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Original Research Article

Difficult laparoscopic cholecystectomy versus conversion to open cholecystectomy: understanding and modern concepts

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ABSTRACT

Background: Cholecystectomy is the most common procedure performed on the biliary tract and the second most common major abdominal operation performed today. In this study we have assessed the value of clinical and ultrasonographic criteria in predicting intraoperative difficulties for patient undergoing laparoscopic Cholecystectomy (LC).
Methods: The study was done on 50 patients of symptomatic cholelithiasis, requiring elective cholecystectomy, attending surgical OPD of People's College of Medical Sciences and Research Centre, Bhopal, India from 31st September 2012 to 31st April 2014.
Results: The mean age of the study population is 40.30years. Male to female ratio is1:4.5. The mean BMI of patients in study is 22.93 kg/m^2. 9 patients had history of previous abdominal surgery. Specificity of ultrasound to predict the conversion to open procedure is 84.21%. Specificity of gallbladder wall thickness to predict the conversion to open cholecystectomy is 92.11%. Specificity of contracted gallbladder to predict the conversion to open cholecystectomy is 94.74%. Specificity of stone impaction at neck of gallbladder to predict the conversion to open cholecystectomy is 94.74%.
Conclusions: In this study we have included 50 patients in which four clinical and four ultrasonographic parameters for predicting difficult laparoscopic cholecystectomy were analysed.

Keywords: Cholelithiasis, Gold standard, Laparoscopic cholecystectomy, Ultrasonography

INTRODUCTION

Cholecystectomy is the most common procedure performed on the biliary tract and the second most common major abdominal operation performed today. Laparoscopic cholecystectomy (LC) first became popular in 1980 and now procedure is considered as standard.[1,2]

In 1882, Carl Langenbuch performed the first open cholecystectomy for gallstone disease.[3] In 1987, 105 years later, Philipe Mouret performed the first laparoscopic cholecystectomy in Lyon, France.[4] Over the last two decades laparoscope has gain worldwide acceptance as the "gold standard" in surgical management of symptomatic cholelithiasis.[5,6]

Despite of advantages and disadvantages of laparoscopic cholecystectomy few require conversion of LC to open cholecystectomy. The common aetiology of such conversion is uncontrollable bleeding, adhesion, inflammation, anatomical variation, trauma of bile duct, presence of malignant pathologies and technical failure. These causable variables are intraoperative events and could not be used as factors to predicate conversions before operation.[7,8] Among clinical parameters age, sex, BMI and previous abdominal surgery, and patient's

laboratory data may be significant predictive factors for difficulties during LC. Several studies have been undergone for the same. Some taking only ultrasonographic parameters, some took only ERCP methods and some studies took clinical and laboratory criteria.

By taking above studies in consideration, in this study we will assess the value of clinical and ultrasonography criteria in predicting intraoperative difficulties for patient undergoing LC and in identifying indicators for Conversion tool and will make combined criteria , that can give surgeon some idea about the potential difficulties and complications that may be encounter during the course of LC. The objective of the study was to predict the value of clinical criteria in predicting operative difficulties during LC for symptomatic cholelithiasis, to predict the value of ultrasonographyc (USG) criteria in predicting operative difficulties during LC for symptomatic cholelithiasis, to predict more effective parameters consisting USG+CLINICAL variables among all parameters in predicting difficulties during LC.

METHODS

The study was done on 50 patients of symptomatic cholelithiasis, requiring elective cholecystectomy, attending surgical OPD of People's College of Medical Sciences and Research Centre, Bhopal, India from 31st September 2012 to 31st April 2014.

Inclusion criteria

- All patients with symptomatic cholelithiasis.
- Patients of all ages and both sexes were included in the study that is all patients with symptomatic gall stone disease were included in the study.

Exclusion criteria

- Patients with common bile duct stone
- Patients with jaundice or abnormal liver function tests (LFT)
- Patients with acute cholecystitis
- Patients with empyema gallbladder
- Patients with acute pancreatitis
- Patients with known carcinoma gallbladder
- Patients with cholangitis, biliary-enteric fistula, Portal hypertension.

