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To study the correlation of preoperative ultrasonographic findings and surgical outcome in laparoscopic cholecystectomy

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Abstract

Objective: To examine whether or not preoperative ultrasonography results were related to surgical outcome in laparoscopic cholecystectomy.

Methods: After clearance from institutional ethical committee, 50 patients with diagnosed Cholelithiasis, who underwent laparoscopic cholecystectomy in department of General surgery HIMS, Sitapur from January 2021 to October 2022, were selected after meeting inclusion and exclusion criteria. Patients with Acute Cholecystitis, presenting within 72 hours of onset of pain and all patients, of any age group & sex after six week of acute phase of Cholecystitis with Cholelithiasis on USG were included in the study. A total of 50 patients were included in the study.

Results: More than one third of patients were 30-40 & >40 years of age (40%) followed by <30 (20%) years. Distended GB was the most common on pre-operative USG abdomen-Gall bladder(92%) and Multiple stone was the second most common on pre-operative USG abdomen-Gall bladder (72%). Easy operative status was among majority of patients (84%) and difficult was in 16% patients. Gall bladder with Operative status. Wall thickness >3 mm ($p=0.009$), Mucocele ($p=0.02$) and Chronic cholecystitis ($p=0.001$) were significantly associated Pre-operative USG abdomen: Gall bladder with Operative status. The mean hospital stay was 12.82 ± 7.14 days.

Conclusion: GB Wall thickness >3 mm, Mucocele and Chronic cholecystitis were significantly associated Pre-operative USG abdomen: Gall bladder with Operative status. Pre-operative USG abdomen: Calot's with Operative status was significantly associated Pre-operative USG abdomen: Calot's with Operative status. Intra-operative score was significantly higher among patients of Difficult than easy.

Key words: Ultrasonographic, Laparoscopic cholecystectomy, cholelithiasis

INTRODUCTION

In 10-15% of the population, cholelithiasis (gallstones) is present, making it one of the most prevalent causes of abdominal discomfort. Cholecystectomy is the most frequent operation done by general surgeons, despite the fact that the majority of patients who undergo the procedure (>80%) do not experience any symptoms (Abd-El-Aal AS and Abdallah, 2018; Bustos et al, 2019).

Cholelithiasis is found throughout Asia, with rates ranging from 3 to 10 percent. Recent studies have found that the rates are 3.2 percent in Japan, 10.7 percent in China, 7.1 percent in North India, and 5 percent in Taiwan (Nomura et al, 1988; Sun et al, 2009; Unisa et al, 2011; Chen et al, 2006).

There are two types of risk factors for gallbladder (GB) disease: (1) ineluctable, such as race, age, gender, and pregnancy; and (2) preventable, which include lifestyle choices. The prevalence of gallstones increases dramatically with increasing body mass index. Gallstone development is connected with elevated levels of triglycerides, low levels of high-density lipoprotein (HDL), and high levels of LDL (Aune et al, 2015).

Physical exercise also seems protective, since it lowers the likelihood that an individual would develop cholelithiasis. Gallstones originally formed from pigment, but their composition shifted to cholesterol as a result of dietary and lifestyle factors, especially with the Westernization of the diet (more fat in the diet) (Larsson et al, 2017).

Although laparoscopic cholecystectomy is a safe and successful procedure, it is also considered one of the most challenging laparoscopic surgeries due to potential complications such as difficulties generating pneumoperitoneum, reaching the peritoneal cavity, and releasing adhesions. In addition, significant inflammation may make it hard for surgeons to locate Calot's triangle, which can further complicate LC procedures. Thus, after LC, severe acute cholecystitis (AC) patients have a high rate of complications like bile leakage, common bile duct injury, and bowel injury, highlighting the importance of inflammation severity assessment (Vivek et al, 2014; Inoue et al, 2017).

Therefore, difficult laparoscopic cholecystectomy, also known as DLC, is a primary issue that surgeons may face when treating AC. A precise prediction of DLC can assist surgeons in preparing for perioperative challenges, improving the efficiency of surgical procedures, and lowering the risk of postoperative complications. However, there are few scoring methods to assess the risk of converting a laparoscopic cholecystectomy (LC) to an open one, and these symptoms do not accurately predict DLC (Wu et al, 2019).

Therefore, evaluating cholecystectomy difficulties and negative surgical outcomes is important. In this respect, USG may play an important role.

The goal of this research was to examine whether or not preoperative ultrasonography results were related to surgical outcome in laparoscopic cholecystectomy.

