

Predicting Difficulty in Laparoscopic Cholecystectomy by Clinical and Ultrasonography Criteria

G Nirmal Kumar¹, Rakesh Fernando¹, Jenitta Little Sophy², K K Arunraja³

¹Associate Professor, Department of Surgery, Government Thoothukudi Medical College, Thoothukudi, Tamil Nadu, India, ²Assistant Professor, Department of Surgery, Government Tirunelveli Medical College, Tirunelveli, Tamil Nadu, India, ³Assistant Professor of Surgery, Government Thiruvallur Medical College, Tamilnadu, India

Abstract

Introduction: The gold standard treatment for symptomatic gallstones is laparoscopic cholecystectomy (LC), which sometimes requires conversion to an open procedure for various reasons. This necessitates establishing a criterion based on both clinically and sonographically to predict the difficulty in LC and conversion preoperatively.

Aim: This study aims to predict the difficulty in LC and its conversion to open cholecystectomy (OC) using clinical and Ultrasonography (USG) criteria.

Materials and Methods: A total of 80 patients from September 2017 to August 2019, diagnosed with cholelithiasis – undergoing LC were included in the study. The parameters that were assessed to predict the difficult LC were as follows: (1) Gallbladder (GB) wall thickness, (2) pericholecystic edema/fluid collection, (3) number of attacks, and (4) total leukocyte count. Z-test was used for statistical analysis.

Results: Out of 80 patients included in this study, 58 (72.5%) were easy, 22 (27.5%) were difficult, and 8 (10%) patients required conversion to OC. The overall conversion rate was 10%. The TLC>11,000, more than 2 previous attacks of cholecystitis, GB wall thickness of >3 mm, and pericholecystic edema/fluid collection were all statistically significant in predicting the difficult LC and its conversion

Conclusion: The difficult LC and conversion to OC can be predicted preoperatively based on the clinical criteria – which include a number of previous attacks of cholecystitis, WBC count, and USG criteria – gallbladder wall thickness and pericholecystic collection.

Key words: Laparoscopic cholecystectomy, Conversion, Open cholecystectomy, Difficulty, Pericholecystic edema

INTRODUCTION

Cholelithiasis is the most common biliary pathology seen in 10–15% of the general population but asymptomatic in the majority (>80%). The prevalence of gallstone varies widely. It is estimated to be around 4% in India.^[1] Changing incidence in India is mainly attributed to westernization and availability of ultrasound in both rural and urban.

Approximately 1–2% of asymptomatic patients per year will develop symptoms requiring cholecystectomy, making cholecystectomy one of the most common operations performed by general surgeons.^[2]

The first laparoscopic cholecystectomy (LC) was performed by Philippe Mouret in Lyon, France^[3] in 1987, since then, it has become the gold standard in the treatment of cholelithiasis and has almost replaced open cholecystectomy (OC), with better preservation of immune function and a reduction of the inflammatory response, post-operative infections compared with open surgery.^[4]

LC though considered safe and effective, yet can become difficult at times due to problems in identifying anatomy, anatomical variation, creating pneumoperitoneum,

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Month of Submission : 04-2021
Month of Peer Review : 04-2021
Month of Acceptance : 05-2021
Month of Publishing : 06-2021

Corresponding Author: Dr. Rakesh Fernando, Department of Surgery, Government Thoothukudi Medical College, Thoothukudi, Tamil Nadu, India.

accessing peritoneal cavity, releasing adhesions, and extracting the gallbladder (GB). LC with these problems along with the time taken more than normal is regarded as difficult GB.

USG has been shown to have an accuracy of 96% in the diagnosis of GB calculi.^[5] The sensitivity with which USG can detect CBD calculi varies from 50 to 75%.^[6] Thus, a few pre-operative ultrasonographic factors along with clinical criteria may help in the prediction of difficulties during LC.

