Original Article

Prediction of Difficult Laparoscopic Cholecystectomy Based on Clinical and Ultrasonographic Parameters

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Abstract

Background: Cholelithiasis is the most common biliary pathology. The definitive treatment for cholelithiasis is either open/ laparoscopic cholecystectomy (LC). The objective of this study was to predict difficulty in doing LC based on clinical and ultrasonographic parameters.

Materials and Methods: A hundred patients admitted with a diagnosis of cholelithiasis in surgical wards in the Department of Surgery, Shyam Shah Medical College and Associated Sanjay Gandhi Memorial Hospital, Rewa, from June 1, 2018, to May 31, 2019, were included in the study. All necessary investigations were carried out. X-ray, ultrasonography (USG) abdomen, and blood investigations were done. Patients underwent LC, and a careful record of pre-operative and post-operative findings was made and carefully filled in the pro forma.

Results: In the present study, body mass index >27.5 kg/m^2 (27%) shows a correlation with predicting difficult LC and conversion to open procedure. Clinical parameters such as guarding and rigidity (8%) with mass (12%) were a sign of acute inflammation, associated with ultrasonography findings favor for difficult cholecystectomy. Gallbladder wall thickness (38%) and pericholecystic fluid collection (16%) in USG are strong predictors of difficulty.

Conclusion: Clinical and USG findings help to predict difficulty in laparoscopic cholecystectomy and leading to the conversion of LC to open cholecystectomy.

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

INTRODUCTION

Cholelithiasis is the most common biliary pathology. Cholelithiasis is one of the most common problems affecting the digestive tract. The prevalence of gallstones is related to factors such as age, gender, and ethnic background. The prevalence of gallstone varies widely from place to place. In India, the prevalence is estimated to be around 4%.[1] Changing incidence in India is mainly attributed to the Westernization of diet, change in socioeconomic structure, and availability of ultrasound as an investigation in both rural and urban areas.

An epidemiological study showed that North Indians have 7 times higher occurrence of gallstones as compared to South Indians.

The National Institute of Health consensus development conference in the year 1992 concluded that laparoscopic cholecystectomy (LC) provides a safe and effective treatment for most patients with symptomatic gallstones.

At present, LC is considered the treatment of choice for symptomatic cholelithiasis. Philip Mouret from France performed the first human LC in 1987. Just after 2 years, the first LC was done in India by Udwadia in 1989. The difficult gallbladder (DGB) is the most common "difficult" laparoscopic surgery being

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performed by a general surgeon all over the world. Minimal post-operative morbidity resulting from minimal invasiveness, along with safety and efficacy has made LC gold standard treatment for symptomatic cholelithiasis. It has now become the most common operation performed by general surgeons. Various pre-operative factors can help in deciding the DGB and its conversion to open cholecystectomy.

It has many advantages over open cholecystectomy in terms of minimal post-operative pain, shorter hospital stay, better cosmetics, and early recovery. As the experience with LC is increasing throughout the world, selection criteria have become more liberal. Most of the factors such as morbid obesity and previous upper abdominal surgery which were considered as an absolute contraindication for attempting LC, have no longer remained as absolute contraindications. LC though considered safe and effective, yet can become difficult at times due to various problems faced during the surgical procedure. Various problems encountered include problems in identifying anatomy, anatomical variation, creating pneumoperitoneum, accessing peritoneal cavity, releasing adhesions, and extracting the GB. LC with these problems along with the time taken more than normal is regarded as difficult. The number of contraindications has come down significantly over time. Attempts can be made in all cases of gallstone diseases with laparoscopic procedure except for patients with bleeding diathesis and carcinoma GB and patients not fit for general anesthesia.

However, of all LC, 1–13% requires conversion to an open for various reasons.[2] Thus, for surgeons, it would be helpful to establish criteria that would assess the risk of conversion preoperatively. This would be useful for informing patients, and a more experienced surgical team could be assembled when the risk for conversion appears significant. Thus, this study is conducted at our hospital to predict the difficult LC and conversion using various clinical and ultrasonographic parameters.

Aims and Objectives
The proposed study entitled "prediction of difficult LC based on clinical and ultrasonographic parameters" with the following aims and objectives:

The objectives are as follows:
1. To find the predictive factor on the clinical ground in predicting difficult LC
2. To determine the clinical and radiological factors role in predicting difficult LC
3. To correlate pre-operative factors with intraoperative severity of acute cholecystitis.

