

Original Article

A study on pre-operative risk factors (USG score) in predicting the conversion from laparoscopic cholecystectomy to open surgery in a tertiary care hospital in India

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ABSTRACT

Background: Laparoscopic cholecystectomy has now become the gold standard surgical treatment of gallstone disease. This study was performed to identify the pre-operative risk factors in predicting 'difficult' gallbladder (GB) for laparoscopic cholecystectomy and hence, conversion to open surgery.

Methods: The study was carried out at Silchar Medical College & Hospital, Assam, from January 2018 to December 2019. In this study, we have included 450 patients of calculous cholecystitis on the basis of history, clinical examinations and USG (ultrasound) findings. Pre-operative patient factors and also the ultrasonographic findings of gallbladder were noted before the patients underwent laparoscopic cholecystectomy. Basing on gallbladder USG finding within 24 hours prior to surgery a score was formulated for prediction of conversion. The cases converted were noted. Chi-square test was used to know whether the individual pre-operative patient factors had significant role in conversion.

Results: Diabetes, previous history of acute cholecystitis, obesity, previous abdominal surgery, patients operated during an acute attack of cholecystitis, ultrasonographic features like thickened gallbladder, distended/contracted gallbladder, presence of pericholecystic fluid were found to be statistically significant risk factors for the conversion to open surgery. A GB USG score of > 10 was statistically significant in predicting the conversion.

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Conclusion: Our preoperative GB USG score, within 24 hours prior to surgery, helps predict 'difficult' laparoscopic cholecystectomy and hence, the risk of conversion to open surgery.

Key words: Calculous cholecystitis, Difficult laparoscopic cholecystectomy, Laparoscopic cholecystectomy.

INTRODUCTION

Gallstones have been identified to be the most common biliary pathology. About 10 to 15% of the general populations have gallstones.¹ They remain asymptomatic in vast majority (70-85)% of the patients.² Prevalence of gallstones in India has been estimated to be around 3-5%. Many studies have shown that the North Indians have 7 times higher chance of occurrence of gallstones as compared to the South Indians.³ Approximately 1-2% of asymptomatic patients will develop symptoms requiring cholecystectomy per year, making cholecystectomy one of the most common operations performed by the general surgeons. Women (5.59%) are more commonly affected than men (1.99%), which is in the ratio of 2.8:1.⁴ Laparoscopic cholecystectomy is now the gold standard treatment of cholelithiasis. The rate of conversion from laparoscopic cholecystectomy to open cholecystectomy varies from 0 to 20%.⁵ Need to convert is neither a failure nor a complication, but an attempt to avoid complication - which has to be kept in mind by the surgeon.

MATERIALS AND METHODS

The study comprises of 450 symptomatic patients of 15-70 years with acute or chronic calculous cholecystitis, who were planned for laparoscopic cholecystectomy. The period of study was from January 2018 to December 2019 and it was hospital based prospective observational study. The subjects for the study were taken from the department of General Surgery, Silchar Medical College and Hospital, Silchar, Assam.

Conventional ultrasonography (USG) of the abdomen was done to confirm a clinically suspected case of calculous cholecystitis. All the patients, posted for laparoscopic cholecystectomy, were made to undergo mandatory conventional ultrasonography of the abdomen, under the supervision of 4th author, to assess the gallbladder status within 24 hours, prior to surgery and subsequently, following the scoring system formulated by us (table 1) to assess the risk of conversion to open surgery. The pre-operative patient factors recorded were the age and sex of the patient, diabetic/non-diabetic, body mass index (BMI), previous history of acute cholecystitis, previous history of abdominal surgery undergone (if any), total leucocyte count 24 hours prior to surgery. All the patient factors and ultrasound findings of gallbladder were noted and their significance in conversion from laparoscopic to open cholecystectomy were found out using Chi-square test. Since our study is based on pre-operative risk factors for conversion from laparoscopic to open surgery, we have not given importance for intra-operative findings of gallbladder. Exclusion criteria were patients with obstructive jaundice, cirrhosis of liver, portal hypertension, dilated bile duct, bile duct diseases, bile duct stones, carcinoma gallbladder, benign gallbladder diseases other than cholelithiasis.