A detailed clinical history with special reference to duration of pain, its periodicity aggravating factor, relieving factor , time since last attack occurred and history of previous abdominal surgery. The information was recorded in the proforma. A detailed physical examination including BMI, any palpable mass in right hypochondriac region, tenderness, any operative scar mark and if present then its location was done and recorded in the proforma. The selected patients were then told about the procedure and written informed consent was taken. Patients were also informed about the conversion to open cholecystectomy

Criteria assessed

- Age- more than or less than 50 years
- Sex- either male or female
- BMI- more or less than 27.5 kg/m^2
- History of previous abdominal surgery- either upper abdominal or lower abdominal.

Pre-operative ultrasound

Criteria assessed

- Gallbladder wall thickness - more than or less than 4mm
- Stone impacted at the neck of gallbladder or not
- Volume of gallbladder-weather gallbladder contracted or not
- CBD size - more than less than 6 mm
- Any evidence of acute cholecystitis and acute pancreatitis.

Intra- operative assessment

Criteria assessed

- Total duration of surgery from the insertion of Verres needle or the insertion of cannula (by open technique to) to the extraction of gallbladder. More than or less than 90 minutes
- Total time taken to dissect the Calot's Triangle more than or less than 20 min
- Total time taken to dissect the gallbladder from the gallbladder bed more than or less than 20 minutes
- Spillage of bile and stone present or not
- Tear of gallbladder present or not
- Any other operative complication during surgery.

RESULTS

Age distribution

Maximum percentage of the patients was in the age group of 35-40 year. Mean age of study population was 40.30 years. The maximum age was 69 years and minimum age was 16 years. There were 12 patients (24%) with age more than 50 years. Among them 8 cases (16%) were difficult on surgery out of which 5cases (10%) converted to open procedure.

Sex distribution

Male to female ratio is 1:4.5. There were 9 males (18%) out of 50 and among 9 males laparoscopic cholecystectomy was difficult in 4 males (8%) and

converted to open in 3 cases (6%) out of difficult cases on surgery.

Body mass index (BMI)

The mean BMI of study population was 22.91 kg/m^2. The maximum BMI was 30.00kg/m^2 and minimum was 19.6kg/m2.There were 9 patients (18%) with BMI>27.5 kg/m^2 out of which 7 cases (14%) were difficult on surgery and among these 5 cases (10%) converted to open procedure.

History of previous abdominal surgery

There were 9 patients out of 50 who had history of previous abdominal surgery. Out of 9 patients 3 had supraumblical scar mark and 6 had infraumblical scar mark (Table 1, Table 2).

Table 1: Comparison of clinical variables for predicting difficult laparoscopic cholecystectomy.

Variable	Sensitivity	Specificity	Positive predictive value	Accuracy	P-value	Chi-square value
Age	44.44%	87.5%	66.66%	72%	0.011	6.44
Sex	22.22%	84.38%	44.44%	62%	0.560	0.340
BMI	38.89%	93.75%	77.77%	74%	0.015	8.37
History of previous abdominal surgery	33.33%	90.63%	66.66%	70%	0.034	4.48
Combined clinical parameters	83.33%	62.5%	55.55%	70%	0.018	8.00

Table 2: Comparison of clinical variables for predicting the conversion to open procedure.

Variable	Sensitivity	Specificity	Positive predictive value	Accuracy	P-value	Chi-square value
Age	41.67%	81.58%	41.66%	72%	0.100	2.70
Sex	25.00%	84.21%	33.33%	70%	0.469	0.524
BMI	41.67%	89.47%	55.55%	78%	0.040	6.46
History of previous abdominal surgery	25.00%	84.21%	33.33%	70%	0.469	0.524
Combined clinical parameters	75.00%	52.63%	33.33%	70%	0.049	6.01

Ultrasonographic prediction

Sensitivity of ultrasonograhic prediction and difficulty in performing LC is 55.55%. Specificity of ultrasonograhic prediction and difficulty in performing LC is 87.55%. Sensitivity of ultrasound to predict the conversion to open procedure is 66.67%. Specificity of ultrasound to predict the conversion to open procedure is 84.21%.

