

A clinical study to determine predictive factors for difficult laparoscopic cholecystectomy

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ABSTRACT

Background: Forecast of a difficult laparoscopic cholecystectomy (LC) can help the surgeon as well as the patient to prepare better for any intraoperative risk and its effective management. **Objectives:** The objectives of this study were to assess the clinical and radiological parameters for predicting the difficult LC and its conversion. **Materials and Methods:** Hundred patients of gallstone disease undergoing LC were studied from September 2014 to August 2015. All the patients underwent detailed pre-operative history, clinical examination, laboratory investigations, and transabdominal sonography. The study group was subjected to LC using the general anesthesia. Peroperative degree of difficulty was evaluated depending on objective variables which included the presence of adhesions at Calot's triangle and between omentum and gallbladder (GB), obvious injury to GB, biliary ducts, bowel, diaphragm or other abdominal viscera, stone/biliary spillage, injury to vessels, need of conversion to open procedure (OP), and post-operative complications in the early post-operative period arising as a result of intra-operative difficulty, for example, biliary fistula, biloma, biliary peritonitis, and bowel injury unmasking after surgery. **Results:** Female ($n = 82$) preponderance was observed. Mean age and body mass index (BMI) was 38.60 ± 11.62 years and 27.29 ± 3.59 kg/m², respectively. The incidence rate of difficult LC was 34%, whereas conversion rate to open cholecystectomy was 11%. Rate of difficult LC was significantly more in patients with a history of previous abdominal surgery ($n = 34$, $P < 0.001$), tenderness in right hypochondrium ($n = 31$, $P = 0.003$), and thickening of GB ($n = 19$, $P < 0.001$), whereas conversion to OP was significantly high in patients with thickening of GB ($n = 19$, $P = 0.001$) and distended or contracted GB ($n = 18$, $P = 0.001$). Most common intraoperative findings which made the procedure difficult was dense adhesions at Calot's triangle ($n = 32$). Most common reason for conversion to OP was stone/biliary spillage (36.4%). **Conclusion:** BMI, history of previous abdominal surgery, tenderness in the right hypochondrium, and thickening of the GB are the significant predictive factors for difficult LC, whereas conversion to OP was high in patients with thickening of GB and GB contracted.

KEY WORDS: Body Mass Index; Laparoscopic Cholecystectomy; Conversion; Open Procedure


INTRODUCTION

In the treatment of patients with gallbladder (GB) stones, minimal invasive surgery has contributed a revolutionary

change. Laparoscopic cholecystectomy (LC) was first introduced to the world in 1987 by Mouret since then it is still evolving. It has quickly replaced the open cholecystectomy as the standard treatment.^[1,2]

LC offers several advantages which include reduced hospitalization, decreased morbidity, and short recovery time. Prevalence of gallstone disease in general population is 3%–20% of the total population worldwide.^[3-5]

Sometimes, the LC may pose undue difficulties during access or dissection and it is considered as a “difficult” when

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safe completion of the laparoscopic procedure cannot be ensured.^[6] Difficulties encountered in cholecystectomy are due to anatomical ductal and vascular anomaly or distorted anatomy following acute or chronic inflammation.^[6-8]

Nowadays, LC is the standard procedure for the treatment of symptomatic GB stone, although few require conversion to open cholecystectomy.^[6,8] On the basis of radiological findings, surgeons can select the cases appropriate for their skills aiming at reducing complications and minimizing the waste of operating time available.

Hence, the present study was aimed to assess the clinical and radiological parameters for predicting the difficult LC and its conversion.

MATERIALS AND METHODS

The present prospective study was performed on 100 patients of gallstone disease undergoing LC in the Department of Surgery, J A Group of Hospitals and G R Medical College, Gwalior (MP), from September 2014 to August 2015. The College Ethical Committee approval and a written informed consent about participating in the study as well as about the chances of conversion to open cholecystectomy were obtained from each patients before starting the study.

