Original Research Article

A Retrospective Cross-Sectional Evaluation of the Predictors of Difficulty in Laparoscopic Cholecystectomy

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Abstract

Aim: The aim of the present study was to identify predictors for difficult Laparoscopic cholecystectomy.

Methods: A retrospective cross-sectional review of surgical records was done for all patients who underwent laparoscopic cholecystectomy on an elective basis at Department of General surgery, Lord Buddha Kosi Medical College & Hospital, Saharsa, Bihar, India for the period of 2 years. A total of 250 patients who underwent laparoscopic cholecystectomy (50 patients with difficult and 200 patients without difficult LC) were studied during the study period.

Results: The majority of patients were female. The median age was 48 years. When we assessed different preoperative and intraoperative variables in two groups (difficult LC and non-difficult LC), we found differences based upon age, gender, past history of acute cholecystitis, gallbladder wall thickness, fibrotic gallbladder, and adhesion at the triangle of Calot (P < 0.05). However, We did not observe significant differences in other variables (P > 0.005). We had also evaluated different factors associated with difficult LC. In logistic regression analysis, on multivariate analysis gender (male), past history of acute cholecystitis, gallbladder wall thickness (≥4–5 mm), fibrotic gallbladder, and adhesion at the triangle of Calot were significantly associated with an increased risk of difficult laparoscopic cholecystectomy (P < 0.05).

Conclusion: Gender (male), past history of acute cholecystitis, gallbladder wall thickness (4–5 mm), fibrotic gallbladder, and adhesion at Calot's triangle are significant predictors for difficult LC. Moreover, an awareness about reliable predictors for difficult LC would be helpful for an appropriate treatment plan and application of the resources to anticipate difficult LC.

Keywords: Cholelithiasis, Predictors, Difficult laparoscopic cholecystectomy.

Introduction

Cholecystectomy is a surgical procedure to remove the gallbladder due to stone or inflammation, and its the most standard procedure performed in the biliary tract. [1] Laparoscopic cholecystectomy has become the preferred method and has been accepted as the gold standard for definitive management of symptomatic cholelithiasis or gallstones. [1,2] This surgical procedure has many advantages over the standard open cholecystectomy, such as minimal trauma, decreased pain, shorter hospital stay, better cosmetic outcome, and faster recovery. [3,4] However, some studies have shown that laparoscopic cholecystectomy has a higher frequency of complications than the standard open cholecystectomy.

The complication includes injury of the common bile duct, bile leakage, gallbladder perforation, injury to the vascular and visceral structure during the application of Veress needle and a trocar, and other complications such as external biliary fistula, perihepatic collection, wound sepsis, hematoma, foreign body inclusions, adhesions, metastatic port-site deposits, and cholelithoptysis. [1,3] In the early years of the laparoscopic cholecystectomy era, the conversion rate to open procedure was 2–15%. After years of learning and understanding the laparoscopic technique and increasing surgeons' experience, the conversion rate dropped to

approximately 1–6%. This conversion was an attempt to avoid complications due to various difficulties encountered during the procedure. [5]

A few factors that play a role in the decision for conversion from laparoscopic to open surgery are, the patient condition, level of surgeon expertise and technical factors, amongst others. One of the leading reasons for conversion is inability to define anatomy and difficult dissection, followed by other complications like bleeding. The conversion rate for elective laparoscopic cholecystectomy is around 5%, whereas the conversion rate in the setting of acute cholecystitis may be as high as 30%. In 1985, the first endoscopic cholecystectomy was performed by Mühe of Böblingen, Germany. Despite skeptical remarks from the academic surgical community, laparoscopic cholecystectomy (LC) was adopted rapidly around the world and has subsequently been recognized as the new "gold standard" for the treatment of gallstone disease. [6] In 1992, the national institutes of health (NIH) consensus development conference stated that laparoscopic cholecystectomy provides a safe and effective treatment for most patients with symptomatic gallstones. [7]

The aim of the present study was to identify predictors for difficult Laparoscopic cholecystectomy.