MATERIAL AND METHODS

After clearance from institutional ethical committee, 50 patients with diagnosed Cholelithiasis, who underwent laparoscopic cholecystectomy in department of General surgery HIMS, Sitapur from January 2021 to October 2022, were selected after meeting inclusion and exclusion criteria.

Patients with Acute Cholecystitis, presenting within 72 hours of onset of pain and all patients, of any age group & sex after six week of acute phase of Cholecystitis with Cholelithiasis on USG were included in the study. All patients with CBD stones & obstructive jaundice, patients with abnormal liver function test (raised alkaline phosphatase), patients with acute Cholecystitis, more than 72 hours but less than six week, patients with known carcinoma gall bladder, patient unfit for surgery, patients with bleeding disorders and female with pregnancy were excluded from the study.

Methods

Name, date of birth, gender, religion, marital status, occupation, residence, complaints, surgical history, family history, alcoholism, diabetes, immune deficiency states, biliary tract diseases, amoebic dysentery, and jaundice are all examples of pieces of demographic data that were collected. A detailed history and thorough clinical examination were entered in proforma to evaluate presentation and risk factors in laparoscopic cholecystectomy. Complete hemogram, bleeding time, clotting time, LFT and prothrombin time would be sent along with other baseline investigations like RBS, RFT, urine for routine/microscopy, stools for ova and cyst. Serum amylase and Lipase were also sent. Chest X ray and ECG was done in routine. The preoperative USG parameters were taken just prior to surgery and were recorded as per table no.

Laparoscopic cholecystectomy was performed by the same experienced senior surgeon. Intraoperative findings were divided into easy laparoscopic cholecystectomy, difficult laparoscopic cholecystectomy and conversion to open cholecystectomy. At least one of thick gallbladder adhesions, liver bed adhesions, or frozen Calot's triangle will make laparoscopic cholecystectomy difficult.

The intra-operative parameters that was judged the ultrasound predictability was recorded as per table no. 2, namely duration of surgery from the insertion of verres needle to the extraction of gallbladder (More than or less than 90 minutes), total time taken to dissect the calot's triangle (more than or less than 20 minutes), total time taken to dissect gallbladder from gallbladder bed (more than or less than 20 minutes), spillage of bile and stone present or not, tear of gallbladder present or not, any other complication during surgery.

Statistical analysis

The information was first recorded in a spreadsheet (Excel, Microsoft corp.), and then transferred to statistical software, EPI6 Info, for further examination. For this purpose, we used the Chi-

square test and the Mann-Whitney U test. When the probability level was less than 0.05, it was deemed significant. SPSS 16.0 was used for all statistical analyses (Chicago, Inc., USA).

RESULTS

More than one third of patients were 30-40 & >40 years of age (40%) followed by <30 (20%) years. The mean age of patients was 39.58 ± 11.88 years. Majority of patients were females (76%). The duration of abdominal pain was >40 days among more than half of patients (54%) followed by <20 days (24%), 20-30 days (18%) and 31-40 days (4%). The mean duration of abdominal pain was 59.84 ± 45.20 days. Nausea was the most common symptomology (44%) followed by vomiting (16%) and fever (4%). Localized right hypochondrium tenderness and Localized right hypochondrium tenderness was in 54% and 6% patients respectively (Table-1).

Gall bladder. Distended GB was the most common on pre-operative USG abdomen-Gall bladder (92%) and Multiple stone was the second most common on pre-operative USG abdomen-Gall bladder (72%). Wall thickness >3 mm was the third most common on pre-operative USG abdomen-Gallbladder (58%). Calot's. Frozen calot's was in 18% patients on pre-operative USG abdomen-Calot's. Size dilatated and stone each was in 2% patients on pre-operative USG abdomen-CBD (Table-2).

Easy operative status was among majority of patients (84%) and difficult was in 16% patients (Fig.1).

Gall bladder with Operative status. Wall thickness >3 mm ($p=0.009$), Mucocele ($p=0.02$) and Chronic cholecystitis ($p=0.001$) were significantly associated Pre-operative USG abdomen: Gall bladder with Operative status. Pre-operative USG abdomen: Calot's with Operative status was significantly ($p=0.0001$) associated Pre-operative USG abdomen: Calot's with Operative status. Intra-operative score was significantly ($p=0.0001$) higher among patients of Difficult (4.25 ± 2.12) than easy (0.83 ± 1.16) (Table-3).