Laparoscopic cholecystectomy was considered to be easy when the time taken from insertion of verses needle to the closure of ports is less than 60 minutes. It is considered to be 'difficult' when it took more than 60 minutes or if there is

Table 1: GB scoring by USG

USG parameters	Score 1	Score 2	Score 3	Score 4
GB size	Normal	Contracted	Distended	–
GB wall thickness	<4mm	>4mm	–	–
No. of stones	Single	Multiple	–	–
Pericholecystic fluid	No	–	–	Yes
Size of stones	<5mm	5mm-10mm	>10mm	–

conversion to open surgery. All laparoscopic cholecystectomies were performed using the conventional 4 ports technique by experienced laparoscopic surgeons.

RESULTS

Total number of patients was 450, out of which, 330 were females and 120 were males; 42 patients had contracted GB, 87 had distended GB and rest 321 patients had normally distended GB; 72 patients had their GB wall thickened; 345 patients had multiple GB stones and 105 patients had single stone in their GB; 48 patients had pericholecystic fluid; 219 patients had stone size <5 mm, 135 patients had 5–10 mm and 96 patients had stone size >10 mm; 57 patients had USG score ≥ 10 . Operating time was >60 min in 51 cases. A total of 15 cases were converted to open surgery, 12 were male and 3 were female; 12 patients GB was distended and 3 had contracted GB. All 15 converted cases had their GB wall thickened and had multiple stones in GB. Pericholecystic fluid was present in 12 out of 15 converted cases. All 15 converted cases had USG score ≥ 10 . We found that as age increases, the risks for conversion also increases. (Table 2)

Pre-operative patient factors in assessing the risk of conversion from laparoscopic to open cholecystectomy are presented in table 3. The inference from this table is that the patients with Diabetes,

previous history of acute cholecystitis, obesity, previous abdominal surgery and patients operated during an acute attack of cholecystitis had significant risk of conversion from laparoscopic to open cholecystectomy (Figure 1).

Intra-operatively we noticed that all 15 converted patients had thickened gallbladder wall and 11 out of 15 converted cases were acute in nature with dense pericholecystic adhesions that made difficulty in dissection. Four (4) out of the 11 converted cases of acute cholecystitis eventually led to intra-operative bleeding due to dense adhesions and were ultimately converted to open procedure.

DISCUSSION

The advantages of laparoscopic cholecystectomy over open cholecystectomy are earlier return to bowel functions, less post-operative pain, better cosmesis, shorter length of hospital stay, earlier return to full activity, lower post-operative infection and decreased overall cost.^{6,7} Uncontrollable bleeding, adhesions, inflammation, anatomical variations, bile duct injury, injury to other viscera and technical failures are the common causes for conversion of laparoscopic surgery to open. These causes are intra-operative events and could not be used as factors to predict conversions prior to the surgery. Pre-operative prediction of

Table 2: Significance of age, sex and ultrasound factors of gallbladder in risk of conversion from laparoscopic to open cholecystectomy

Risk factors		Frequency (%)	Converted	p-value	Significant p- value
Age (years)	16-30	219 (48.6%)	0	0.011	Yes
	31-45	159 (35.3%)	6		
	46-60	60 (13.3%)	6		
	>60	12 (2.66%)	3		
Sex	Male	120 (26.7%)	12	0.006	Yes
	Female	330 (73.3%)	3		
GB status	Contracted	42 (9.3%)	3	0.00083	Yes
	Distended	87 (19.3%)	12		
	Normal	321 (71.3%)	0		
GB wall	Thickened	72 (16%)	15	0.00000018	Yes
	Not thickened	378 (84%)	0		
No. of stones	Multiple	345 (76.7%)	15	0.209	No
	Single	105 (23.3%)	0		
Pericholecystic fluid	Yes	48 (10.7%)	4	0.000000004	Yes
	No	402 (89.3%)	1		
Stone size	<5mm	219 (48.7%)	3	0.388	No
	5-10mm	135 (30%)	6		
	>10mm	96 (21.3%)	6		
USG score	≥ 10	57 (12.7%)	15	0.0000000001	Yes
	<10	393 (87.3%)	0		

conversion assist the surgeon to prepare better for the surgery and also to counsel the patient and patient's attendants better, prior to the surgery. The Gallbladder is very accurately assessed by ultrasonography. As it is readily available in most of the centers and is also cost effective, we have taken ultrasonographic features of gallbladder to predict the risks for conversion from laparoscopic cholecystectomy to open cholecystectomy. Also we have considered the pre-operative co-morbid conditions in

assessing the risk of conversion as it has vital role to play.