MATERIALS AND METHODOLOGY

The proposed study entitled "prediction of difficult LC based on clinical and ultrasonographic parameters" was carried out on 100 patients admitted in a surgical ward in the Department of Surgery, Shyam Shah Medical College and Associated Sanjay Gandhi Memorial Hospital, Rewa, from June 1, 2018, to May 31, 2019.

Sample Size
Approximate 100 patients during the period of study as per hospital admission rate:

Type of Study
This was a prospective hospital-based time bound study.

Inclusion Criteria
The patients aged between 20 and 60 years, presenting symptoms and signs of cholelithiasis/cholecystitis and diagnosed by ultrasonography of the abdomen were included in the study.

Exclusion Criteria
The following criteria were excluded from the study:
1. Patients below 20 years of age
2. Patients with common bile duct (CBD) calculus, raised alkaline phosphatase, and dilated CBD, where CBD exploration is needed
3. Patients with features of obstructive jaundice
4. Suspected malignant GB disease
5. Patient medically unfit for laparoscopic surgery.

Methodology
A prospective study of all patients admitted from June 1, 2018, to May 31, 2019, for undergoing LC will be used. A minimum of 100 LC will be studied during the period. The patients confirmed by ultrasonography examination will be evaluated with following factors: Age, sex, duration of illness, history of previous hospitalization, concurrent systemic illness, body mass index (BMI), temperature, and abdominal scar whether infraumbilical or supraumbilical, tenderness in the right upper quadrant, palpable GB, complete blood counts and liver function test values, serum amylase, sonographic findings-GB wall thickness, pericholecystic collection, size of calculi, multiple calculi, impacted stone, hydrops of GB, perforated or gangrenous GB, and anatomical variation. Following an evaluation, the patient will be subjected to LC. Time taken, biliary/stone spillage, bleeding during surgery, calot's triangle dissection, GB bed dissection, anatomical variation, injury to duct/artery, difficult extraction of GB, extension of incision, and need for conversion will be noted and operating surgeon grading it: Easy, moderate or difficult, duration of hospital stay, intraperitoneal bile leak, necessity for interventional procedure, or death are considered.

Table 1: Presenting signs

Signs	Present series	%
Tenderness in right hypochondrium	80	80
Guarding	8	8
Mass	12	12

Table 2: BMI and difficulty during surgery

BMI	Difficult	Very difficult
<25	2	2
25–27.5	1	1
>27.5	13	7

BMI: Body mass index

Table 3: Ultrasonography findings

Ultrasonography	Number of cases (%)
Multiple calculi	66 (66)
Solitary calculi	18 (18)
Solitary impacted calculi	16 (16)
Wall thickening	38 (38)
Pericholecystic collection	16 (16)

Graph 1: Correlation between body mass index and difficulty during surgery

Graph 2: Ultrasonographic finding of patients in study

OBSERVATION AND RESULTS

Tenderness in right hypochodrium was present in 80 (80%) patients, Guarding and rigidity in 8 (8%) patients and a mass was palpable in 12 (12%) patients.
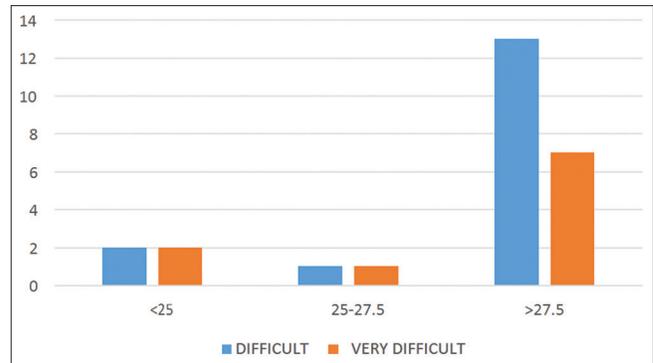
In this study 54 (54%) patients had BMI <25, 22 (22%) were having BMI between 25-27.5 and for remaining 27 (27%) it was >27.5, and difficulty increases with BMI >27.5.