The hospital stay was 7-14 days among half of patients (50%) followed by < 7 & 15-21 (18%) and >21 (14%) days. The mean hospital stay was 12.82 ± 7.14 days (Table-4).

DISCUSSION

3-20 % of the world's population suffers with gallstones, making it a major public health issue. Many people with this condition have no symptoms at all, and they are only discovered during routine ultrasonography examinations. When it comes to removing a diseased gallbladder, laparoscopic cholecystectomy (LC) is now the preferred method of surgery. Some of the advantages of LC over open surgery include a shorter hospital stay, less postoperative discomfort, faster healing, better cosmesis, and lower cost (Bittner, 2006).

Surgeons may be better prepared for surgery if they have access to preoperative information based on radiological findings that indicates an increased likelihood of intra-operative complications necessitating conversion to open surgery. More exact preoperative counselling, more efficient use of operating room time, more accurate risk assessment for technical challenges, and more suitable team assignment are all possible outcomes. By reducing the amount of time it takes to convert and by helping both surgeons and patients mentally prepare for the procedure, it has the potential to enhance patient safety. Difficulties in describing the

anatomy clearly or challenges emerging during treatment account for the vast majority of conversions, while patient and surgeon factors and equipment failure also play a role. When an intra-operative complication becomes severe enough to jeopardize the patient's life, the surgeon may choose to switch to open surgery, or the patient may make the decision for him or her. Data from published works show that voluntary conversion has no detrimental effect on patient outcomes, but forcible conversion significantly increases morbidity. Instead of seeing conversion as a technological failure, surgeons should view it as an opportunity to improve surgical procedures in cases when it is necessary (Radu et al, 2011).

Ultrasonography is widely available, safe, benign, and inexpensive, making it the initial imaging method for biliary system diagnosis and evaluation. This device allows real-time gallbladder study and evaluation of other findings that aid diagnosis, eliminating unnecessary cholecystectomies and their consequences (Rosenthal et al, 1990).

USG is now the gold standard for diagnosing cholecystitis and cholelithiasis in patients. Ultrasonography-based gallstone detection is now reliable in over 90% of symptomatic individuals. In 93% of patients, ultrasonography is accurate to within 1 mm when measuring gallbladder wall thickness. In some, but not all, accounts from the medical literature, a gallbladder wall thickness larger than 3 mm is indicative of cholecystitis. The literature has several clinical studies demonstrating a correlation between gallbladder wall thickness measured by preoperative ultrasonography and the degree of difficulty in performing an LC (Rosen et al, 2002).

In order to determine which pre-operative ultrasonographic indicators are most predictive of a successful laparoscopic cholecystectomy, the current research was conducted in the Department of General Surgery at HIMS, Sitapur. As many as fifty people were included in the research.

In this study, more than one third of patients were 30-40 & >40 years of age (40%) followed by <30 (20%) years. Patients averaged 39.58 ± 11.88 years. Patients were 76% female. Two (4%) of cases were in the age group (20-30), 20 (40%) were in (31-40), 22 (44%) were in (41-50), and 6 (12%) were in (51-60). 41.82 ± 7.65 years. 33 (66%), female. 77 In a research, the mean age \pm SD of 177 patients operated was 47.72 ± 17.54 years. 73 The youngest patient was 16 and the oldest was 68. Most patients were 40-50 (34.9%). Average age was 46. 32 (38%) of 86 patients were male and 54 (62%) were female (Bhondave et al, 2017).

In the present study, the duration of abdominal pain was >40 days among more than half of patients (54%) followed by <20 days (24%), 20-30 days (18%) and 31-40 days (4%). The mean duration of abdominal pain was 59.84 ± 45.20 days.

Nausea was the most common symptomology (44%) followed by vomiting (16%) and fever (4%) in this study. This study showed that the normal Built general finding was among majority of patients (96%) followed by average & obesity (2%). In this study, localized right hypochondrium tenderness and Localized right hypochondrium tenderness (Murphy's sign) was in 54% and 6% patients respectively.

In this study, Distended GB was the most common finding on pre-operative USG abdomen (92%) and Multiple stone was the second most common finding on pre-operative USG abdomen

(72%). Wall thickness >3 mm was the third most common finding on pre-operative USG abdomen (58%). Frozen calot's was seen in 18% patients on pre-operative USG abdomen. In this study, CBD Size dilated and stone present, each was in 2% patients on pre-operative USG abdomen.

