Journal of Coastal Life Medicine

Using Clinicoradiological Assessment to Identify Patients Likely to Have A Difficult Laparoscopic Cholecystectomy

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Abstract

Background: Open cholecystectomy has been superseded with laparoscopic surgery. Laparoscopic cholecystectomy preserves immune function and reduces inflammation better than open surgery.

Objective: To evaluate how clinical and radiological variables predict difficult laparoscopic cholecystectomy and how preoperative factors affect intraoperative acute cholecystitis severity.

Materials and Methods: Department of Surgery conducted this prospective research from December 2017 through June 2019. The study comprised 60 tertiary health centre surgical ward patients with cholelithiasis/cholecystitis who were clinically examined and verified by USG. Patients under 18 with CBD calculus, elevated ALP, dilated CBD, needing CBD exploration, obstructive jaundice, and unwilling for laparoscopic cholecystectomy were eliminated. The study received ethical approval from the institute and patient consent. SPSS 22 gathered and analysed the data.

Results: Females dominated (68.33%) while 31–40-year-old had the most instances (38.33%). Every patient had chronic pain. Laparoscopic to open cholecystectomy conversion was 10%. BMI, impacted stone, prior surgery, and acute cholecystitis significantly affected pre-operative score.

Conclusion: Preoperative grading predicts laparoscopic cholecystectomy outcomes statistically and clinically.

1. Introduction –

Gallstone disease is a common digestive problem. Gallstones occur in 11–36% of autopsy reports. Age, gender, and ethnicity affect gallstone prevalence. Gallstone prevalence varies globally. Gallstones affect 20 million Americans, and 1 million new instances of cholelithiasis are identified annually. India estimates 4%. North Indians had seven times more gallstones than south Indians, according to a railroad employee epidemiological survey (Tendon, 2003). Western food, socioeconomic change, and rural and urban access to ultrasonography are the main causes of India's rising prevalence.

Certain conditions cause gallstones. Obesity, pregnancy, dietary variables, Crohn's disease, terminal ileal resection, gastric surgery, genetic spherocytosis, sickle cell disease, and thalassemia cause gallstones. Gallstones are three times more common in women and two times more common in their first-degree relatives (Schwartz, 2015).

Most gallstone patients never have symptoms. Some people acquire symptomatic biliary colic from a cystic duct stone for unknown reasons. Symptomatic gallstone disease may cause problems. Acute cholecystitis, choledocholithiasis with or without cholangitis, gallstone pancreatitis, cholecystocholedochal fistula, cholecystoduodenal fistula, cholecystoenteric fistula, gallstone ileus, and gallbladder cancer are examples. Gallstone problems seldom present.

Ultrasonography, CT scans, abdominal radiography, and laparotomy often detect gallstones in individuals without biliary symptoms. Biliary colic and major gallstone consequences have been studied. 3% of asymptomatic patients develop biliary colic yearly (Schwartz, 2015). Biliary colic symptoms often repeat. Complicated gallstone disease affects 3–5% of symptomatic people annually. Over 20 years, two-thirds of asymptomatic gallstone patients remain symptom-free (Schwartz, 2015).

Laparoscopic cholecystectomy is the gold standard for cholelithiasis and symptomatic gallbladder stone

Journal of Coastal Life Medicine

disorders (Tendon., 2003). The US's most prevalent procedure has climbed from 5 to 7 lakhs/year ("NIH Consensus Conference. Gallstones and Laparoscopic Cholecystectomy," 1993). Laparoscopic cholecystectomy improves bowel function, discomfort, cosmetics, hospital stay, full activity, and cost (Barkun et al., 1992, Soper & Dunnegan, 1992)

Laparoscopic cholecystectomy is the most common surgery for symptomatic cholelithiasis because it is minimally invasive, has a better view, and less pain and recovery time (Deziel, 2016). Since 1989, laparoscopic cholecystectomy has been the usual therapy for symptomatic gall stones, however some planned LCs need conversion due to various causes (Dubois et al., 1990).