The rate of conversion from LC to OC is 5–10% and with lesser morbidity and mortality comparable to or less than that of traditional OC when performed by an experienced laparoscopic surgeon.^[7]

Appropriate planning to avoid complications and difficulties intraoperatively for the benefit of the patient and surgeon may be accomplished by a proper appreciation of these variables. Improved patient counseling, safety, and post-operative expectations are also other obvious benefits. Hence, it is necessary to study the predictive factors for difficult GB and therefore this study was undertaken.

Aim

This study aims to predict the difficulty in LC and its conversion to OC using clinical and Ultrasonography (USG) criteria.

MATERIALS AND METHODS

This was prospective hospital-based study was carried out on 80 patients admitted in surgical wards of the Department of General Surgery, Tirunelveli Medical College from September 2017 to August 2019.

Inclusion Criteria

Patients aged between 20 and 75 who have been clinically and radiologically (USG abdomen) diagnosed with cholelithiasis were included in the study.

Exclusion Criteria

Patients below 20 years of age, patients with common bile duct (CBD) calculus, raised alkaline phosphatase and dilated CBD, where CBD exploration is needed, patients with features of obstructive jaundice, suspected malignant GB disease, and patient medically unfit for laparoscopic surgery were excluded from the study.

The patients confirmed by USG examination are evaluated with the following factors: Age, sex, body mass index (BMI), h/o previous hospitalization, h/o previous abdominal surgeries, h/o acute cholecystitis/pancreatitis, concurrent systemic illness, BMI, temperature previous abdominal

surgeries, tenderness in the right upper quadrant, palpable GB, complete blood counts, and liver function test values, serum amylase.

Sonographic Findings

- GB wall thickness (>/<3 mm)
- Pericholecystic collection
- Size and number of calculi impacted stone
- Hydrops of GB, perforated or gangrenous GB
- Anatomical variation
- Nature of liver parenchyma (normal, fatty infiltration, and liver fibrosis).

Following evaluation, the patients will be subjected to LC and the following operative parameters are noted:

- Access to peritoneal cavity (easy/difficult)
- Bleeding during surgery (normal/abnormal)
- GB bed dissection (easy/difficult)
- Injury to duct/artery
- Extraction of GB (easy/difficult), or
- Conversion to open surgery.

Analyses of pre-operative risk factors, their relation to the dependent factors were performed using *t*-test, Chi-square test, and significance ($P = 0.05$) was demonstrated. Results were computed using relevant software (SPSS).

RESULTS

Among 80 patients, 19 (23.8%) had previous abdominal surgeries, 23 patients among 80 (28.8%) had a history of acute cholecystitis. In the present series, majority of the patients were in the age group of 51–75 years. Among the sample size of 80 patients, 62 were female and 18 were male. The difficulty of LC increases with BMI >28.5. Among the 80 patients, 28 patients had GB wall thickness of >3 mm, 18 patients had pericholecystic collection, 16 patients had liver fibrosis, and 47 patients had multiple GB stones. Among 80 patients, 22 patients had difficulty in access to the peritoneal cavity, 21 patients had difficulty in GB bed dissection, 20 patients had abnormal bleeding, 19 patients had difficulty in extraction of GB, and in eight patients, LC was converted to OC.

DISCUSSION

LC has become the procedure of choice for the management of symptomatic gallstone disease. Difficult GB is a term used to denote if there is an increased surgical risk compared to standard cholecystectomies and has been associated with difficult dissection, altered anatomy, and increased risk of bleeding.

Certain pre-operative parameters help surgeons decide whether to proceed with a minimally invasive approach or perform an open procedure. The use of a predictive score of operative difficulty is thus of primary interest to identify high-risk procedures and could be helpful to improve patient counseling, optimize surgical planning and operating room efficiency, detect patients at risk of complications, and change, when necessary, the operative technique.