This study found that the hospital stay was 7-14 days among half of patients (50%) followed by < 7 & 15-21 (18%) and >21 (14%) days. The mean hospital stay was 12.82 ± 7.14 days. It was found in another study that the postoperative hospital stay was 2 ± 1 days (Bhondave et al, 2017).

In the present study, Easy operative status was among majority of patients (84%) and difficult was in 16% patients. Another study showed that 33 (66%) cases had easy operation. Furthermore, 14 (28%) patients had difficult laparoscopic cholecystectomy and 3 (6%) were found to be very difficult on laparoscopic cholecystectomy. Another study found 85 (42.5%) patients had easy laparoscopic cholecystectomy and 115 (57.5%) had difficult. Studying stone impaction and pericholecystic collection. It was founded that 80 of 150 patients had easy LC and 70 had difficult LC (Sahota IK and Kumar, 2020; Fathy El-sayed Darwish et al, 2022).

This study showed that Wall thickness >3 mm ($p=0.009$), Mucocele ($p=0.02$) and Chronic cholecystitis ($p=0.001$) were significantly associated Pre-operative USG abdomen: Gall bladder with Operative status. Another studied showed that statistically significant differences were found between the two groups of easy and difficult LC regarding gallbladder wall thickness ($P = 0.008$), stone impaction ($P = 0.009$), and gallbladder flow ($P = 0.04$) (Jalil et al, 2020). In this study, Pre-operative USG abdomen: Calot's with Operative status was significantly ($p=0.0001$) associated Pre-operative USG abdomen: Calot's with Operative status.

Intra-operative score was significantly ($p=0.0001$) higher among patients of Difficult (4.25 ± 2.12) than easy (0.83 ± 1.16) in the current study. 90.9% of Easy Pre-operative score patients had easy intra-operative scores, 9.1% had intermediate. 33.3% of individuals with difficult pre-operative scores had easy, 11.1% moderate, 22.2% severe, and 33.3% extreme intra-operative scores. Pre-operative and intraoperative scores correlated. The research found that precise prediction can tell high-risk patients about conversion likelihood so they can plan beforehand. Surgeons should also know about high-risk patient problems. Radiological markers were also excellent indicators of difficulties. In another study, preoperative score predicted easy cholecystectomy for 157 (75.5%) patients and difficult for 51 (24.5%). Of the 33 patients, 10 scored as Difficult and Very Difficult preoperatively, 9 were difficult intra-operatively, and 9 had complications with prediction accuracy of 94.45%. 3 instances (9%) required open surgery owing to thick adhesions at Calot's triangle and uncontrolled cystic artery haemorrhage (Shaban et al, 2020; Iqbal et al, 2020; Bhagavan et al, 2021).

History of acute cholecystitis, overweight with BMI >27.5 kg/m², palpable gallbladder, wall thickness >4 mm, and impacted stone were the most reliable preoperative predictors of DLC in patients over 50. Preoperative assessment and intraoperative outcome were statistically associated. The research found that preoperative and intraoperative grading might aid evaluation,

experience, and decision-making. Validating these rating methods required a large-scale prospective research. In the prior research, 7.9% converted. At preoperative score 5, sensitivity, specificity, positive predictive value, and negative predictive value were 89.40% (CI: 83.36%-93.82%), 69.23% (CI: 48.21%-85.67%), 94.41% (CI: 90.44%-96.79%), and 52.94% (CI: 39.85%-65.64%). Abdominal scar, recent hospitalization, and enlarged gall bladder wall were statistically significant risk variables in multivariate analyses (Kumar et al, 2021; Baral et al, 2020).

Lack of follow-up and a very small sample size were two of the study's drawbacks. Results from research with bigger sample sizes tend to be more reliable.

CONCLUSION

GB Wall thickness > 3 mm, Mucocele and Chronic cholecystitis were significantly associated Pre-operative USG abdomen: Gall bladder with Operative status. Pre-operative USG abdomen: Calot's with Operative status was significantly associated Pre-operative USG abdomen: Calot's with Operative status. Intra-operative score was significantly higher among patients of Difficult than easy.

