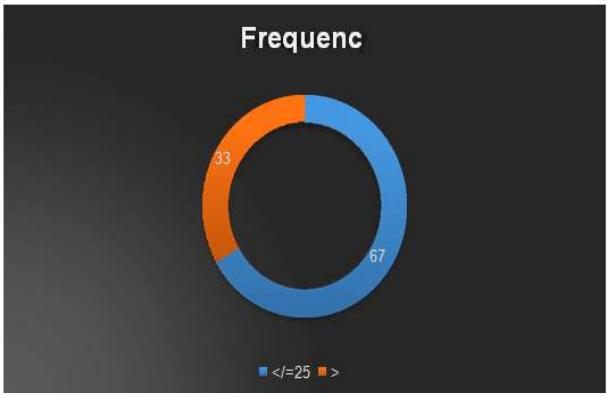
GENDER FREQUENCY: 21 patients out of 39 were females (53.85%) and 18 (46.15%) were males as shown in table below:

Gender of patient	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
Female	21	53.85%	37.18%	69.91%
Male	18	46.15%	30.09%	62.82%
TOTAL	39	100.00%		



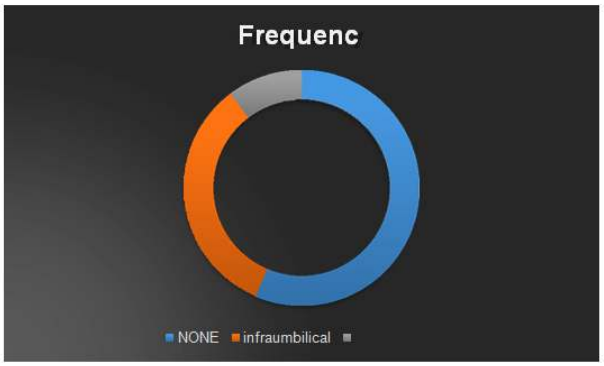
BMI frequency: Patients (66.67%) had BMI equal or lower than 25, while other 13 (33.33%) patients had BMI of more than 25 as shown in table below:

BMI	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
</=25	26	66.67%	49.78%	80.91%
> 25	13	33.33%	19.09%	50.22%
TOTAL	39	100.00%		



PREVIOUS ABDOMINAL SURGERY: Previous infra-umbilical surgeries were found in 13 patients (33.33%) and supraumbilical surgeries in 4 patients (10.26%) as tabulated below:

Previous abdominal surgery	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
Absent	22	56.41%	39.62%	72.19%
Infra-umbilical	13	33.33%	19.09%	50.22%
Supraumbilical	4	10.26%	2.87%	24.22%
TOTAL	39	10.00%		



Ultrasound features: Of 39 patients who had undergone laparoscopic cholecystectomy, 25 patients had distended gallbladder, 7 had contracted gallbladder and 7 had normal gallbladder. 11 patients had normal GB wall thickness, 20 had 3-4mm GB wall thickness and 8 patients had >4mm thickness. Of 39 patients, 3 patients had impacted Gall bladder stones (most of them in the neck of the GB). 31 patients had multiple gallbladder calculi. Pericholecystic collections were found in 8 patients

Gallbladder status: 26 patients out of 39 had distended gallbladder though none of them are clinically palpable. 7 patients(17.95%) patients had contracted gallbladder as shown in the table below:

Gall bladder status	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
Normal	7	17.95%	7.54%	33.53%

Gall bladder status	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
Normal	7	17.95%	7.54%	33.53%
Distended	25	64.10%	47.18%	78.80%
Contracted	7	17.95%	7.54%	33.53%
TOTAL	39	100.00 %		

Gallbladder wall thickness: Of 39 patients, 11 patients have normal gallbladder wall thickness, 20 patients have wall thickness ranging from >3mm to 4 mm, and 8 patients have thickened wall of more than 8mm.

Impacted stones: Out of 39 patients, impacted stones were sonographically noted in 3 patients (7.69%) in the region of neck of gallbladder.