All patients with symptomatic cholelithiasis (confirmed on ultrasonography [USG]), patients presenting with acalculous cholecystitis, and patients having age >18 years were included in the study, whereas patients below 18 years, patients with common bile duct (CBD) calculus, raised alkaline phosphatase (ALP), dilated CBD/hepatic ducts/IHBR (where CBD exploration was indicated), features of obstructive jaundice, unfit for general anesthesia, refusing LC, having asymptomatic gallstone disease, and patients with chronic diseases and metabolic disorders were excluded from the present study.

All the patients underwent detailed pre-operative history including age, sex, duration of pain in the right upper abdomen, previous episodes of similar pain, history of diabetes mellitus, pancreatitis, episodes of acute cholecystitis, and clinical examination including body mass index (BMI) and also noted if gall bladder was palpable per abdominally and if tenderness was present in right hypochondrium, laboratory investigations including blood sugar level (fasting) and estimation of serum level of liver enzymes (aspartate transaminase [AST], alanine transaminase, and ALP) and transabdominal sonography were also done as a routine.

Patients were fasted overnight to see for maximal distension of the GB. The USG was done on B mode, gray scale, and real-time scan with 3.5 MHz probe. The observations included number and size of gallstones, if the gallstones were impacted at the neck of GB or cystic duct,

Table 1: Frequency of intraoperative events leading to difficult procedure

Intraoperative findings which made the procedure difficult	Frequency of occurrence
Dense adhesions at Calot's triangle	32
Visceral injury	2
Stone/biliary spillage	25
Vascular injury/significant bleeding	16

Table 2: Reasons for conversion to OP in study cohort

Reason for conversion	Number of patients (%)
Frozen Calot's triangle	3 (27.3)
Visceral injury	2 (18.2)
Stone/biliary spillage	4 (36.4)
Significant bleeding	2 (18.2)
Total	11 (100)

OP: Open procedure

if the GB was contracted, wall thickness of GB, presence of mucocele, presence of pericholecystic fluid, and evidence of fatty liver.

The study group was subjected to LC using the American setup of cables under general anesthesia. The video equipment used were - 10 mm 30° wide-angle telescope, light transmission cable, three-chip video camera, light source, and monitors. The laparoscopic instruments used were Verres needle, carbon dioxide insufflator with monitoring of abdominal pressure and gas flow, trocar sheath 5 mm and 10 mm size, curved dissecting forceps, grasping forceps, clip applicators and clips, extraction forceps, scissors and conventional instruments, and sutures to close the fascia and skin.

All surgeries were done by a single surgeon to avoid surgeons' bias. Perioperative degree of difficulty was evaluated depending on objective variables which included the presence of adhesions at Calot's triangle and between omentum and GB, obvious injury to GB, biliary ducts, bowel, diaphragm or other abdominal viscera, stone/biliary spillage, injury to vessels, need of conversion to open procedure (OP), and post-operative complications in the early post-operative period arising as a result of intraoperative difficulty, for example, biliary fistula, biloma, biliary peritonitis, and bowel injury unmasking after surgery. The patients with the presence of any/all of the above factors were considered to have undergone a difficult LC.

The statistical analysis was done to investigate a significant association between the study variables (pre-operative clinical and sonological findings) and perioperative difficulty in the surgery (evaluated as stated above), using Chi-square test and Student t-test. $P < 0.05$ was considered to be statistically significant (confidence interval = 95%).