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Table-1: Basic profile of patients

	No. (n=50)	%
Age in years		
<30	10	20.0
30-40	20	40.0
>40	20	40.0
Mean±SD	39.58±11.88	
Gender		
Male	12	24.0
Female	38	76.0
Duration of abdominal pain		
<20 days	12	24.0
20-30 days	9	18.0
31-40 days	2	4.0
>40 days	27	54.0
Mean±SD	59.84±45.20	
Symptomology#		
Jaundice	0	0.0
Fever	2	4.0
Chills/Rigor	0	0.0
Nausea	22	44.0
Vomiting	8	16.0
Abdominal findings#		
Generalized Tenderness	0	0.0
Localized right hypochondrium tenderness	27	54.0
Guarding	0	0.0
Murphy's Sign	3	6.0
Ascites	0	0.0

#Multiple response

Table-2: Distribution of patients according to Pre-operative USG abdomen: Gall bladder

Gall bladder	No. (n=50)	%
Gall bladder		
Wall thickness>3 mm	29	58.0
Impacted stones	5	10
Pericholecystic fluid	5	10
Mucocele	1	2.0
Acute cholecystitis	3	6.0
Sub acute cholecystitis	2	4.0
Chronic cholecystitis	11	22.0
Solitary Stone	13	26.0
Multiple stone	36	72.0
Distended GB	46	92.0
Calot's		
Normal	41	82.0
Frozen calot's	9	18.0
GBD		
Size dilatated	1	2.0
Stone	1	2.0

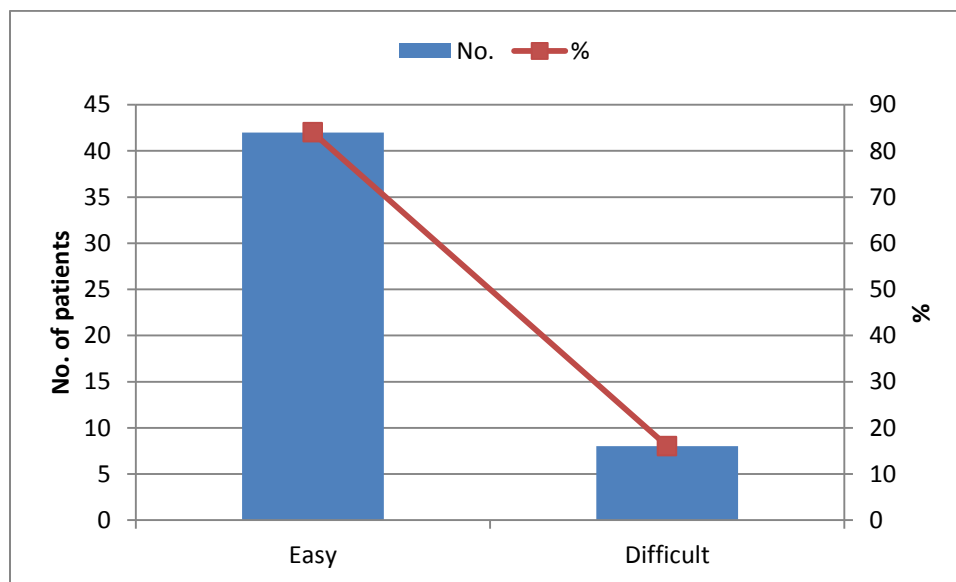
**Fig.1: Distribution of patients according to Operative status**

Table-3: Association of Pre-operative USG abdomen: Gall bladder with Operative status

	No. of patients	Easy		Difficult		p-value ¹
		No.	%	No.	%	
Gall bladder						
Wall thickness>3 mm	29	21	72.4	8	27.6	0.009*
Impacted stones	5	4	80.0	1	20.0	0.79
Pericholecystic fluid	5	3	60.0	2	40.0	0.12
Mucocele	1	0	0.0	1	100.0	0.02*
Acute cholecystitis	3	3	100.0	0	0.0	0.43
Sub acute cholecystitis	2	2	100.0	0	0.0	0.52
Chronic cholecystitis	11	5	45.5	6	54.5	0.001*
Solitary Stone	13	11	84.6	2	15.4	0.94
Multiple stone	36	30	83.3	6	16.7	0.83
Distended GB	46	3	75.0	1	25.0	0.60
Calot's						
Normal	41	39	95.1	2	4.9	0.0001*
Frozen calot's	9	3	33.3	6	66.7	
Clinical score	1.12±1.55		0.00±0.00			-
USG score	2.62±1.06		3.00±0.00			-
Intra-operative score	4.25±2.12		0.83±1.16			0.0001*

¹Chi-square test, *Significant

Table-4: Distribution of patients according to Hospital stay

Hospital stay	No. (n=50)	%
<7 days	9	18.0
7-14 days	25	50.0
15-21 days	9	18.0
>21 days	7	14.0
Mean ± SD	12.82±7.14	