Even with bile or stone leakage, LC might be challenging and necessitate conversion to open cholecystectomy to conclude (Duca et al., 2003). The surgeon must evaluate the degree of difficulty to prepare for a challenging case and advise the patient about conversion and provide proper explanation (Anderson & Wearne, 2007).

The 1992 NIH consensus development conference said that laparoscopic cholecystectomy "provides a safe and effective treatment for the majority of symptomatic gallstone patients"(Gollan, 1993).

Laparoscopic cholecystectomy (LC) is advised for cholelithiasis. It reduces post-operative pain, hospital stays, cosmetics, and healing time compared to open cholecystectomy. Selection criteria are more open as experience and the learning curve decrease. Morbid obesity and upper abdominal surgery are no longer absolute contraindications. Except for bleeding diathesis, gallbladder cancer, and unsuitability for general anesthesia, every gallstone disease may be treated laparoscopically.

1–13% of laparoscopic cholecystectomies must be switched to open procedures4. Surgeons should construct preoperative conversion risk assessment parameters. This would notify patients and allow for a more experienced surgical team when conversion risk is high. This study used clinical and radiographic criteria to predict difficult laparoscopic cholecystectomies and their conversion to open ones (Sharma, 2007).

Thus, the aim of this study is to use clinico-radiological parameters to predict laparoscopic cholecystectomy difficulties and conversion to open.

2. Materials And Methodology -

In Krishna Institute of Medical Sciences, Karad's Department of General Surgery, this prospective analytical study assessed and confirmed cholelithiasis/cholecystitis patients by ultrasonography.

December 2017–June 2019 was the research period. Cholelithiasis/cholecystitis patients were investigated. Statistics suggest 60 patients.

Source of data:

This research was conducted at the Krishna Institute of Medical Sciences in Karad, Maharashtra, after receiving approval from the Institutional Ethical Committee. For each patient, a thorough medical history, physical examination, and investigations were performed. Written informed consent was obtained.

Patients were selected for the investigation based on the inclusion and exclusion criteria listed below.

Inclusion requirements for the study include all patients, regardless of gender or age, diagnosed with symptomatic gallbladder disease using USG.

The exclusion criteria include Jaundice or aberrant liver function tests constitute exclusion criteria. Cholangitis, Alkaline phosphatase elevation, Common bile duct dilation, Common bile duct stones, Empyema of gall bladder, Acute pancreatitis, Cirrhosis, and Portal hypertension, etc. Pregnancy, Patients who refuse surgery or are unwilling to undergo laparoscopic cholecystectomy.

Data collection:

The study included symptomatic gallbladder patients of various ages and genders. The patient consented before the operation. The clinical history and physical examination were complete.

Hemogram, liver function tests, chest x-ray, and other pre-anesthetic testing were done before surgery.

Preoperative ultrasonography assessed gall bladder wall thickness (higher than 4mm may indicate laparoscopic cholecystectomy complications).

Journal of Coastal Life Medicine

Randhawa and Pujahari's grading method provided preoperative scores based on medical history, physical examination, and sonographic results. Scores of 5 or

Randhawa and Pujahari scoring system

less were simple, 6-10 challenging, and 11-15 highly difficult.

History			Max score
Age	< 50 (0)	>50 (1)	1
Sex	Female (0)	Male (1)	1
H/o Hospitalization	No (0)	Yes (4)	1
Clinical			
BMI	<25	>25-27.5 (1) >27.5 (2)	2
Palpable GB	No (0)	Yes (1)	1
Abdominal scar	No (0)	Infraumbilical (1) Supraumbilical (2)	2
Sonography			
Wall thickness	Thin (0)	Thick >4 mm (2)	2
Impacted stones	No (0)	Yes (1)	1
Pericholecystic collection	No (0)	Yes (1)	1

• Preoperative and intraoperative patient parameters were documented.

Preoperative parameters

• Attacks, Leucocyte total, Ultrasound gallbladder wall thickness, Ultrasonography shows pericholecystic fluid accumulation, after examination, the patient had laparoscopic cholecystectomy. Time, biliary/stone leakage, duct/artery damage, and possible conversion to open surgery were documented. One laparoscopic surgeon performed all surgeries.

