

Significance of preoperative laboratory and radiological parameters in predicting difficult laparoscopic cholecystectomy

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ABSTRACT

Introduction: Laparoscopic cholecystectomy is a routine procedure for cholecystitis and cholelithiasis, but at times can have difficulties that may make the surgeon decide for an open cholecystectomy instead. Identification of possible preoperative factors that could allow prediction of difficult laparoscopic cholecystectomies would be of great help to the practicing surgeon.

Objective: To assess the significance of preoperative laboratory and radiological features in prediction of difficult laparoscopic cholecystectomy.

Materials & Methods: A Case Control study was carried out at Rehman Medical Institute, Peshawar, based on the archived medical records of patients diagnosed with cholecystitis and cholelithiasis who underwent Laparoscopic Cholecystectomy (Lap Chole) from 2014 to 2019. Patients were divided into two cases (difficult Lap Chole) and controls (normal Lap Chole). In the laboratory variables, WBC Count and LFTs (serum bilirubin, ALT and AST) were considered. In the case of radiological variables, CT scan findings were considered. Regression analysis was done to assess the variables. Data were analyzed using SPSS version 26.

Results: With the sample size of 126, 56(44.4%) patients were male and 70(55.6%) were female. The total number of cases were 25(20%) whereas controls were 101(80%) giving a ratio of 1:4. The majority (51%) of patients had no comorbidities; 58(46%) patients had normal WBC count whereas 68(54%) patients had raised WBC count. Fifty six (44.4%) patients had normal LFTs whereas 70(55.6%) patients had deranged LFTs. Most common CT finding (29.6%) was acutely inflamed gallbladder with multiple calculi, increased wall thickness and pericholecystic fluid. Univariate Regression analysis identified CT findings and Duration of surgery as significant predictive variables; multivariate regression analysis identified the selected variables as significantly predictive.

Conclusion: Selected preoperative and operative variables such as laboratory and radiological features, and duration of surgery can be useful for prediction of difficult laparoscopic cholecystectomy.

Keywords: Gallstones; Laparoscopy; Cholecystectomy, Laparoscopic.

The authors declared no conflict of interest. All authors contributed substantially to the planning of research, data collection, data analysis, and write-up of the article, and agreed to be accountable for all aspects of the work.

INTRODUCTION

Laparoscopic Cholecystectomy (Lap Chole) is a minimally invasive surgical procedure using ports to remove a diseased gallbladder. It helps in the removal of gallbladder inflamed with stones. It is preferred over open cholecystectomy due to being less painful, with decreased blood loss, lesser duration of hospital stay, and lower rate of postoperative complications. Since the early 1990s, this technique has largely replaced the open technique for cholecystectomies.¹ From a study conducted in 2019 in Pakistan, incidence of 4.2% in males and 14.2% in females was reported in Pakistan.² Laparoscopic cholecystectomy is considered as a gold standard surgical procedure for gallstones all over the globe.³ According to one study carried out in Delhi, India, history of hospitalization, palpable gall bladder, impacted stone, and gall bladder wall thickness were statistically significant factors for prediction of difficult laparoscopic cholecystectomy.⁴ Another study by Shannon et al⁵ found that the presence of upper abdominal surgeries and presence of upper abdominal scars or hernias were significantly associated with difficulty in umbilical port placement making it a difficult laparoscopic cholecystectomy. Difficulty in grasping the gallbladder is also associated with distended gall bladder and pericholecystic inflammation.⁶ The main reason for distended gallbladder is large stone in the neck of gall bladder.⁷ Ishizaki et al,⁸ in their study have found post-ERCP status as a significant predictor of difficulty in adhesiolysis and Calot's triangle dissection. Similarly, abnormal LFTs and elevated amylase levels indicate ongoing hepatitis, cholangitis, and pancreatitis, that make it difficult to dissect due to edema.^{9,10} When considering gender as a variable, men tend to present late due to lack of attention to subtle symptoms and hence present as an advanced case.¹¹ Similarly other variables such as age, obesity, recurrent attacks of cholecystitis, etc., were also assessed in various studies.