Gallbladder wall thickness

Sensitivity of gallbladder wall thickness to predict difficulty in laparoscopic surgery is 38.89 %. Specificity of gallbladder wall thickness to predict difficulty in laparoscopic surgery is 93.75%. Sensitivity of gallbladder wall thickness to predict the conversion to open cholecystectomy is 50%. Specificity of gallbladder wall thickness to predict the conversion to open cholecystectomy is 92.11%.

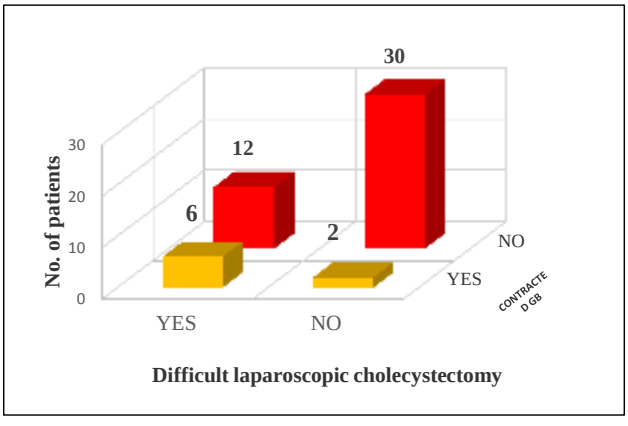

Figure 1: Correlation the gallbladder contraction and difficult laparoscopic cholecystectomy.

Contracted gallbladder

Sensitivity of contracted gallbladder to predict difficult laparoscopic cholecystectomy is 33.33%. Specificity of

contracted gallbladder to predict difficult laparoscopic cholecystectomy is 93.75%. Figure 1 showing correlation between gallbladder contraction and difficult LC.

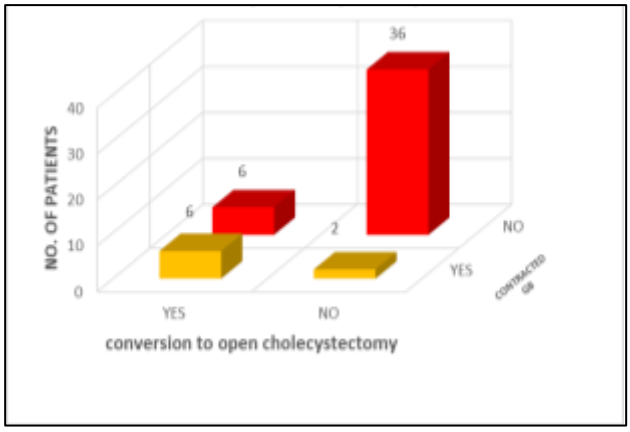

Figure 2: Correlation the gallbladder contraction and conversion to open cholecystectomy.

Sensitivity of contracted gallbladder to predict the conversion to open cholecystectomy 50%. Specificity of contracted gallbladder to predict the conversion to open cholecystectomy 94.74%. Figure 2 showing correlation between gallbladder contraction and conversion to open cholecystectomy.

Stone impacted at neck of gallbladder

Sensitivity of stone impaction at neck of gallbladder to predict difficult laparoscopic cholecystectomy is 38.89%. Specificity of stone impaction at neck of gallbladder to predict difficult laparoscopic cholecystectomy is 96.88%.

Sensitivity of stone impaction at neck of gallbladder to predict the conversion to open cholecystectomy is 50.00%. Specificity of stone impaction at neck of gallbladder to predict the conversion to open cholecystectomy is 94.74% (Table 3, Table 4).

Difficult laparoscopic surgery

Table 3: Comparison of ultrasonographic variables for difficult laproscopic surgery.

Variable	Sensitivity	Specificity	Positive predictive value	Accuracy	P-value	Chi-square value
Gallbladder wall thickness	38.89%	93.75%	77.77%	74%	0.004	8.31
Impaction of stone at the neck of gallbladder	38.89%	96.88%	87.5%	76%	0.001	11
Contracted gallbladder	33.33%	93.75%	75%	72%	0.012	6.29
Combined ultrasonograhic parameters	55.55%	87.5%	71.42%	76%	0.000	13.7

Table 4: Comparison of ultrasonograhic variables for the conversion to open procedure.

