

Prospective Assessment of the Clinical and Radiological Parameters for Predicting the Difficult LC and its Conversion

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Received: 17-10-2021 / Revised: 09-11-2021 / Accepted: 10-12-2021

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Conflict of interest: Nil

Abstract

Objectives: 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 at Nalanda Medical College and Hospital, Patna, Bihar, India over a period of 10 months. The statistical analysis was done to investigate a significant association between the study variables (pre-operative clinical and sonological findings) and per-operative 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%).

Results: Mean age and BMI of the study cohort were 35.1 ± 14.2 years and 26.5 ± 3.06 kg/m², respectively. There were 15 males and 85 females. Out of 100 patients, 30 had a difficult LC. Therefore, an incidence rate of 30% for difficulty during surgeries was encountered in the present study. Of the 30 difficult LC, 15 patients had the procedure converted to open cholecystectomy, and hence, conversion rate was 13%

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.

Keywords: Body Mass Index; Laparoscopic Cholecystectomy; Conversion; Open Procedure

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Introduction:

Cholelithiasis is a common ailment and affects about 10 to 15% of general population.[1]Laparoscopic cholecystectomy is one of the most common surgeries performed and has replaced open cholecystectomy. Since the introduction of laparoscopic cholecystectomy, the number of cholecystectomy perform in the United States has increased from 5 Lakh per year to 7 Lakh per year.[2]

Cholelithiasis is the most common biliary pathology. Gallstones are present in 10 to 15%of the general population and asymptomatic in the majority (>80%). The prevalence of gallstone varies widely in different parts of the world. In

India it is estimated to be around 4%. An epidemiological study restricted to rail road workers showed that north Indians have 7 times higher occurrence of gallstones as compared to south Indians.[3]

LC though safe and effective, is time consuming and can be difficult. Various problems faced are difficulty in creating pneumoperitoneum, accessing peritoneal cavity, releasing adhesions, discerning anatomy and extracting the gall bladder.

The definition of difficult LC is inconsistent. The term difficult cholecystectomy refers to multiple technical intra-operative difficulties that increase the risk for complications and significantly prolong the operating time. Approximately 2% to 15% of patients require conversion to open surgery for various reasons [4, 5]. Therefore, it is essential to study the predictive factors for difficult LC. Hence, we have undertaken this study of predictive factors for difficult LC.

Nowadays, LC is the standard procedure for the treatment of symptomatic GB stone,

although few require conversion to open cholecystectomy.[6, 7]

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 at Nalanda Medical College and Hospital Patna Bihar over a period of 10 months.

Methodology

All patients with symptomatic cholelithiasis (confirmed on ultrasonography [USG]), patients presenting with a calculous 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 was 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, 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.

Preoperative 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.

Statistical analysis

Analysis was done to investigate a significant association between the study variables (pre-operative clinical and sonological findings) and per-operative 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%).

Results:

Mean age and BMI of the study cohort were 35.1 ± 14.2 years and 26.5 ± 3.06 kg/m², respectively. There were 15 males and 85 females.

Of 100 patients, 30 had a difficult LC. Therefore, an incidence rate of 30% for difficulty during surgeries was encountered in the present study. Of the 30 difficult LC, 15 patients had the procedure converted to open cholecystectomy, and hence, conversion rate was 13% [Figures 1 and 2, Tables 1 and 2].

History of previous abdominal surgery ($n = 35$); $P < 0.001$, tenderness in right hypochondrium ($n = 27$); $P = 0.003$, palpable GB per abdomen ($n = 15$); $P = 0.200$, thickening of GB ($n = 20$); $P < 0.001$, pericholecystic collection ($n = 32$); $P = 0.092$, impacted gallstones on the neck of GB and cystic duct ($n = 45$); $P = 0.671$, GB distended or contracted ($n = 24$); $P = 0.824$. LC; LC.

History of abdominal surgery ($n = 41$); $P = 0.402$, tenderness in right hypochondrium ($n = 36$); $P = 0.761$, palpable GB per abdomen ($n = 17$); $P = 0.693$, thickening of GB ($n = 27$); $P = 0.001$, pericholecystic collection ($n = 33$); $P > 0.05$, impacted gallstones on neck of GB and cystic duct ($n = 43$); $P = 0.725$, GB distended or contracted ($n = 17$); $P = 0.001$. Open procedure; OP.