All the 100 patients had stones in gallbladder, 66 patients had multiple calculi, 18 had solitary calculi and 16 had solitary impacted calculi, 38 patients had wall thickening and 16 had pericholecystic collection.
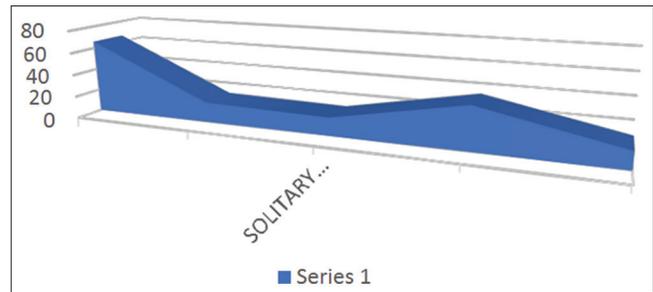
DISCUSSION

The proposed study entitled "prediction of difficult LC based on clinical and ultrasonographic parameters" was carried out on 100 patients admitted in a surgical ward in the Department of Surgery, Shyam Shah Medical College and Associated Sanjay Gandhi Memorial Hospital, Rewa, from June 1, 2018, to May 31, 2019.

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

Pre-operative complexity estimation helps 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.

In the present study, the pain was the predominant symptom seen in all 100 patients. All the 100 patients presented with chronic recurring pain. In 82% (82) of patients, the pain was in the right hypochondrium. Of the 82 patients, 72% (72) patients had a colicky type of pain, 28% (28) patients had a gripping type of pain, and 18% (18) patients had a dull aching type of pain with tenderness in right hypochondrium 80% (80), guarding 8% (8) and mass in 12% (12) [Table 1]. In a similar study by Reddy and Balamaddaiah in 2016,[3] 80% had pain in the right hypochondrium and among all patients undergone LC 44% and in converted to open 76% had pain in the right hypochondrium. In a study conducted by Goyal *et al.* in 2017,[4] 68% patient had pain in the right upper abdomen, of which 14% were difficult and converted to open cholecystectomy. In patients who had experienced pain within 2–4 months before hospitalization, this could have been due to pericholecystic inflammation-causing dense adhesion and subsequent conversion.

Fever was present in 12% (12) of the patients, which was of moderate degree and was associated with chills. In a study by Kassa and Jaiswal in 2017,[5] as a pre-operative factors, fever was found to be statistically significant factors for prediction of difficult LC ($P = 0.03$), while in another study by Khandelwal *et al.* in 2017,[6] 50% patient had a history of fever during attack among them 48% patient had difficulty during surgery while remaining 50% without a history of fever, only 2% had difficulty during LC.

In our study, patients with fever invariably associated with increased GB wall thickness and pericholecystic fluid collection; those patients had a difficult cholecystectomy; hence, fever is a strong predictor of difficulty.

General survey revealed that 54 (54%) patients had BMI <25, 22 (22%) had BMI in the range of 25–27.5, and 24 (24%) had BMI >27.5. In a study by Bunkar *et al.* in 2017,[7] 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,[8] mean BMI for the patients undergoing a difficult LC was 30.96 ± 2.12 kg/m^2 while for those having an uneventful, LC was 25.40 (±2.57) kg/m^2 ($P < 0.001$). Mean BMI for patients undergoing conversion to OP was 32.00 ± 1.21 kg/m^2 while for those not having conversion was 26.71 (±3.34) kg/m^2 ($P < 0.001$). According to the present study obese, patients had a difficult cholecystectomy and BMI is a strong predictor and obesity associated with other comorbid conditions such as diabetes and hypertension.

In the present study, BMI >27.5 kg/m^2 shows a correlation with predicting difficult LC and conversion to open procedure ($P \leq 0.001$), which is in agreement with the previous studies [Table 2 and Graph 1].

In our study, all the 100 (100%) patients had stones in GB, 30 (30%) patients had wall thickening, and 20 (20%) had a pericholecystic fluid collection. As per our study, GB wall thickness and pericholecystic fluid collection are strong predictors of difficulty. The presence of pericholecystic fluid significantly increases the difficulty of visualization and the risk of local sepsis [Table 3 and Graph 2].

CONCLUSION

From the results of the present study, we concluded that various clinical parameters (pain, fever, vomiting, BMI, etc.) and ultrasonographic parameters are significant predictors of difficult LC. The conversion rate from LC to open cholecystectomy was 10%. These factors can predict difficulty to be encountered during surgery and help in making decision for conversion, thus shortening the duration of surgery and preventing unnecessary complications.

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ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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