Variable	Sensitivity	Specificity	Positive predictive value	Accuracy	P-value	Chi-square value
Gallbladder wall thickness	50.00%	92.11%	66.66%	82%	0.001	11.00
Impaction of stone at neck of gallbladder	50.00%	94.75%	75.00%	76%	0.0001	13.6
Contracted gallbladder	50.00%	94.74%	75.00%	84%	0.0001	13.6
Combined ultrasonograhic parameters	66.67%	84.21%	57.14%	80%	0.001	11.7

DISCUSSION

Cholecystectomy remains the gold standard for the treatment of the gallstone disease. Laparoscopy can be difficult in dense adhesions and distorted anatomy. The various features that increase the technical difficulty are adhesion in the Calot's triangle. (The hepatic artery, common bile duct and cystic duct) distorted anatomy, empyema of gallbladder, contracted gallbladder, Mirrizi's syndrome, previous upper abdominal operation, and acute cholecystitis. The conversion rates in various studies range from 1.5% to 35%.[9-13]

Clinical parameters

Age

In 1994, Fried, et al published a study suggesting that the most significant predictors of conversion were increasing age, obesity, thickened gallbladder wall by preoperative ultrasound and acute cholecystitis.[14] In our study, we did find a positive correlation between age of the patient and the difficult laparoscopic cholecystectomy (P-value = 0.011) but we did not find a correlation between increasing age and need for conversion (P-value = 0.100). Similar was the findings of Edward H. Rege et al, found

very little correlation between age and the need to convert to an open operation.[15]

Sex

In the study, male sex was not found to be a statistically significant predictor of difficult LC (P-value = 0.560). This finding was in conformity with that of Woisetschlager R et al.[16] They did not find male sex to be a predictive factor of difficult cholecystectomy.

BMI

Fried et al in 1994 and in 1996 Liu et al have linked obesity to a higher incidence of conversions.[14,17] Ponsky J et al found in their series that obesity independently predicted conversion to open cholecystectomy in patients with acute cholecystitis.[18] In our study BMI>27.5 kg/m^2 shows correlation with predicting difficult laparoscopic cholecystectomy and conversion to open procedure (P value=0.015, P value=0.040 respectively), which is in agreement with previous studies.

History of previous abdominal surgery

Some of the studies have mentioned previous abdominal surgery as a risk factor predicting difficult LC.[19] Particularly surgery of the stomach and duodenum may make laparoscopic biliary surgery more difficult.[20]

In our study history of previous abdominal surgery can predict difficult laparoscopic cholecystectomy (P-value = 0.034) which is in agreement with above studies.

Ultrasonograhic parameters

Ultrasonograhic parameters are better than clinical parameters but when used in combination with preoperative colour doppler ultrasound can predict difficult laparoscopic cholecystectomy more accurately. The most valuable assessment the ultrasound can give is gall bladder wall thickness, gall bladder size CBD diameter and CBD stones and any abnormal anatomy of the biliary tract if present.

Gallbladder wall thickness

It is generally agreed that a sonographic/pathologic wall thickness of 3mm constitutes the upper limit of normal and may serve as a demarcation between thin walled and thick walled gallbladder.[21] In our study we have taken an arbitrary wall thickness cut-off as 4mm (that is gallbladder wall thickness more than 4 mm were predicted to be difficult.

Impaction of stone at neck of gallbladder

Stone impaction at the neck is another parameter that shows a good predictive value. The reason for the difficulty was the impacted stone caused the gallbladder change into mucocele and also the impaction of the stone at the neck causes difficulty in holding the gallbladder during dissection for retraction leading to difficult surgery

Contracted gallbladder

The contracted gallbladder is another important predictive factor for difficult laparoscopic cholecystectomy. The contracted gallbladder is usually a non-functioning gallbladder after repeated attacks of cholecystitis with dense adhesion with the surrounding structure. In our study there were 8 contracted gallbladder out of which 6 cases were difficult on surgery and 6 cases out of 6were converted to open cholecystectomy.