The present study was conducted to evaluate the significance of preoperative radiological and laboratory features in predicting difficult Laparoscopic Cholecystectomy, so as to minimize the expenditure of healthcare on patient and making it easy for surgeons to order only specific tests.

MATERIALS & METHODS

This case control study was carried out at Rehman General Hospital, Peshawar, Khyber Pakhtunkhwa from September 01, 2022, to September 30, 2022, based on retrospective hospital data from April 2014 to August 2019 of 126 patients who were diagnosed with Cholecystitis and Cholelithiasis and underwent Cholecystectomy in Rehman Medical Institute. The sample was of only 126 patients due to missing CT reports of many patients. Patients were divided into two groups Cases and Controls. Cases were the patients who underwent difficult laparoscopic Cholecystectomy defined as surgeries with operative time >2 h, need for conversion to open surgery, significant bleeding and/or use of synthetic hemostats, vascular and/or biliary injuries and additional procedures (intraoperative common bile duct exploration or ERCP). Controls were the ones with normal Lap Chole defined as surgery duration <2 hours, no conversion to open surgery, absence of significant bleeding and no biliary injuries. The two groups were homogenous for demographic data such as age, gender and co-morbidities.

In the laboratory variables, we considered WBC Count and LFT (serum bilirubin, ALT and AST). In case of radiological variable, CT scan findings such as Irregular or Absent wall, Pericholecystic Fluid, Fat Stranding, Thickened wall >4mm were considered. Univariate and Multivariate Regression analysis was done to assess the variables. The Dependent variable was "Converted to Open", and the Independent variables were "CT findings", "WBC", "LFTs" and "Duration of Surgery". Lab variables such as WBC Count and LFT reports, and CT scan findings were considered as definite variables and their relation whether linear or inverse in predicting difficult lap chole was assessed.

Data were analyzed using SPSS version 26. Quantitative variables were expressed as mean and standard deviation and categorical variables as frequencies and percentages. A $p \leq 0.05$ was considered statistically significant.

RESULTS

Of 126 subjects, 56(44.4%) were male and 70(55.6%) were female; the mean for age was 51.88 years with majority of patients in the age group of 51 to 52 years old. Most (51%) patients had no comorbidities; 31(24.6%) patients had surgery duration of more than 2 hours and 75.4% (95 patients) had duration of less than 2 hours. Total number of cases were 25(20%) whereas controls were 101(80%) giving a ratio of 1:4.

Table 1 shows that 58(46%) patients had normal WBC count whereas 68(54%) patients had raised WBC count. Similarly, 56(44.4%) patients had normal LFTs whereas 70(55.6%) patients had deranged LFTs.

Table 1: WBC and LFTs of patients undergoing Lap Chole (n=126).

Laboratory Features	Frequency	Percentage
WBC		
Raised	68	54
Normal	58	46
Total	126	100
LFTs		
Normal	56	44.4
Raised Alt	21	16.7
Albumin changed	13	10.3
Raised Bilirubin	16	12.7
Raised Alt and Bilirubin	20	15.9
Total	126	100

Table 2 shows CT findings with percentages and frequency. Most commonly found CT finding was acutely inflamed gallbladder with multiple calculi, increase wall thickness and pericholecystic fluid accounting for a total of 29.6%

Table 2: CT findings of patients undergoing Lap Chole (n=126).