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	29
Visceral injury	4
Stone/biliary spillage	23
Vascular injury/significant bleeding	14

Table 2: Reasons for conversion to OP in study cohort

Reason for conversion	Number of patients (%)
Frozen Calot’s triangle	4 (26.6)
Visceral injury	3 (20)
Stone/biliary spillage	6 (40)
Significant bleeding	2 (5)
Total	15 (100)

OP: Open procedure

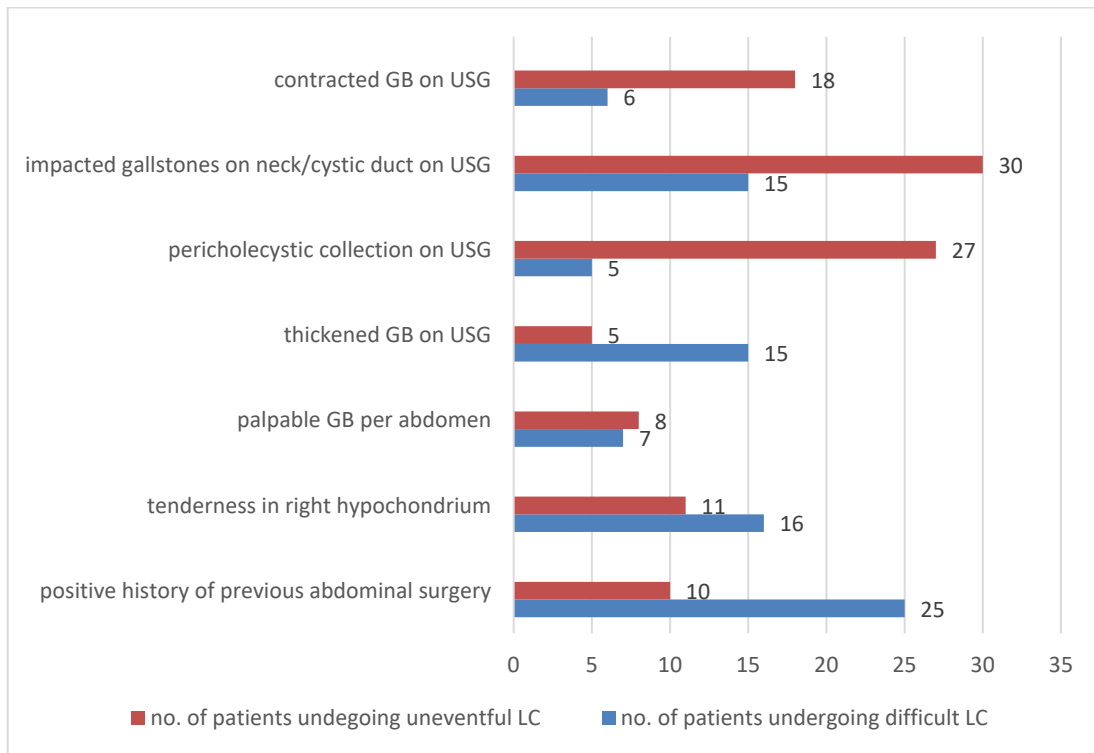


Figure 1: Frequency of difficult laparoscopic cholecystectomy in relation with study variables