The study shows that pre-operative clinical parameters and ultrasonograhic parameters can predict operative difficulty for laparoscopic cholecystectomy to a good extent. Pre-operative clinical parameters and ultrasonography can also aid in recognition of cases where an open cholecystectomy should be considered and the patient counselled pre-operatively. The BMI> 27.5 kg/m^2 among clinical parameters and impaction of stone at the neck of gallbladder was the most accurate predictors of the potential operative difficulty and conversion to open procedure.

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REFERENCES

1. Troidl H, Spangenberger W, Dietrich A, Neugebauer E. Laparoskopische cholecystektomie. erste erfahrungen and ergebnissebei 300 operationen: eine prospective beobachtungs studie. Chirurg. 1991;62:257-65.
2. Mouret P. How I developed laparoscopic cholecystectomy. Ann Acad Med Singapore. 1996;25:744-7.
3. Antonio B, Francis G, Stalpart V, Weil D, Langenbech C. The first cholecystectomy. Am J Surg. 1976;132:81-2.
4. Hunter JG, Trus T. Laparoscopic cholecystectomy. In: Nyhus LM, Baker RJ, Fischer JE, editors. Mastery of Surgery, 3rd edition. Boston:Little Brown and company. 1997:1098.
5. Soper NJ, Stockmann PT, Dunnegan DL. Laparoscopic cholecystectomy: the new 'gold standard'? Arch Surg. 1992;127:917-21.

6. Soper NJ, Brunt LM, Kerbl K. Laparoscopic general surgery. N Engl J Med. 1994;330:409-19.
7. Casey BJ, Richards ML, Strodel WE, Schwesinger WH, Sirinek KR. Reasons for conversion from laparoscopic to open cholecystectomy: a 10-year review. J Gastrointest Surg. 2002;6:800-5.
8. Sakuramoto S, Sato S, Okuri T, Sato K, Hiki Y, Kakita A. Preoperative evaluation to predict technical difficulties of laparoscopic cholecystectomy on the basis of histological inflammation findings on resected gallbladder. Am J Surg. 2000;179:114-21.
9. Grace P, Qureshi A, Darzi A. Laparoscopic cholecystectomy, a hundred consecutive cases. Jr Med J. 1991:84:12-4.
10. Cushieri A, Dubois F, Mouiel J. The European experience with laparoscopic cholecystectomy. Am J Surg. 1991;161:385-7.
11. Dubios F, Berthelot C, Levard H. Laparoscopic cholecystectomy: historic and personal experience. Surg Laparosc Endosc. 1991;1:52-7.
12. Davis C, Arrengani M, Nagan R. Laparoscopic cholecystectomy: The st. vincent experience. Surglaparosc Endosc. 1992;2:64-9.
13. Mau CL, Chi L. Prospective randomized study of early versus delayed laparoscopic cholecystectomy for acute cholecystitis. Annals Surg. 1998;227(4):461-7.
14. Fried GM, Barkun JS, Sigman HH, Joseph L, Clas D, Garzon J, et al. Factors determining conversion to laparotomy in patients undergoing laparoscopic cholecystectomy. Am J Surg. 1994;167:35-41.
15. Edward H. Livingston, Rege RV. A nationwide study of conversion from laparoscopic to open Cholecystectomy. Am J Surg. 2004;88:205-11.
16. Schrenk P, Woisetschlager R. Laparoscopic cholecystectomy. Surg Endosc. 1995;9:25.
17. Rossi RL, Schirmer WJ, Braascb JW, Sanders LB, Munson JL. Laparoscopic bile duct injuries: risk factors, recognition, and repair. Arch Surg. 1992;27:596-602.
18. Rosen M, Brody F, Ponsky J. Predictive factors for conversion of laparoscopic cholecystectomy. Am J Surg. 2002;184:254-8.
19. Hutchinson CH, Traverso LW, Lee FT. Laparoscopic cholecystectomy: do preoperative factors predict the need to convert to open? Surg Endosc. 1994;8:875.
20. Berger DL, Matt RA. Carcinoma of the gall bladder. In Oxford Text book of Surgery. Peter J Morris, Ronald A Malt. Oxford Medical Publications, New York. 1994;1240-1242.
21. Cooperberg PL, Gibney RG, Imaging of gallbladder. Radiology. 1987;163:605-13.

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