CT Findings	Frequency	Percentage
Acutely inflamed GB with multiple calculi, increased wall thickness and pericholecystic fluid	37	29.6
Perforated Gall Bladder	28	22.4
Interrupted wall enhancement and contained perforation	7	5.6
Gangrenous GB with perforation	24	19.2
GB with mass formation	12	9.6
Empyema of GB	17	13.6
Total	125	100
Missing	1	0.8
Total	126	100

Table 3 shows both univariate and multivariate regression. For univariate regression, CT findings ($p=0.10$) and Duration of Surgery ($p=0.012$) contributed significantly to the dependent variable of "Converted to Open". Multivariate regression analysis showed a significant contribution to the dependent variable ($p=0.005$), thereby showing a greater effect than the individual independent variables.

Table 3: Regression analysis of independent variables for prediction of difficult lap cholecystectomy (n=126).

Independents	Dependent	Beta	R	R ²	F value	p value	Hypothesis supported
Univariate Regression							
CT findings	Converted to open	-0.051	0.230	0.045	6.873	0.010	Yes
WBC		-0.016	0.020	0.000	0.051	0.822	No
LFTs		-0.010	0.038	0.001	0.178	0.674	No
Duration of surgery		0.207	0.225	0.05	6.554	0.012	Yes
Multivariate Regression (all independent variables)		-0.056	0.339	0.115	3.90	0.005	Yes
	0.110						
	0.008						
	0.255						

DISCUSSION

The research for significance of preoperative factors such as WBC count, LFTs and CT findings in predicting the conversion of laparoscopic cholecystectomy to open cholecystectomy is essential. Predictive preoperative factors are useful in assessing the risk, the type of surgical technique to be used, and postoperative prognosis. In this study, retrospective data were analyzed, of patients undergoing Lap Chole using laboratory test results (WBC count and LFTs) and the radiological features of CT findings. The CT findings were selected due to dissection of Callout's triangle, cystic artery and duct identification, and detachment of gall bladder from liver bed. CT findings helped in precise presentation of the problem. We could only find few articles emphasizing role of CT in prediction of difficult laparoscopic cholecystectomy.^{12,13}

In the present study, no association was found between laboratory features and prediction of difficult lap chole which was in discordance with Bourgooin et al.^{14,15} CT findings had correlation with difficult Lap Chole. A study by Nakazawa et al in 2020 also showed correlation between CT findings and difficult laparoscopic cholecystectomy.¹²

A study conducted at the Department of General and Emergency Surgery of the University Hospital Policlinico of Palermo Italy between January 2015 and December 2019 showed association of raised WBC count with difficult laparoscopic cholecystectomy and pre-operative abdominal CT was found helpful in predicting difficult laparoscopic cholecystectomy.¹⁶ Another study carried out at the Department of General Surgery in Menoufia University Hospital and Tala General Hospital, Egypt found increased wall

thickness of gall bladder in most of the patients undergoing difficult laparoscopic cholecystectomy.¹⁷ Some studies also considered gender, previous abdominal surgical scars, and recurrent attacks of cholecystitis as factors for prediction of difficult Lap Chole. Recurrent or previous attacks of acute cholecystitis and abdominal surgery scar showed significant correlation.^{19,20} Worldwide, mostly males underwent difficult lap chole¹⁸ whereas our study showed no correlation between gender and difficult laparoscopic cholecystectomy.

A few studies also showed comorbidity such as uncontrolled diabetes as a major risk factor for conversion to open cholecystectomy,^{21,22} whereas our study showed majority of patients who underwent lap cholecystectomy had no comorbidity. A study carried out at Shifa International Hospital, Islamabad, showed age correlation with conversion to open cholecystectomy. Patients aged above 65 had an increased rate of conversion to open cholecystectomy.³ Our study proved no such correlation.

LIMITATIONS

The limitations of the present study were lack of previous surgical patient records, lack of history of recurrent cholecystitis, CT reports lacking exact measurement of gallstones and gall bladder thickness, and a limited sample size.

CONCLUSION

Selected preoperative laboratory and radiological findings as well as the Duration of Surgery are useful predictors for the possibility of Difficult Laparoscopic Cholecystectomy in patients suffering from cholecystitis and cholelithiasis.

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