INTRAOPERATIVE RESULTS

This study found easy, difficult, and open cholecystectomy.

One of the following made laparoscopic cholecystectomy difficult: Dense gallbladder-surround adhesions Dense liver-gallbladder adhesions

Post-op monitoring included calot triangle adhesions, biliary anomalies, stone/biliary leakage, vascular/visceral damage, and complications. All patients had recurrence tracked.

Statistical Analysis

Data imported into Excel and analyzed with SPSS 22. Frequency and proportional categorical data. Fischer

Journal of Coastal Life Medicine

exact test determined significance. Statistical significance was 0.05.

3. Results –

The mean age of the participants in this study was 41.97 10.88 years, with a minimum age of 21 years and a maximum age of 60 years. The majority of study participants were between the ages of 31 and 40 (38.33%), followed by 51 to 60 (31.67%).

Table 1: Distribution of the study subjects based on the age groups

Age group(years)	Frequency	Percentage
21 to 30	6	10.00
31 to 40	23	38.33
41 to 50	12	20.00
51 to 60	19	31.67
Total	60	100.00
Mean	**41.97**	

The gender breakdown of the patients is presented in the table below. There was a total of 60 patients, with females accounting for 41 cases (68.33%) and men accounting for 19 cases (31.34%). The ratio of females to males was discovered to be 2.15 to 1.

Table 2: Distribution of the study subjects based on the gender

Gender	Frequency	Percentage
Female	41	68.33
Male	19	31.67
Total	60	100.00

According to the body mass index, we discovered that around 55 percent of patients (33/60) had a normal BMI, 21.67% of patients (13/60) were overweight, and 23.33 percent of patients (14/60) were obese. It was determined that the mean body mass index was 25.88 with a standard deviation of 4.59.

Journal of Coastal Life Medicine

Table 3: Distribution of the study subjects based on the body mass index

Body mass index (kg/m^2)	Frequency	Percentage
<18.5	0	0
18.5 to 24.99	33	55.00
25 to 29.99	13	21.67
>30	14	23.33
Total	60	100.00

After abdominal pain, vomiting was the next most frequent presenting symptom, occurring in 51.67% of patients (31/60), and dyspepsia occurred in 18.33% of patients (11/60). We observed that pain in the abdomen was the most prevalent symptom, since it was experienced by all 60 patients (100%) in our study.

Table 4: Distribution of the study subjects based on the symptoms(n=60)

Symptoms	Frequency	Percentage
Dyspepsia	11	18.33
Fever	5	8.33
Pain	60	100.00
Vomiting	31	51.67

In the research that we conducted, we found that soreness on palpation was present in around 66.67% of the patients (40/60), and that guarding, jaundice, and bulk per abdomen each occurred in 6.67% of the cases.

Table 5: Distribution of the study subjects based on the signs (n=60)

Signs	Frequency	Percentage
Guarding	4	6.67

Journal of Coastal Life Medicine

Jaundice	4	6.67
Mass	4	6.67
Tenderness	40	66.67

According to the findings of our research, almost sixty percent of patients (36/60) had numerous calculi, 21.67 percent of patients (13/60) had single calculi, and 8.33 percent of patients (5/60) had solitary impacted calculi. In addition to this, we discovered that wall thickness was present in 20% of instances (12/60), and 13.33% of cases (8/60) exhibited pericholecysytic collection.

Table 6: Distribution of the study subjects based on the USG findings (n=60)

USG findings	Frequency	Percentage
Multiple calculi	36	60.00
Single calculi	13	21.67
Wall thickness	12	20.00
Pericholecystic collection	8	13.33
Solitary impacted calculi	5	8.33

According to the findings of our research, 71.67% of patients (43/60) had a pre-operative score that ranged from 0 to 5, 26.67% of patients (16/60) had a score that ranged from 6 to 10, and 1.67% of patients (1/60) had a pre-operative score that ranged from 11 to 15.