Materials and Methods

A retrospective cross-sectional review of surgical records was done for all patients who underwent laparoscopic cholecystectomy on an elective basis at department of General Surgery, Lord Buddha Kosi Medical College & Hospital, Saharsa, Bihar, India for the period of 2 years. A total of 250 patients who underwent laparoscopic cholecystectomy (50 patients with difficult and 200 patients without difficult LC) were studied during the study period. We included only those patients who were planned for elective LC and excluded those who underwent emergency LC for cholelithiasis with acute cholecystitis. We divided the patients into two groups based on operative findings of difficult LC; difficult LC group and non-difficult group. We defined difficult LC as those comprising an operative time of more than

two hours, need for conversion to open cholecystectomy, significant bleeding (any hemorrhage that couldn't be managed with manual pressure and cautery and had to be managed with conversion into open surgeries) and those with vascular and biliary injuries.

Patient's demographics, risk factors, and perioperative details were analyzed. Clinical evaluation, abdominal ultrasonography as well baseline investigations were used as a tool to assess all patients for surgery. The patients who presented with acute phase (acute cholecystitis) was planned for surgery after the resolution of symptoms. Therefore, all of these patients were initially managed medically, discharged and readmitted for elective laparoscopic cholecystectomy.

Meanwhile, the selected patients with suspected choledocholithiasis or with dilated biliary duct in ultrasonography had been evaluated with magnetic resonance cholangiopancreatography (MRCP). In addition, patients with common bile duct stones had endoscopic retrograde cholangiopan creatography (ERCP) before cholecystectomy. During operation, all patients received perioperative prophylactic antibiotics. The standard four-port technique was applied for the procedure. Meanwhile, the open method was used to introduce a sub umbilical cannula. In most of the cases, we placed titanium clips for cystic artery and cystic duct ligations and we did not perform intraoperative cholangiography routinely. Furthermore, we only put a closed suction drain in selected cases according to need.

Perioperative data comprising duration of surgery, and operative findings were documented. During analysis of data, independent t-test or Mann–Whitney test was applied for all quantitative variables while Chi-square test or Fisher's exact test was used for all categorical variables. Univariate and multivariate logistic regression were performed to recognize independent predictors associated with difficult LC. Statistical software SPSS version 25.0 (Statistical Package for the Social Sciences) was used for statistical analysis. A P value < 0.005 was considered statistically significant.

Results

Table 1: Patient's demographics and perioperative data

Variable	Difficult LC N=50	Non-difficult N=200	P Value
Age, (years)			0.012
≥60	11	22	
<60	39	178	
Sex			0.001
Male	35	32	
female	15	168	
Smoking			0.220
Smoker	24	32	

Non-smoker	26	168	
Past history of acute cholecystitis			0.001
Yes	40	6	
No	10	194	
BMI			0.525
<18.5	2	6	
≥18.5 < 25	45	190	
≥25	3	4	
Comorbidity,%	8	16	0.017
Diabetes mellitus	7	4	
Hypertension	3	6	
Cardiovascular disease	0	2	
Respiratory diseases	0	2	
Neurological problems	0	2	
Renal disease	0	2	
GB wall thickness (mm)			0.001
≥4–5	44	6	
<4–5	6	194	
Fibrotic GB			0.007
Yes	12	20	
No	38	180	
Adhesion in TOC			0.001
Yes	43	4	
No	7	196	

The majority of patients were female. The median age was 48 years. When we assessed different preoperative and intraoperative variables in two groups (difficult LC and non-difficult LC), we found differences based upon age, gender, past history of acute cholecystitis, gallbladder wall thickness, fibrotic gallbladder, and adhesion at the triangle of Calot ($P < 0.05$). However, We did not observe significant differences in other variables ($P > 0.005$).

Table 2: Association of variables with difficult laparoscopic cholecystectomy

Variables	Univariate analysis OR,(CI) P value	Multivariate analysis OR;(CI); P* value
Age(≥60)	2.08; (1.133–5.004); 0.017	0.232;(0.044–1.205); 0.084
Sex (Male)	4.32; (3.12–5.93); 0.001	0.172;(0.043–0.675); 0.016
Presence of Comorbidity	1.98; (1.01–3.79); 0.048	0.728;(0.120–4.429); 0.733
Past history of acute cholecystitis	22.0; (11.58–38.05); 0.001	0.039; (0.005–0.309); 0.003
GB wall thickness ≥4–5 mm	24.0; (12.77–41.39); 0.001	0.075; (0.008–0.666); 0.022
Fibrotic GB	2.46; (1.325–4.51); 0.005	166.4; (7.946–3492); 0.001
Presence of Adhesion in TOC	34.6; (16.48–72.51); 0.001	0.022;(0.001–0.311); 0.007

We had also evaluated different factors associated with difficult LC. In logistic regression analysis, on multivariate analysis gender (male), past history of acute cholecystitis, gallbladder wall thickness (≥4–5 mm), fibrotic gallbladder, and adhesion at the triangle of Calot were significantly associated with an increased risk of difficult laparoscopic cholecystectomy ($P < 0.05$).