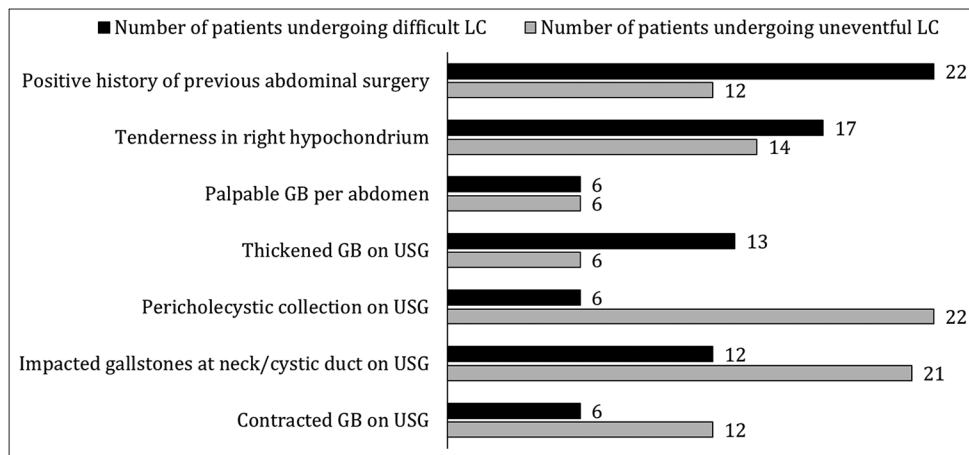


Figure 1: Frequency of difficult laparoscopic cholecystectomy in relation with study variables

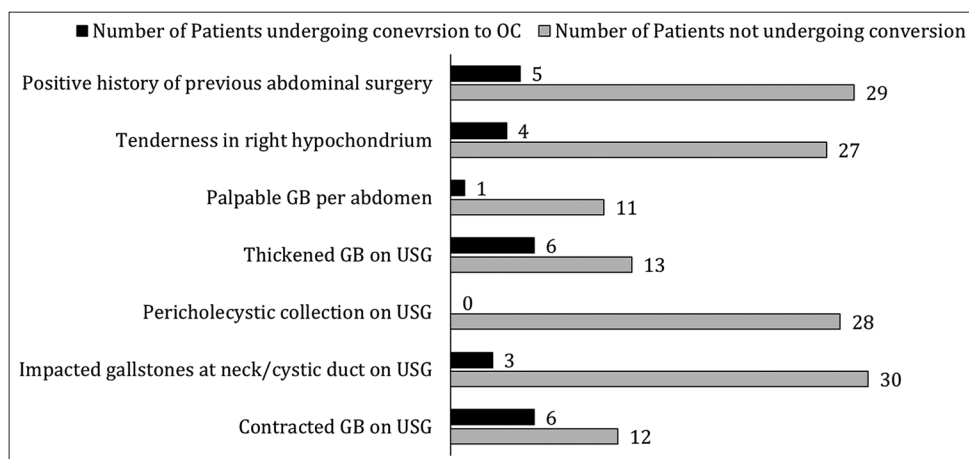


Figure 2: Frequency of conversion to open procedure in relation with study variables

RESULTS

Mean age and BMI of the study cohort were 38.60 ± 11.62 years and 27.29 ± 3.59 kg/m², respectively. There were 18 males and 82 females.

Of 100 patients, 34 had a difficult LC. Therefore, an incidence rate of 34% for difficulty during surgeries was encountered in the present study. Of the 34 difficult LC, 11 patients had the procedure converted to open cholecystectomy, and hence, conversion rate was 11% [Figures 1 and 2, Tables 1 and 2].

Mean age for the patients undergoing a difficult LC was 38.14 ± 10.45 years while for those having an uneventful LC was 38.83 ± 12.25 years ($P = 0.781$). Mean age for patients undergoing conversion to OP was 40.55 ± 9.17 years while for those not having conversion was 38.36 ± 11.91 years ($P = 0.587$). Of 100 patients, 6 males and 28 females underwent a difficult LC ($P = 0.947$), whereas 2 males and 9 females underwent a conversion to OP ($P = 0.987$). Mean BMI for the patients undergoing a difficult LC was 30.96 ± 2.12 kg/m² while for those having an uneventful LC was $25.40 (\pm 2.57)$ 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 $26.71 (\pm 3.34)$ kg/m² ($P < 0.001$).

History of previous abdominal surgery ($n = 34$); $P < 0.001$, tenderness in right hypochondrium ($n = 31$); $P = 0.003$, palpable GB per abdomen ($n = 12$); $P = 0.212$, thickening of GB ($n = 19$); $P < 0.001$, pericholecystic collection ($n = 28$); $P = 0.098$, impacted gallstones on the neck of GB and cystic duct ($n = 33$); $P = 0.726$, GB distended or contracted ($n = 18$); $P = 0.947$. LC; LC.