Impacted gall bladder calculus	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
Absent	36	92.31%	79.13%	98.38%
Present	3	7.69%	1.62%	20.87%
TOTAL	39	100.00%		

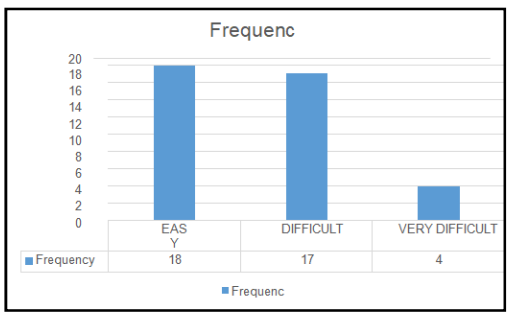
Spillage during surgery: Of 39 patients, bile spillage was noted in 5 patients (12.82%), while both bile and stone spillage were noted in 3 patients(7.69%) as shown in table below:

Spillage during surgery	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
No spillage	31	79.49%	63.54%	90.70%
Bile spillage	5	12.82%	4.30%	27.43%
Bile + stone spillage	3	7.69%	1.62%	20.87%
TOTAL	39	100.00%		

Clinico-sonographic scoring Vs. Graded operation time: Of 39 patients, 18 patients (46.15%) had easy surgery, 17 (43.52%) had difficult surgery, whereas 4 patients had very difficult surgery as shown in table below.

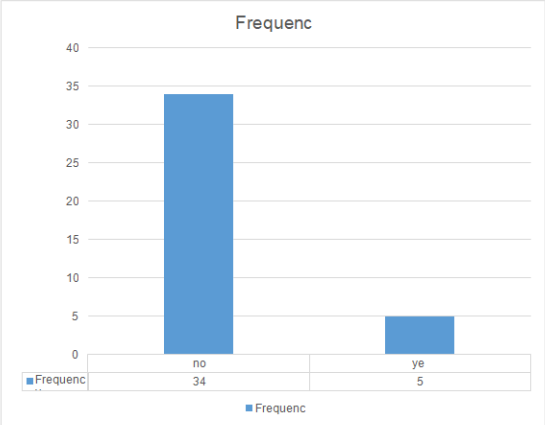
Final score	Frequency	Percent	95% lower confidence limit	95% upper confidence limit
Easy	18	46.15%	30.09%	62.82%
Difficult	17	43.52%	27.81%	60.38%
Very difficult	4	10.26%	2.87%	24.22%
TOTAL	39	100.00%		

Laparoscopic conversion to open cholecystectomy: Of 39 patients, 5 patients were converted into open cholecystectomy, owing to dense adhesion in the Calot's triangle in 4 patients.



One patient out of 4 had previous supraumbilical surgery with extensive intraperitoneal adhesions.

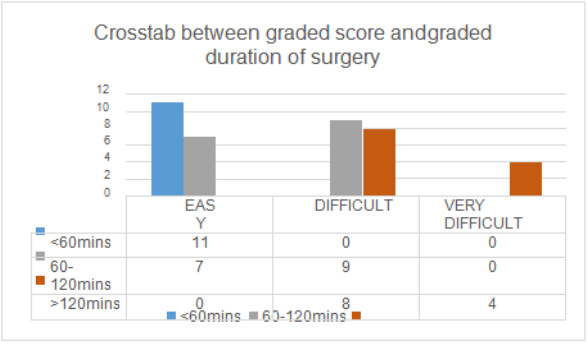
COC	Frequency	Percent	Exact 95% LCL	Exact 95% UCL
NO	34	87.18%	72.57%	95.70%
YES	5	12.82%	4.30Z	27.43%
TOTAL	39	100.00%		



CROSSTABULATION: Chi-square test for independence between graded duration of operation and graded total score shows very significant p-value of <0.00 and Pearson Chi-square value of 28.318 and degrees of freedom=4 as shown in table below:

Clino-sonographic score	<60mins	60-120mins	>120mins	TOTAL
EASY	11	7	0	18
DIFFICULT	0	9	8	17
VERY DIFFICULT	0	0	4	4
TOTAL	11	16	12	39

Chi-square	df	Probability
28.318	4	0

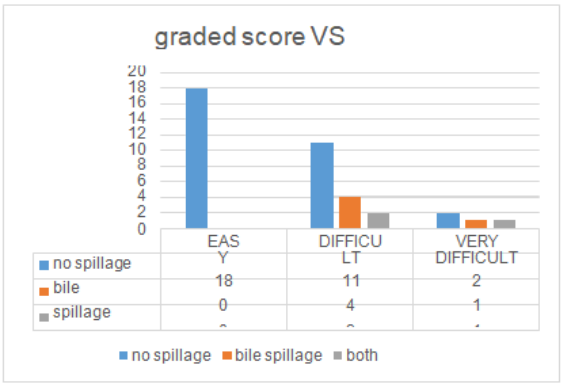


Out of 39 patients who were graded as Easy in 18 patients, 11 was easy while 7 was difficult as operative grading. Of 17 patients who were graded as difficult, 9 patients were difficult while 8 patients were very difficult. 4 patients were clinico-sonographically graded as very difficult and yielded the same operative results.