The majority of the patients in the present series were in the age group of 51–75 years. In the present series, out of 80 patients, 62 were female, and 18 were male. Among 80 patients, 19 (23.8%) had previous abdominal surgeries, 23 patients among 80 (28.8%) had a history of acute cholecystitis. In the present series of 80 patients, GB thickness >3 mm was found in 28 patients (35%), pericholecystic collection presents in 18 patients (22.5%), fibrosis of liver parenchyma presents in 16 patients (20%), and 47 patients (58.8%) had multiple GB stones [Table 1]. Among 80 patients, there was difficulty in access to the peritoneal cavity for 22 (27.5%) patients, difficult GB bed dissection in 21 (26.3%) patients, abnormal bleeding in 20 (25%) patients, and difficulty in extraction of GB in 19 (23.8%) patients. Eight cases were converted to OC [Table 2]. In other studies, of all LC, 1–13% requires conversion to an open for various reasons.^[8]

In our study, the pre-operative parameters BMI, history of cholecystitis, previous abdominal surgery, GB wall thickness, pericholecystic collection, number of stones, and liver parenchyma were analyzed with operative parameters. Initially, univariate analysis was done and statistically significant factors were found followed by multivariate analysis.

BMI – in the present series, 22 patients had difficulty in access to the peritoneal cavity with a mean BMI of 32.14,

20 patients with mean BMI 28.38 had abnormal bleeding, 19 patients with a mean BMI of 32.026 had difficulty in extraction of GB, and eight patients with mean BMI of 32.475 were converted to open surgery. In a study by Bunkar *et al.* in 2017,^[9] BMI of patients was <25 in 26 (26%) patients; 25.1–30 in 60 (60%) patients; and >30 in 14 (14%) patients, and BMI >30 was a significant predictor of difficulty. In a study by Mudgal *et al.* in 2018,^[10] mean BMI for the patients undergoing a difficult LC was 30.96±2.12 kg/m² while for those having an uneventful, LC was 25.40 (±2.57) kg/m² (P < 0.001). Mean BMI for patients undergoing conversion to OP was 32.00 ± 1.21 kg/m² while for those not having conversion was 26.71 (±3.34) kg/m² (P < 0.001).

Among 19 patients with h/o previous abdominal surgery, nine patients had difficult access to the peritoneal cavity, eight patients had abnormal bleeding during surgery, 10 patients had difficult GB bed dissection, and five patients were converted to open surgery [Figure 1].

Among 23 patients with a history of acute cholecystitis, 10 patients had difficulty in access to the peritoneal cavity, 14 patients had to bleed, 16 patients had difficult GB bed dissection, 10 patients had difficult extraction of GB, and six patients were converted to open surgery [Figure 2].

Table 1: Ultrasonographic findings

| USG abdomen findings | No. of patients (%) |
|------------------------------|---------------------|
| GB thickness >3 mm | 28 (35) |
| Pericholecystic collection | 18 (22.5) |
| Fibrosis of liver parenchyma | 16 (20) |
| Multiple gallstones | 43 (58.8) |

Table 2: Operative parameters

| Operative parameters | No. of patients (%) |
|---|---------------------|
| Difficulty in access to the peritoneal cavity | 22 (27.5) |
| Difficult GB bed dissection | 21 (26.3) |
| Abnormal bleeding | 20 (25) |
| Difficulty in the extraction of gallbladder | 19 (23.8) |
| Converted to open cholecystectomy | 8 (10) |