History of abdominal surgery ($n = 34$); $P = 0.395$, tenderness in right hypochondrium ($n = 31$); $P = 0.683$, palpable GB per abdomen ($n = 12$); $P = 0.753$, thickening of GB ($n = 19$); $P = 0.001$, pericholecystic collection ($n = 28$); $P > 0.05$, impacted gallstones on neck of GB and cystic duct ($n = 33$); $P = 0.668$, GB distended or contracted ($n = 18$); $P = 0.001$. open procedure; OP.

Of 100 patients, 8 patients had post-operative complications related to procedure (biliary leak, biliary fistula, biloma formation, and biliary peritonitis) in all of whom the

procedure was considered difficult. Thus, the complication rate in our study was 8%. Two patients (18.18%) of the 11, who underwent conversion to OP, developed post-operative complications.

DISCUSSION

LC is considered as the gold standard for the treatment of symptomatic cholelithiasis and pre-operative prediction of difficult surgeries, and its conversion is very important for planning LC.^[9,10] Pre-operative prediction becomes more important so that surgeons can be requested to be present during surgery and to avoid unnecessarily prolonging the surgery and to prevent complications.^[11] In the present study, difficult LC was significantly more in patients with a history of previous abdominal surgery, tenderness in right hypochondrium, and thickening of GB, whereas conversion to OP was significantly high in patients with thickening of GB and distended or contracted GB.

A Bijapur study by Nidoni *et al.* on 180 patients reported that 24.44% were difficult and 5.56% of patients required conversion to open cholecystectomy, in agreement to that in the present study, 34% were difficult LC cases, whereas 11% were converted to open cholecystectomy.^[12] Several authors have shown that conversion from LC to OP can result in a significant change in the outcome for the patient, as it has higher post-operative complications and requires longer hospital stay.^[13,14] The conversion rate in our study was 11% (11 of 100), which compares well with the incidence reported in the literature, which varies from 2% to 15%.^[15,16] A similar study by Tiwary *et al.* which included 536 patients who underwent LC reported overall conversion rate of 7.81%.^[17] Sharma *et al.* studied 200 patients undergoing LC at Kathmandu reported conversion rate of 4%.^[18] Nidoni *et al.* also reported that more than two previous attacks of cholecystitis, GB wall thickness of >3 mm, and pericholecystic collection were all statistically significant for predicting the difficult LC and its conversion.^[12] Similarly, in the present study, history of previous abdominal surgery, tenderness in the right hypochondrium, and thickening of GB were the significant predictive factors for difficult LC, whereas conversion was high in patients with thickening of GB and GB contracted. Similarly, Dhanke *et al.* determined the predictive factors for difficult LC and reported that high BMI, history of prior hospitalization, palpable GB, impacted stone, and pericholecystic collection are significant predictors of difficult LC which is in agreement with the present study findings, also in the present study among demographic parameters, BMI of >30 kg/m² was the significant predictor of difficult LC and conversion to OP.^[19] Nachnani and Supe also reported that BMI >30 kg/m², male gender, past history of acute cholecystitis or pancreatitis, past history of upper abdominal surgery, and thickness of GB wall more than 3 mm are significant predictable factors of difficult cases.^[20] Similar findings were reported by Husain *et al.*^[21] Rizvi *et al.* studied

298 patients and reported that contracted GB (<5 cm), stone impaction, thickened GB wall, and cholecystitis were able to predict pre-operatively the need for conversion.^[11]

Small sample size is the main limitation of the present study; a large randomized clinical trial is required with greater number of factors affecting the outcome. This can help to develop a universal scoring method for prediction of difficulty and chances of conversion during the procedure.

CONCLUSION

Hence, it was concluded that history of previous abdominal surgery, tenderness in the right hypochondrium, and thickening of GB, whereas conversion to OP was significantly high in patients with thickening of GB and distended or contracted GB. Among demographic parameters, BMI >30 kg/m was the significant predictor of difficult LC and conversion. This consequently increases the operating time of such patients. This can contribute to the quest for surgical excellence and better patient care for one of the most commonly performed surgical procedures in the world.

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