



## CORRELATION OF PREOPERATIVE ULTRASONOGRAPHIC CRITERIA WITH INTRA OPERATIVE DIFFICULTIES OF LAPAROSCOPIC CHOLECYSTECTOMY AND THE POSSIBILITY OF CONVERSION TO OPEN CHOLECYSTECTOMY

<b>Dr. Thota Priyanka</b>	Post Graduate, Department of General Surgery, Alluri sitaramaraju academy of medical sciences, Eluru 524005, Eluru district, Andhra Pradesh, India
<b>Dr. B. Sandeep</b>	Professor, Department of General Surgery, Alluri sitaramaraju academy of medical sciences, Eluru 524005, Eluru district, Andhra Pradesh, India
<b>Dr. Srinivas Mahesh Ayyar</b>	Assistant Professor, Alluri sitaramaraju academy of medical sciences, Eluru 524005, Eluru district Andhra Pradesh, India

**ABSTRACT** **Aim:** The aim of this study was to utilise various parameters in pre operative ultrasonography and correlate this with intra operative findings in order to assess the possible difficulty of the surgery and to predict the necessity of Open Cholecystectomy prior to performing the surgery. **Material and Methods:** **Site of study:** Study was conducted at Alluri Sitarama Raju Academy Of Medical Sciences and General Hospital, Eluru **Type and Duration of Study** Study was a prospective analysis of symptomatic gall bladder stone and prediction of ultrasonographic finding and its correlations with intra operative findings. The total duration of study was around 12 months from DECEMBER 2022 to NOVEMBER 2023 **Sample size and study population** Assessment and Correlation of Technical Difficulties and Conversion to Open Procedure during Laparoscopic Cholecystectomy by Preoperative Ultrasonography. The study observed that the sensitivity and specificity of ultrasonography for predicting difficulties in surgery was 70.83% and 91.84% respectively and sensitivity of ultrasound to predict the conversion to open procedure was 76.47%, specificity was 85.71%. The total number of laparoscopic cholecystectomies attempted was 146 out of which 48 (32.9%) were difficult on surgery. Out of total 146 cases 34 (23.3%) cases were converted to open procedure. Taking these values as reference, the minimum required sample size with desired precision of 17.5% and 5% level of significance is 97 patients. **Results:** Maximum patients in our study were found to be in the age group of 50-59 yrs (24.49%). The mean age was 49.09 yrs and the vast majority of patients were females (81.63%). In this study, various parameters in pre operative ultrasonography were considered and correlated with intra operative findings and operative inference. Out of 98 patients, a total of 94 patients (95.92%) had mild intra operative bleeding and 4 (4.08%) had moderate intra operative bleeding. A statistically significant association was seen between duration of surgery and increase in gall bladder thickness (p-value <0.001), with impaction of stone at the neck of the gall bladder (p value 0.030), with the presence of aberrant anatomy, Phrygian cap (p value 0.041), CBD size (p-value <0.001) and with prediction by ultrasonography (p-value 0.001). In our study, different gall bladder morphology (i.e. phrygian cap) was seen in two patients and both were difficult during surgery. **Conclusion:** Pre-operative ultrasonography is a good indicator of difficulties which may be faced intra operatively by the surgeon. Increase in gall bladder wall thickness, presence of impaction of stone at the neck of the gall bladder and aberrant morphology of the gall bladder and Dilated CBD. It also helps us to plan out the surgery in advance and take consent and appraise the patient of the possible necessity for open cholecystectomy.

**KEYWORDS :** Pericholecystic Fluid, Aberrant Anatomy, Gas in Gallbladder wall, Common Bile Duct Size, Impacted Stone at neck of gall bladder, Conversion to Open Cholecystectomy.

### INTRODUCTION-

Cholelithiasis, which is one of the most common disease involving Gall bladder and biliary tree, was traditionally being dealt by conventional or open cholecystectomy. With the introduction of laparoscopic cholecystectomy (LC), the surgical community witnessed a revolution in ideology and minimal access surgery gained tremendous popularity.