Discussion

Laparoscopic cholecystectomy (LC) is the gold standard treatment for symptomatic cholelithiasis due to its effectiveness, and safety. Moreover, the benefits of laparoscopic cholecystectomy are; less postoperative pain, faster recovery, earlier return of bowel function, and shorter hospital stay when compared to conventional cholecystectomy. [8,9]

Although, the LC is the most common operation performed these days, some of the intended LC require conversion due to several factors. Many a time it demands conversion to open cholecystectomy due to intraoperative complications for the safe ending of the procedure and takes more than anticipated time. However, current literature has mentioned a conversion rate of nearly about (2%–10%). [10]

The majority of patients were female. The median age was 48 years. When we assessed different preoperative and intraoperative variables in two groups (difficult LC and non-difficult LC), we found differences based upon age, gender, past history of acute cholecystitis, gallbladder wall thickness, fibrotic gallbladder, and adhesion at the

triangle of Calot (P < 0.05). However, We did not observe significant differences in other variables (P > 0.005). We had also evaluated different factors associated with difficult LC. In logistic regression analysis, on multivariate analysis gender (male), past history of acute cholecystitis, gallbladder wall thickness (≥4–5 mm), fibrotic gallbladder, and adhesion at the triangle of Calot were significantly associated with an increased risk of difficult laparoscopic cholecystectomy (P < 0.05). The literature has mentioned different predictors for difficult LC such as age 60 or more, male gender, comorbid condition, past history of acute cholecystitis, previous abdominal surgery, gall bladder wall thickness 4–5 mm, contracted gall bladder, and impacted stone. [11,12] When we analyzed the predictors of difficult LC in DLC, we found that gender (male), past history of acute cholecystitis, gall bladder wall thickness (4–5 mm), fibrotic gallbladder, and adhesion in the triangle of Calot were significant risk factors for difficult LC likewise reported in other studies. [13]

In Our study we found that there was delayed presentation of symptoms by male as compared to female patients. The possible reason could be less attention to mild symptoms leading to presentation only after disease progression. This scenario has also been mentioned in other studies. [14,15] Most of the time, the levels of difficulties are hard to assume. Nevertheless, it is necessary to predict so that the patient can be informed regarding the possibility of conversion. Likewise, the surgeon can get mentally prepared to be ready for having a good surgical team, intraoperative cholangiogram, the timing of the procedure and have overall preparedness to defy the difficult cholecystectomy for better postoperative outcomes. It is always better to know the predictors to complete such challenging surgeries. Based upon the risk factors like; patient demographics such as age, gender, body weight, comorbidity, and ASA score, along with clinical findings (acute versus chronic cholecystitis), and the surgeon's experience; the chance of possible complications, and conversion into open surgery can be estimated. [16,17]

In literature, the role of CT scan has been maintained in difficult LC. [18] However, we could not perform CT scans routinely because of the economic constraints of our patients. We perform the preoperative ultrasonographic evaluation of patients scheduled for surgery. Preoperative ultrasonographic findings of gallbladder wall thickness are also a significant predictor for difficult LC in our study, similarly reported by Giuseppe et al. [19] Some studies have highlighted the use of laparoscopic ultrasound during cholecystectomy and incorporate its benefit in difficult situations while the anatomy is not clear. [20] Besides, several approaches have been described for the management of difficult LC in the literature including laparoscopic subtotal cholecystectomy, fundus first or antegrade or other techniques. [21,22] Though we usually performed laparoscopic subtotal cholecystectomy being very loyal to conversion, this study could not make a single recommendation about these techniques to manage difficult LC sand this has been agreed about growing consensus in laparoscopic subtotal cholecystectomy and fundus first methods.

Conclusion

Gender (male), past history of acute cholecystitis, gallbladder wall thickness (4–5 mm), fibrotic gallbladder, and adhesion at Calot's triangle are significant predictors for difficult LC. Moreover, an awareness about reliable predictors for difficult LC would be helpful for an appropriate treatment plan and application of the resources to anticipate difficult LC.

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