Table 7: Distribution of the study subjects based on the pre-operative score

Pre-operative score	Frequency	Percentage
0-5	43	71.67
6-10	16	26.67
11-15	1	1.67
Total	60	100.00

Journal of Coastal Life Medicine

In the current study, it was found that the result was simple for the majority of the patients, which accounted for 70% (42/60) of the total patients. On the other hand, it was discovered that the result was tough for 20% (12/60) of the patients, and very difficult for 10% (6/60) of the patients. Six out of a total of sixty patients required an open cholecystectomy to be performed. Therefore, 10% of patients required open cholecystectomies after first undergoing laparoscopic cholecystectomies.

Table 8: Distribution of the study subjects based on the outcome

Outcome	Frequency	Percentage
Easy	42	70.00
Difficult	12	20.00
Very difficult	6	10.00
Total	60	100.00

The table that may be seen below details intraoperative occurrences that result in challenging procedures for patients. The majority of the 18 patients who underwent a difficult or very difficult surgery developed thick adhesions at Calot's triangle (72.22%), which was followed by substantial bleeding (44.44%), biliary spilling (38.89%), and visceral damage (5.55%).

Table 9: Frequency of intraoperative events leading to difficult procedure:

Intra-operative events	No of patients (n=18)	Percentage
Dense adhesions at Calot's triangle	13	72.22
Visceral injury	01	5.55
Stone/biliary spillage	07	38.89
Vascular injury/significant bleeding	08	44.44

In the simple category, each of the examples received a score between 0 and 5. In the challenging situations, 8.33% of them had a score between 0 and 5, 91.67% had a score between 6 and 10, and none received a score higher than 11. Among the most challenging situations, 83.33 percent received a score between 6 and 10, while 16.67 percent received a score between 11 and 15.

Journal of Coastal Life Medicine

Table 10: Correlation of pre-operative score with outcome

Pre-operativescore	Easy		Difficult		Very difficult	
	No[r]	%	No[r]	%	No[r]	%
0-5	42	100.00	1	8.33	0	0
6-10	0	0	11	91.67	5	83.33
11-15	0	0	0	0	1	16.67
Total	42	100	12	100	6	100.00

The correlation between pre-operative score and risk variables for patients is displayed in the table to the right. It was observed that body mass index (BMI), impacted stone, history of prior surgery, and acute cholecystitis all exhibited statistically significant correlation (P 0.05), but age, sex, gall bladder wall thickness, and pericholecystic collection all showed no significant association (P > 0.05).

Table 11: Association of various risk factors with the difficulty level

Risk factors	Easy		Difficult		P value
	No[r]	%	No[r]	%	
Age					
<50	30	71.43	11	61.11	0.4311
>50	12	28.57	7	38.89	
Gender					
Female	29	69.05	12	66.67	0.8552
Male	13	30.95	6	33.33	
Body mass index					
<25	30	71.42	3	16.67	
>25	12	28.58	15	83.33	0.0012
USG wall thickness					

Journal of Coastal Life Medicine

Present	9	21.43	3	16.67	0.6723
Absent	33	78.57	15	83.33	
Impacted stone					
Present	0	0	5	27.77	0.0001
Absent	42	100.00	13	72.23	
Pericholecystic collection					
Present	7	16.67	1	5.56	0.2453
Absent	35	83.33	17	94.44	
Previous surgery					
Yes	12	28.58	12	66.67	0.009
No	30	71.42	6	33.33	
Acute Cholecystitis					
Yes	14	33.33	15	83.33	0.002
No	28	66.67	3	16.67	

The post-operative problems experienced by patients are detailed in the table that can be seen above. Only two patients out of sixty experienced a wound infection, which is a 3.33 percent infection rate.

Table 12: Post-operative complications among patients:

Post-operative complications	No of patients(n=60)	Percent age
Wound infection	02	3.33
Hemorrhage	00	00
Retained stone	00	00
Bile leak	00	00

Journal of Coastal Life Medicine

Prolonged ileus	00	00

4. Discussion -

This prospective study at a tertiary care center examined factors that predict complicated laparoscopic cholecystectomy. Surgery conducted study from December 2017 to June 2019. Sixty tertiary care surgical ward patients were the research population. USG confirmed cholelithiasis or cholecystitis in all of these individuals.