The gold standard operative procedure today for dealing with cholelithiasis has become LC. Upwards of 80% of cholecystectomies are carried out laparoscopically nowadays.

Earlier return of bowel function, less postoperative pain, improved cosmesis, shorter length of hospital stay, earlier return to full activity and decreased overall cost are known advantages of laparoscopic cholecystectomy. Patients with bleeding diathesis and carcinoma gallbladder are the only major contraindications of treating gall stone disease with laparoscopic procedure.

According to recent studies, laparoscopic removal of gall bladder may be completed with less morbidity and mortality compared to that of traditional open cholecystectomy when performed by an experienced laparoscopic surgeon.

Complications of LC are injuries to the (CBD) common bile duct, injury to bowel, bladder, aorta, iliac vessels and vena cava.

These complications are more prone to happen if initial trocar is inserted blindly into the peritoneum. Limitations of laparoscopy are costly equipment and unavailability of such equipment.

Ultrasonography remains the common screening test for cholecystitis and cholelithiasis because of the relative ease with which it can be

performed, lack of ionizing radiation and ability to image the entire upper abdomen at the time of examination.

Ultrasonography has been shown to have an accuracy of 96% in the diagnosis of gall bladder calculi. The sensitivity with which ultrasonography can detect CBD calculi varies from 50% to 75%.

Thus, a few preoperative ultrasonographic factors may help in the prediction of difficulties during LC. Appropriate planning to avoid complications and difficulties intra operatively for the benefit of patient and surgeon may be accomplished by a proper appreciation of these variables. Improved patient counseling, safety and post operative expectations are also obvious benefits of this.

### AIMS AND OBJECTIVES:

1. To Predict intra-operative difficulties during laparoscopic cholecystectomy
2. To Optimize the duration of surgery and provide better patient counseling on the basis of prior ultrasound findings
3. To Correlate pre-operative ultrasound evaluation of the gallbladder with intraoperative complications.

### MATERIALS AND METHODS:

This study was conducted at ASRAM, ELURU Andhra Pradesh, during the calendar year 2021-2023 ASRAM is a 1100 bedded tertiary care hospital rendering services to the people of Andhra Pradesh and adjacent districts. The hospital has a 24 hours casualty department, 20-bedded surgical intensive care unit, several open wards with capacity for around 200 surgical patients, and equipped with an emergency operating room (8).

A retrospective study of 98 patients was done over a period of last one years (DECEMBER 2022 - NOVEMBER 2023).

**Inclusion criteria:**

1. Symptomatic Cholelithiasis
2. Cholecystitis (Early Presentation < 1week)
3. Age > 18 years
4. ASA score <= 3
5. BMI < 30

**Exclusion Criteria**

1. BMI >= 30
2. History of > 3 Previous Abdominal Surgeries
3. Dilated CBD > 10mm
4. CBD Stone
5. Previous CBD Exploration
6. Pancreatitis
7. Abdominal wall Infections
8. Allergic reactions to drugs
9. Non compliant Patients
10. ASA Score > 3
11. Bleeding Diathesis

Prior approval was taken from Ethical Committee of Alluri Sitarama Raju Academy Of Medical Sciences and General Hospital before the study was initiated. Written informed consent was also taken from the patient for both Laparoscopic and Open Cholecystectomy prior to conducting the surgery.

All patients have been evaluated pre-operatively by ultrasound of abdomen. The pre operative criteria which were taken into consideration are given below. These criteria were then matched against certain intra operative criteria which are also given below. Each pre operative criteria was compared against an intra operative criteria and routine investigations and informed consent. Patients were also informed about the possibility of conversion to open cholecystectomy.