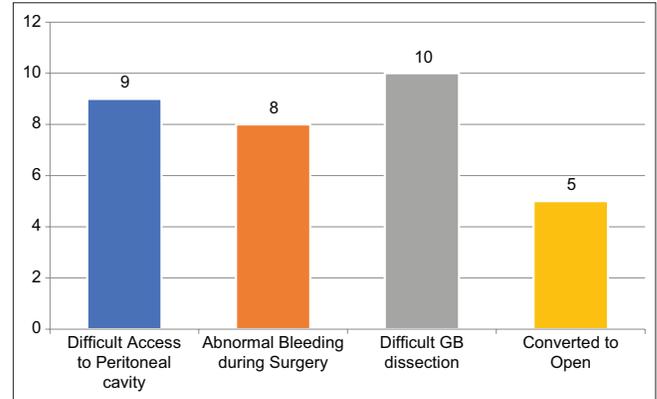


Figure 1: H/O previous abdominal surgery – 19 patients

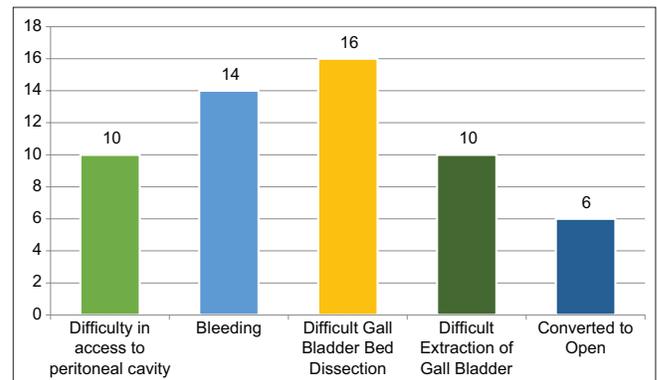


Figure 2: H/O acute cholecystitis – 23 patients

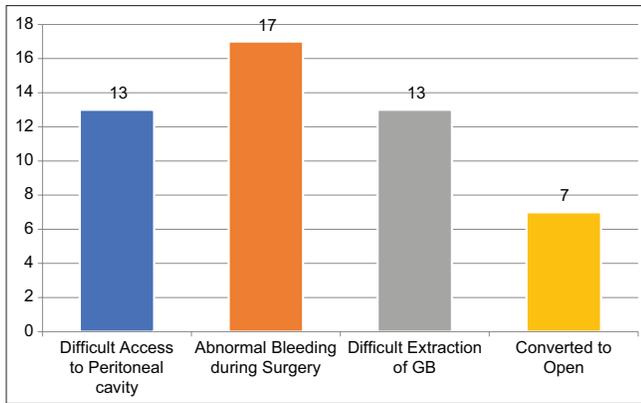


Figure 3: Gallbladder wall thickness >3 mm – 28 patients

Among 28 patients with GB wall thickness >3 mm, 13 patients had difficulty in access to the peritoneal cavity, 17 patients had abnormal bleeding, 19 patients had difficulty in dissecting GB bed, 13 patients had difficult extraction of GB, and seven patients were converted to open surgery [Figure 3].

Among 18 cases with pericholecystic collection, nine cases had difficulty in access to the peritoneal cavity, 10 cases had abnormal bleeding, 13 cases had difficulty in dissection from GB bed, eight cases had difficulty in extraction of GB, and six cases were converted to open surgery.

Among 47 patients with multiple GB stones, 17 had difficulty in dissecting from GB bed, 19 had difficulty in extraction of GB, and eight patients were converted to open surgery.

Among 16 cases with liver fibrosis, 10 patients had abnormal bleeding, 11 had difficulty in dissecting from GB bed, and six cases were converted to open surgery.

Patients with a mean BMI >32.14 had difficulty in access to the peritoneal cavity and difficulty in the extraction of GB. Patients with GB thickness >3 mm have difficulty in the dissection of GB bed and abnormal bleeding.

CONCLUSION

The highest incidence of gallstone is in the age group of 51–75 years. The incidence of gallstones is more in females

compared to males. Ultrasound is the most accurate and sensitive investigation for the diagnosis of cholelithiasis. In the present study, BMI >32.5, history of cholecystitis, previous abdominal surgery, GB wall thickness >3 mm, pericholecystic collection, multiple stones, and liver fibrosis were significant predictors of difficult LC. The conversion rate from LC to OC was 10%. These factors can predict difficulty to be encountered during surgery and help in deciding for conversion, obtaining surgical expertise, thus shortening the duration of surgery and preventing unnecessary complications.

ACKNOWLEDGMENTS

The authors would like to thank our patients who participated in our study and also thank our colleagues, seniors, and paramedical staff who helped and supported us throughout the study.

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How to cite this article: Kumar GN, Fernando R, Sophy JL, Arunraja KK. Predicting Difficulty in Laparoscopic Cholecystectomy by Clinical and Ultrasonography Criteria. *Int J Sci Stud* 2021;9(3):93-96.

Source of Support: Nil, **Conflicts of Interest:** None declared.