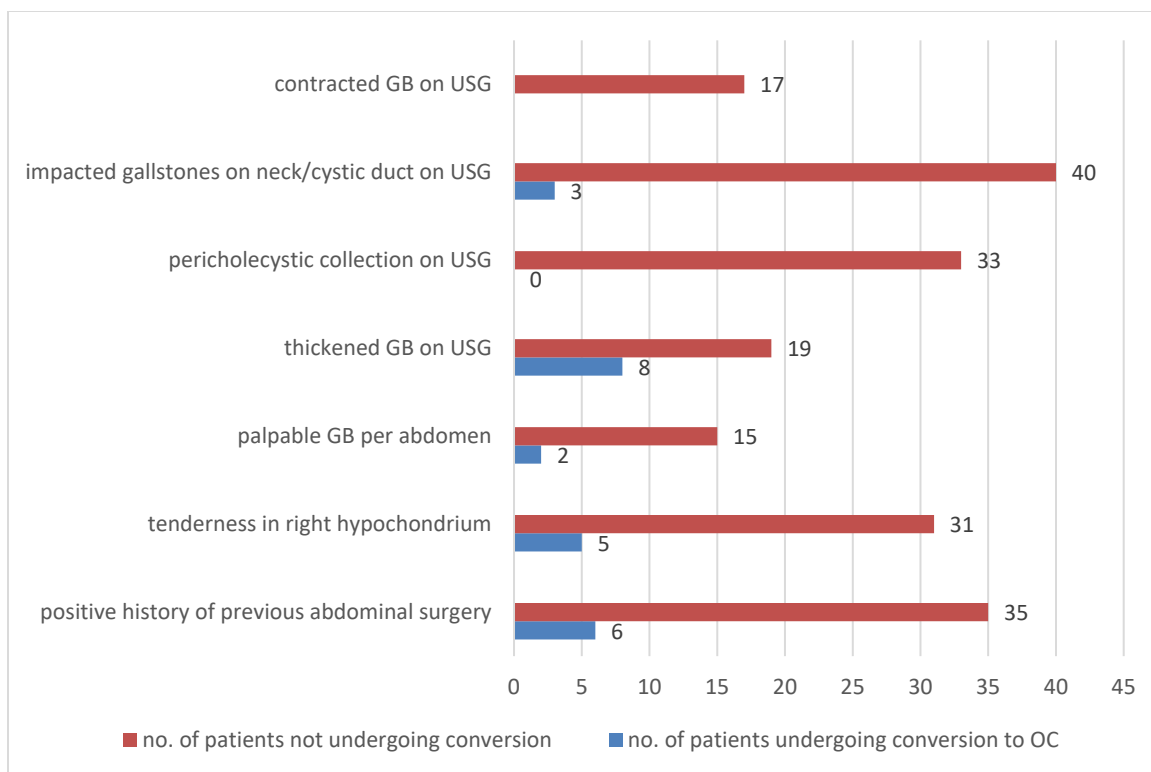


Figure 2: Frequency of conversion to open procedure in relation with study variables

Discussion:

Atul Kumar Gupta et al [8] studied various predictors of difficulty and their correlation with likely difficulty observed out of 50 adults undergoing laparoscopic cholecystectomy for symptomatic cholelithiasis majority of patients in the age group of 31-40 years (18 out of 50).

Nikhil Agrawal et al [9] studied preoperative prediction of difficult laparoscopic cholecystectomy by scoring method observed the mean age group of the study was 39.47 ± 12.08 years with the minimum age being 18 years and the maximum being 64 years. The majority of patients were in the age group of ≤ 50 years (25 patients) and only 16.7% (five cases) were > 50 years.

There is significant relation ($P < 0.0001$) between difficulty level and history of gall stone related complications. Prior acute cholecystitis or acute pancreatitis results in a scarred and fibrosed gall bladder, and in

dense fibrotic adhesions that render laparoscopic dissection difficult.[10, 11]

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]

Prior acute cholecystitis or acute pancreatitis results in a scarred and fibrosed gall bladder and in dense fibrotic adhesions that render laparoscopic dissection difficult.

Gall bladder wall thickness is related to the inflammation or fibrosis that follows previous attacks of cholecystitis, and thus

may reflect difficulty in delineation of the anatomy during surgery [11].

The various preoperative parameters in literature for predicting conversion to OC are obesity, raised LFT and raised TLC, h/o prior biliary intervention, h/o acute cholecystitis, h/o previous upper abdominal surgery, thick wall gall bladder, contracted gall bladder, pericholecystic fluid collection, stone size > 2cm [15, 16].

It should be remembered that conversion should not be regarded as a complication or a failure, but as a prudent choice to avoid additional risks/damage in particular cases.