The pre operative ultrasonographic criteria which were taken into consideration were:

1. Gall Bladder size: Normal, Distended, Contracted
2. Number of stone: Single, Multiple
3. Size of stone : Large (>1cm), Small (<1cm)
4. Pericholecystic fluid : Present, Absent
5. Aberrant Anatomy (double gall bladder, intrahepatic gall bladder)
6. Gas in gall bladder wall : Presence, Absence
7. Mobility of Stones in gall bladder: Mobile, Immobile
8. CBD size : >8mm, <8mm
9. GB wall thickness : <4mm, >4mm
10. Stone impaction at the neck of GB

Intra operative criteria which were taken into consideration were:

1. Total duration of surgery from the insertion of Veress needle to the extraction of gall bladder : >120 mins, < 120 mins
2. Total time taken to dissect the Calot's Triangle : >20 mins, <20 mins
3. Total time taken to dissect the gall bladder from the gall Bladder bed >20 mins, < 20mins
4. Tear of gall bladder & spillage of bile and stone : Present, Absent
5. Bleeding : Mild, Moderate (requiring fluid replacement in excess of usual) Severe (requiring transfusion of blood or blood products)
6. Extraction of gall bladder : Easy, Difficult (If extraction of gall bladder requires extraction of port or decompression of gall bladder)
7. Conversion to Open Cholecystectomy : Yes, No

**RESULTS:**

Maximum patients in our study were found to be in the age group of 50-59 yrs (24.49%). The mean age was 49.09 yrs and the vast majority of patients were females (81.63%).

**Table 1 : Distribution of age interval in study population**

Age interval	N	%
20-29	11	11.22%
30-39	17	17.35%
40-49	21	21.43%
50-59	24	24.49%
60-69	16	16.33%
70-80	9	9.18%
TOTAL	98	100%
Mean	49.08	
+/- SD	14.67	

**Table 2 : Association of intra-operative findings with ultrasonographic parameter.**

ULTRASONOGRAPHIC PARAMETERS		INTRA OPERATIVE BLEED		DURATION OF SURGERY		CALOT'S DISSECTION	
		Mild {n (%)}	Moderate {n (%)}	<120 mins {n (%)}	>120 mins {n (%)}	<20 mins {n (%)}	>20 mins {n (%)}
Gall bladder wall thickness (mm)	<4	77(81.91%)	1(25%)	72(92.31%)	6(30%)	73(90.12%)	4(28.57%)
	>4	17(18.09%)	3(75%)	6(7.69%)	14(70%)	8(9.88%)	10(71.43%)
Peri cholecystic fluid		8(8.5%)	1(25%)	5(6.41%)	4(20%)	5(6.17%)	4(28.57%)
Gall bladder size	Normal	85(90%)	1(25%)	69(88.46%)	17(85%)	71(87.65%)	13(92.86%)
	Distended	6(6.38%)	0(0%)	6(7.69%)	0(0%)	6(7.41%)	0(0%)
	Contracted	3(3.19%)	3(75%)	3(3.85%)	3(15%)	4(4.94%)	1(7.14%)
Stone size (cm)	<1	74(78.72%)	3(75%)	62(79.49%)	15(75%)	64(79.01%)	10(71.43%)
	>1	20(21.28%)	1(25%)	16(20.51%)	5(25%)	17(20.99%)	4(28.57%)
No. of stones	Single	12(12.7%)	0(0%)	11(14.10%)	1(5%)	12(14.81%)	0(0%)
	Multiple	82(87.23%)	4(100%)	67(85.90%)	19(95%)	69(85.19%)	14(100%)
Stone impacted at GB neck		8(8.51%)	0(0%)	4(5.13%)	4(20%)	5(6.17%)	2(14.29%)
Aberrant anatomy		2(2.13%)	0(0%)	0(0%)	2(10%)	0(0%)	0(0%)
Gas in GB wall		11(11.70%)	0(0%)	10(12.82%)	1(5%)	10(12.35%)	0(0%)
Common bile duct size (in mm)	<8	76(80.85%)	2(50%)	73(93.58%)	5(25%)	70(87.50%)	8(53.33%)
	>8	18(19.14%)	2(50%)	5(6.42%)	15(75%)	10(12.50%)	7(46.67%)
Liver Mobility	+	71(75.53%)	3(75%)	60(76.92%)	14(70%)	62(75.60%)	10(71.43%)
	-	23(24.47%)	1(25%)	18(23.08%)	6(30%)	20(24.40%)	3(23.08%)
Prediction by ultrasonography	Simple	53(56.38%)	1(25%)	50(64.10%)	4(20%)	58(62.96%)	3(21.43%)
	Difficult	41(43.62%)	3(75%)	28(35.90%)	16(80%)	30(37.04%)	11(78.57%)