Patients who were under 18, had CBD calculus, high ALP, dilated CBD, required CBD exploration, had obstructive jaundice, and refused laparoscopic cholecystectomy were ineligible for the trial.

The study was conducted with institutional ethics committee clearance and informed consent from participants. Patients provided demographic, clinical spectrum, and outcome data.

AGE DISTRIBUTION:

In the current study, 31-40 years was the most common age range (38.33%), followed by 51-60 years (31.67%). The average age of the research participants was 41.97 10.88 years old, with the youngest being 21 and the oldest 60.

This study revealed that 18 of 50 patients who had laparoscopic cholecystectomy for symptomatic cholelithiasis were 31-40 years old, similar to Atul Kumar Gupta et al.24. Atul Kumar Gupta et al. (Gupta et al., 2018) found similar results.

Both Herman's and Motiwala's research found that most patients were between 41 and 50 years old.

Nikhil Agrawal et al. used scoring to predict difficult laparoscopic cholecystectomy (Singh et al., 2015). The study's mean age was 39.47 12.08 years, ranging from 18 to 62 years.

Shiv K. Bunkar and colleagues (Bunkar et al., 2017) observed that 80 patients (80%) were between 20 and 40 years old, which indicated complicated laparoscopic cholecystectomy.

SEX DISTRIBUTION:

Out of 60 cases, 68.33% (41/60) were female and 31.67% (19/60) were male. (Estrogen and progesterone affect biliary cholesterol and gallbladder motility, which may explain female gallstones).

Battachary et al. (1983) and Motiwala (1991) obtained similar results. These studies showed 71.4% and 64% female patients and 28.6% and 36% male patients.

Gupta et al. (2018) evaluated many factors of difficulty and their relationship with projected difficulty. They discovered 45 women (90%) and 5 guys (10%).

Nikhil Agrawal et al.30 used grading to predict difficult laparoscopic cholecystectomy. 6 of the 30 patients were male (20%) and 24 were female (80%).

Shiv K. Bunkaret et al. (2017) examined pre-operative variables that indicated difficult laparoscopic cholecystectomy and found that 11 (11%) of 100 patients were men and 89 (89%) were women.

FINDINGS ON PHYSICAL EXAMINATION:

This study found that 55% of patients (33/60) had a normal BMI, 21.67% (13/60) were overweight, and 23.33% (14/60) were obese. BMI measurements underpin these conclusions. The average BMI was 25.88 kg/m2 with a standard deviation of 4.59 kg/m2.

J. S. Randhawa et al. (2009) and A. K. Pujahari et al. (1970) found similar results. Nikhil Agrawal and colleagues (Singh et al., 2015) employed scoring to predict difficult laparoscopic cholecystectomy preoperatively. Six patients (20%) had BMIs beyond 27.5 kg/m2.

When Shiv K. Bunkar and colleagues (Bunkar et al., 2017) examined pre-operative factors that indicated difficult laparoscopic cholecystectomy, they discovered that BMI varied from 25 in 26 (26%) patients, 25.1-30 in 60 (60%) patients, and >30 in 14 (14%) patients. 26 (26%) individuals had BMIs of 25.

PRESENTING COMPLAINTS:

Pain

Pain was the main symptom in all sixty people. 76.67%

(46/60) of patients had right hypochondrial pain. 35 of 60 individuals complained colicky pain. 14 (23.33%) had back pain.

Pain was the most common symptom in both Ganey's (1986) and Sharma's (1977) series.

Vomiting

There was a history of regurgitation in 51.67 percent (31 of 60) of the patients. The onset of nausea and regurgitation occurred simultaneously with the onset of torment. This was consistent with the findings of the investigations conducted by Ganey et al. (1986) and Alok Sharma et al. (1977).

Dyspepsia

Dyspepsia was observed in 18.13 percent (11/60) of the examined individuals. This is consistent with the findings of Ganey and colleagues (1986) and Alok Sharma and colleagues (1977).

Fever

8.33% of the patients, or 5/60, were determined to have a mild fever. This symptom was consistent with the findings of both Ganey's (Ganey et al., 1986) and Sharma's (Sharma et al., 1977) studies.