Common reasons for conversion such as bleeding, accidental lesions of the biliary ducts or adjacent organs and intolerance to pneumoperitoneum are difficult to predict preoperatively and may arise even in the simplest of laparoscopic cholecystectomies [17].

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.

References:

1. Kurin Conlon. Gallbladder and bile ducts 25th edition. Chapter 63 in Bailey and Love's short practice of Surgery, Norman S. Williams, Christopher J.K. Bulstrode, P. Ronan O'Connell. 2017: 1119-1120.
2. Ravi S. Chari, MD and Shinul A. Shah, MD. Biliary system, Chapter 54 Sabiston textbook of surgery, Volume 2, 18th edition, Courtney M. Townsend, R. Daniel Beauchamp, B. Mark Evers, Kenneth L. Mattox, 2016: 1547-1588.
3. Rakesh Tendon, "Diseases of gallbladder and biliary tract". API text book of medicine, Dr. Siddarth N Shah, 7th edition, 2003, PP 642 – 644.
4. Alponat A, Kum CK, Koh BC, Rajnakova A, Goh PM. Predictive factors for conversion of laparoscopic cholecystectomy. World journal of surgery 1997;21(6):629-33.
5. Sanabria JR, Gallinger S, Croxford R, Strasberg SM. Risk factors in elective laparoscopic cholecystectomy for conversion to open cholecystectomy. Journal of the American College of Surgeons 1994;179(6):696-704.
6. Murayama KM, Thompson JS. Retrograde laparoscopic gallbladder dissection. Contemp Surg 1996;48:106-7.
7. Daradkeh SS, Suwan A, Abukhalaf M. Pre-operative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. World J Surg 1998;22:75-7.
8. Gupta AK, Shiwach N, Gupta S, Gupta S, Goel A, Bhagat TS. Predicting difficult laparoscopic cholecystectomy. Int Surg J 2018;5:1094-9.
9. Nikhil Agrawal, Sumitroj Singh, and Sudhir Khichy. Preoperative Prediction of Difficult Laparoscopic Cholecystectomy: A Scoring Method Niger J Surg. 2015 Jul- Dec; 21(2): 130–133.
10. Randhawa JS, Pujahari AK. Preoperative prediction of difficult lap chole: a scoring method. Indian Journal of Surgery 2009;71(4):198-201.
11. Nachnani J, Supe A. Pre-operative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. Indian journal of gastroenterology: official journal of the Indian Society of Gastroenterology 2004;24(1):16-8.
12. Nidoni R, Udachan TV, Sasnur P, Baloorkar R, Sindgikar V, Narasangi B, et al. Predicting difficult laparoscopic

- cholecystectomy based on clinicoradiological assessment. *J Clin Diagn Res* 2015;9:PC09-12.
13. Krahenbuhl L, Sclabas G, Wente MN, Schafer M, Schlumpf R, Buchler MW. Incidence, risk factors, and prevention of biliary tract injuries during laparoscopic cholecystectomy in Switzerland. *World J Surg* 2001;25:1325-30.
 14. Merriam LT, Kanaan SA, Dawes LG, Angelos P, Prystowsky JB, Rege RV, et al. Gangrenous cholecystitis: Analysis of risk factors and experience with laparoscopic cholecystectomy. *Surgery* 1999;126:680-6.
 15. Ercan M, Bostanci EB, Teke Z, Karaman K, Dalgic T, Ulas M, et al. Predictive factors for conversion to open surgery in patients undergoing elective laparoscopic cholecystectomy. *Journal of Laparoendoscopic & Advanced Surgical Techniques* 2010;20(5):427-34.
 16. Ishizaki Y, Miwa K, Yoshimoto J, Sugo H, Kawasaki S. Conversion of elective laparoscopic to open cholecystectomy between 1993 and 2004. *British journal of Surgery* 2006;93(8):987-91.
 17. Costantini R, Caldaralo F, Palmieri C, Napolitano L, Aceto L, Cellini C, et al. Risk factors for conversion of laparoscopic cholecystectomy. *Annali Italiani di Chirurgia* 2012;83(3):245-252.