**Table 3 : shows Ultrasonographic features with intra operative findings**

TEAR OF GALL BLADDER AND SPILLAGE OF STONES AND BILE	n	%
YES	11	11.22%
NO	87	88.78%
TOTAL	98	100%
OPERATIVE INFERENCE	n	%
Easy	84	85.71%

Difficult	14	14.29%
TOTAL	98	100%

75% of patients with moderate intra operative bleeding had gall bladder wall thickness of > 4mm and a contracted gall bladder. This showed that the GB wall thickness was a statistically significant factor (p value 0.006 and < 0.001 respectively).

It was seen that 100% of patients with moderate bleeding had multiple calculi and 25% had stone size > 1cm. No statistically significant association was found.

For 75% of patients with moderate bleeding, the ultrasound prediction was difficult. Association was insignificant statistically.

70% of patients with duration of surgery > 120 minutes had gall bladder wall thickness > 4 mm. Association was found to be statistically significant (p value < 0.001).

A significant association was found between duration of surgery and stone impacted at gall bladder neck (p-value 0.030) and also with aberrant anatomy (p-value 0.041).

A significant association was found between duration of surgery and:

- i. CBD size (p-value 0.001)
- ii. Prediction of difficulty by ultrasonography (p-value 0.001) It was observed that a significant association was seen between "time to dissect gall bladder bed" and
  - i. Gall bladder wall thickness (p-value 0.001).
  - ii. Gall bladder size (p-value 0.008).
- iii. A statistically significant association was seen between "Time to dissect calot's triangle" and prediction by ultrasonography (p-value 0.007) and CBD size (p-value 0.001)

A statistically significant association was observed between "extraction of gallbladder" and gall bladder wall thickness (p-value 0.001).

A statistically significant association was observed between "Extraction of gall bladder" and Prediction of difficulty by ultrasonography (p-value 0.02)

A statistically significant association was found between "tear of gallbladder and spillage of bile and stones" and prediction by ultrasonography (p-value 0.011)

A statistically significant association was found between "operative inference by surgeon" and gall bladder wall thickness (p-value 0.001) A statistically significant association was found between "operative inference by surgeon" and stone impacted at gall bladder neck (p-value 0.043) and aberrant anatomy (p-value 0.02)

A statistically significant association was found between "operative inference by surgeon" and:

- i. CBD size (p-value 0.024).
- ii. Liver mobility (p-value 0.005)
- iii. Prediction by ultrasonography (p-value 0.008)

## DISCUSSION

Total number of cases in our study was 98. Maximum patients in our study were found to be in the age group of 50-59 yrs (24.49%). The mean age was 49.09 yrs and the vast majority of patients were females (81.63%).

In this study, various parameters in pre operative ultrasonography were considered and correlated with intra operative findings and operative inference.

On the basis of our study, it was seen that intra operative bleeding had a statistically significant association with gall bladder wall thickness (p-value 0.006) and size of the gall bladder (p value < 0.001).

Based on the findings by Nachnani et al in his study, it was found that bleeding occurred more often in patients with gall bladder wall thickness exceeding 3 mm.

Out of a total of 98 patients, up to 80% had a duration of surgery less than 120 mins. A statistically significant association was seen between duration of surgery and increase in gall bladder thickness (p-value

< 0.001), with impaction of stone at the neck of the gall bladder (p-value 0.030), with the presence of aberrant anatomy, Phrygian cap (p-value 0.041), CBD size (p value < 0.001) and with prediction by ultrasonography (p-value 0.001).