PRESENTING SIGNS:

Four of sixty clinical jaundice patients (6.67%) developed obstructive jaundice after further examination. After 6 weeks, these patients received endoscopic retrograde cholangiopancreatography (ERCP) with CBD stenting and laparoscopic cholecystectomy.

40 of 60 patients had right hypochondrium soreness. Tenderness was more common in Hadfield et al.'s 2007 research.

Guarding was seen in 4 out of 60 patients (6.67%), compared to Kama et al.'s 18.7%. 19 patients had a positive Murphy's sign.

This research comprised 6.67% patients with palpable mass, compared to Hadfield's 7%.

RADIOLOGICAL FINDINGS:

Ultrasonography was used on all sixty patients in our investigation. We observed that 36 out of 60

individuals had several calculi, 21.67% had a single calculus, and 8.33% had a gallbladder affected calculus. 12 (20%) had gall bladder wall thickening. 8 of 60 people had pericholecystic collection, 13.33%.

Alok Sharma et al. (1977) found 98.3% of individuals had gallstones and 5.2% had gallbladder wall thickening. 73.7% had many stones, 26.3% had one, and 5.2% had bile duct stones. Bunker SK et al. (2017) reached similar conclusions.

Preoperative score predicts eventual result:

Our research found that 43/60 patients (71.67%) had pre-operative scores of 0-5. This was followed by 25.38% (16/60) who scored 6-10 and 1.67% (1/60) who scored 11-15.

Nikhil Agrawal et al. (2015) used a grading technique to predict difficult laparoscopic cholecystectomy preoperatively. They found 17 cases (56.7%) easy, 13 (43.3%) demanding, and none very difficult.

According to an evaluation of pre-operative factors that predict difficult laparoscopic cholecystectomy by Shiv K. Bunkar et al. (Bunkar et al., 2017), 88.4% of patients with a pre-operative score between 0 and 5 had an easy procedure, 6.4% had a difficult procedure, and 5.2% had a very difficult procedure. Laparoscopic cholecystectomy was challenging in 78.9% and extremely difficult in 21.1% of patients with grades 6–10. All patients scoring 11–15 underwent a severe laparoscopic cholecystectomy.

ANALYSIS OF THE PRE-OPERATIVE SCORE IN CONJUNCTION WITH THE RISK FACTORS:

BMI, abdominal surgery, acute cholecystitis, and ultrasound-detected impacted stones were statistically significant (P0.05) in this research. Age, sex, wall thickness, and pericholecystic collection did not correlate. (P>0.05)

Shiv K. Bunkar and colleagues (Bunkar et al., 2017) found that a body mass index of more than 30, a history of medical disease like diabetes, a palpable gall bladder, prior hospitalization, pericholecystic collection, and an impacted stone were risk factors for difficult laparoscopic cholecystectomy.

Atul Kumar Gupta and colleagues (Gupta et al., 2018)

Journal of Coastal Life Medicine

studied difficulty predictors and predicted challenges. Clinical predictors include more than one year of symptoms, acute cholecystitis, and a body mass index of above thirty were statistically significant.

POST-OPERATIVE COMPLICATIONS:

Only 2 (2.98%) of 67 patients got wound infections in this study.

In four patients with epigastric port site infections, Shiv K. Bunkare et al. (Bunkar et al., 2017) observed postoperative complications. Postoperative complications plagued these patients.

Statistically and clinically, the preoperative score predicts LC surgery outcomes. Despite the small sample size, the predictors of problematic LC mirrored past studies. Validating the scoring approach requires further randomized prospective testing with more individuals.

5. Conclusion

Preoperative rating predicts laparoscopic cholecystectomy outcomes statistically and clinically. This study found that prior abdominal surgery, acute cholecystitis, and ultrasound-detected impacted calculus predicted a difficult laparoscopic cholecystectomy and a high conversion rate to open surgery. BMI >25kg/m2 was the strongest predictor of laparoscopic cholecystectomy difficulty and resort to open surgery. This lengthens their surgeries.

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