CROSSTABULATION: Chi-square test for independence between intraoperative biliary and stone leakage and graded total score shows very significant p-value of <0.05 and Pearson Chi- square value of 9.4577 and degrees of freedom=4.

SCORE VS SPILLAGE	No spillage	Bileonly	Bothbile+stone	TOTAL
EASY	18	0	0	18
DIFFICULT	11	4	2	17
VERY DIFFICULT	2	1	1	4
TOTAL	31	5	3	39

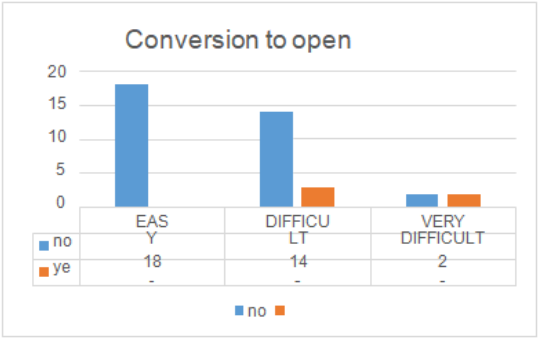
Chi-square	df	Probability
9.4577	4	0.0506



CROSSTABULATION: Chi-square test for independence between conversion to open cholecystectomyand graded total score shows very significant p-value of <0.018 and Pearson Chi- square value of 7.9484 and degrees of freedom=2.

Conversion to open	no	yes	TOTAL
EASY	18	0	18
DIFFICULT	14	3	17
VERY DIFFICULT	2	2	4
TOTAL	34	5	39

Chi-square	df	Probability
7.9484	2	0.0188



DISCUSSION

Laparoscopic cholecystectomy is the treatment of choice for cholelithiasis owing to its smaller incision, less pain, better cosmesis, faster recovery and lesser hospital stay. These study was initiated after obtaining approval from the Ethical Committee of Pims ;udaipur . Only consented patients and those eligible as per inclusion and exclusion criteria were included in the study. The total number of patients included in the study was 39. The study was conducted at Pims ;udaipur with the aim to pre operatively predict difficult laparoscopic cholecystectomy using the transabdominal ultrasound and clinical parameters and comparing them with intraoperative findings. The clinico- sonographic parameters were given certain scores which were graded to correlate with the difficulty level of surgery. A total of 39 patients with cholelithiasis who underwent laparoscopic cholecystectomy were included in the study. The mean age of the patients was 47 years (SD 13).

The age range of patient was between 24 and 75 years. 53% were female patients. Of these 39 patients, 17 had undergone previous abdominal surgeries. Of which 13 had infra umbilical, and 4 had supraumbilical surgeries. Obesity was present in 33.3% (95% CI 19-50). None of the patients had palpable gallbladder. None of the patients had any comorbidities. Out of 39 patients included in the study, 24 patients (61.54%) were below 50years, while 15 patients were above 50 years (38.46%). Of 39 patients who had undergone laparoscopic cholecystectomy, 25 patients had distended gallbladder, 7 had contracted gallbladder and 7 had normal gallbladder. 11 patients had normal GB wall thickness, 20 had 3- 4mm GB wall thickness and 8 patients had >4mm thickness. Of 39 patients, 3 patients had impacted Gall bladder stones (most of them in the neck of the GB). 31 patients had multiple gallbladder calculi. Pericholecystic collections were found in 8 patients.

CONCLUSION

To conclude this study, laparoscopic cholecystectomy is treatment of choice for cholelithiasis. Preoperative prediction with clinical and ultrasonographic parameters has a positive prediction for difficult laparoscopy. It can help us in predicting difficult surgery, prevent complications, obtain adequate and proper consent from patient, as well as proper planning of surgery. Gallbladder wall thickness, distended GB, impacted stones, pericholecystic collections, previous supraumbilical surgeries and Calot's triangle are of importance in prediction. Intraoperative difficulties were noted with thickened gallbladder wall, distended gallbladder, pericholecystic collections, frozen Calot's triangle and presence of previous supraumbilical surgery. There were several drawbacks in our study. Operating procedures were performed by different surgeons with different experience. The study population was small, which a larger sample size could have yielded a better outcome..

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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