In our study, different gall bladder morphology (i.e. phrygian cap) was seen in two patients and both were difficult during surgery. Around 4% of the population exhibit Phrygian cap, or pseudo-duplication of the gall bladder.

According to the study of VR Anil kumar et al, it was reported that phrygian cap may be associated with anomalies of biliary tree, which may lead to a difficult surgery.

## CONCLUSION

Pre-operative ultrasonography is a good indicator of difficulties which may be faced intra operatively by the surgeon. Increase in gall bladder wall thickness, presence of impaction of stone at the neck of the gall bladder and aberrant morphology of the gall bladder and Dilated CBD. It also helps us to plan out the surgery in advance and take consent and appraise the patient of the possible necessity for open cholecystectomy. The possible limitation of our study is due to the fact that, even though a sample size of 98 is considered substantial from a statistical point of view, the number of difficult surgical cases was only 14, which is obviously small in comparison. A larger sample size could have given us a better indicator of PPV probably.

## REFERENCES

1. Antoni B, Francis G, Stalpart Ven Der Weil, Carl Langenbech and the first cholecystectomy. Am J Surg. 1976; 132:81-2.
2. Cuschieri A, Dubois F, Mouiel J, Mouret P, Becker H, Buess G, et al. The European experience with laparoscopic cholecystectomy. Am J Surg. 1991; 161(3):385-7
3. The Southern Surgeon Club. A prospective analysis of 1518 laparoscopic cholecystectomies. N Engl J Med. 1991; 324(16): 1073-8.
4. Liu CL, Fan ST, Lai EC, Lo CM, Chu KM. Factors affecting conversion of laparoscopic cholecystectomy to open surgery. Arch Surg. 1996; 131(1):98-101.
5. Barkun JS, Barkun AN, Sampalis JS et al. Randomized controlled trial of laparoscopic versus minilaparotomy cholecystectomy. Lancet. 1992; 340:1116-1119.
6. Bas EB, Pitt HA, Lillemo KD. Cost-effectiveness of laparoscopic cholecystectomy versus open cholecystectomy. Am J Surg. 1993; 165:466-471.
7. McMahon A, Russell I, Baxter J et al. Laparoscopic versus minilaparoscopic cholecystectomy randomised trial. Lancet. 1994; 343:135-138.
8. Soper NJ. Laparoscopic cholecystectomy. Curr Probl Surg 1991; 28:585-655.
9. Soper NJ, Barteau J, Clayman R, et al. Laparoscopic versus standard open cholecystectomy: comparison of early results. Surg Gynecol Obstet. 1992; 174:114-118.
10. Hunter JG, Trus T. Laparoscopic cholecystectomy. In: Nyhus LM, Baker RJ, Fischer JE, editors. Mastery of Surgery. 3rd ed., vol I, Boston: Little Brown and company. 1997:1098.
11. Perters JH, Ellison EC, Innes JT et al. Safety and efficacy of laparoscopic cholecystectomy: A prospective analysis of 100 initial patients, Ann Surg 1991; 213:3-12.
12. Hanney RM, All KM, Cregan PC, et al. Major vascular injury and laparoscopy. Aust N Z J Surg. 1995; 65:533-535.
13. Cogliandolo A, Monganaro T, Saitta FP, et al. Blind versus open approach to laparoscopic cholecystectomy: a randomized study. Surg Laparosc Endo. 1998; 8:353-355.
14. Peter L, Robert G. Imaging of the gall bladder. Radiology. Vol 63. 1987; 3:605-607.
15. Peter C, Jeremy J, W. Lau. Preoperative ultrasonography to predict technical difficulties and complications of laparoscopic cholecystectomy. The American journal of surgery Vol. 168 July; 1994:54-56.
16. Glenn F, Grafe WR Jr. Historical events in biliary tract surgery. Arch Surg. 1966; 93: 848-52.