In our study, male gender (8 out of 12 converted were diabetic), advancing age (mostly who were diabetic), GB wall thickening of more than 4 mm, distended/contracted GB, presence of pericholecystic fluid, USG score 10 or more, diabetes, previous history of acute cholecystitis, obesity, previous abdominal surgery and patients operated during an acute attack of cholecystitis were found to be the significant

TABLE 3: Pre-operative patient factors and their significance in conversion from laparoscopic to open cholecystectomy

Pre-operative patient factors		Underwent Laparoscopic Cholecystectomy	Converted to Open Cholecystectomy	Chi-square statistic value	p-value
Diabetic	Yes	35	11	67.34	<0.00001
	No	400	4		Significant
Previous h/o Acute Cholecystitis	Yes	54	6	9.54	0.002
	No	381	9		Significant
BMI	<25	382	3	55.14	<0.00001
	25-27.5	35	7		Significant
	>27.5	18	5		
Abdominal scar (previous surgery)	Supraumbilical	5	3	48.94	<0.00001 Significant
	Infraumbilical	25	5		
	No scar	405	7		
Present h/o Acute Cholecystitis	Yes	52	11	45.37	<0.00001
	No	383	4		Significant
Total leucocyte count	>11,000/mm ³	261	9	0	1.0
	<11,000/mm ³	174	6		Not significant

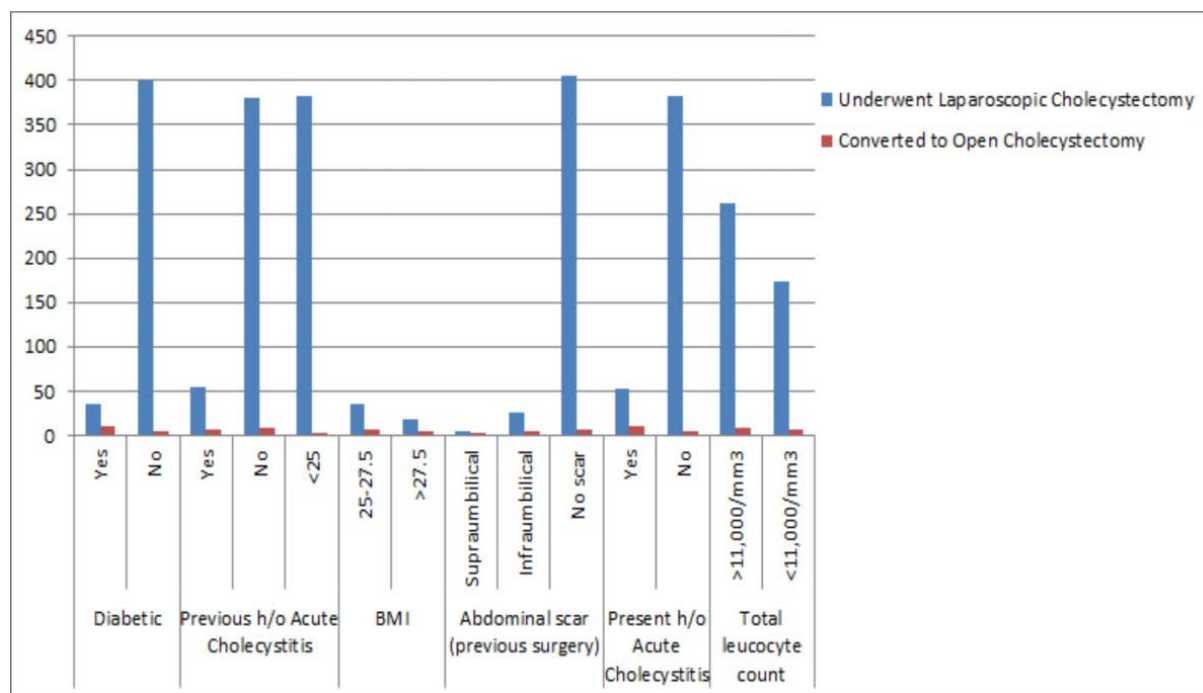
risk factors in conversion from laparoscopic surgery to open surgery. We also observed that, size and the number of stones in the gallbladder didn't have a significant effect on conversion to open surgery.

In our study, incidence of gallstones was found to be higher in females (73%) than in males (27%) that correspond to the ratio of 2.7:1 that corresponds with the report of Unisa S et al 2.8:1.⁴ Nachnani J, Supe A⁸ observed that the male gender and thickening of GB wall >3 mm were significant predictors for risk of conversion. Kama NA et al⁹ reported that male sex, abdominal tenderness, previous upper abdominal surgeries, sonographically thickened gallbladder wall, age over 60 years, preoperative diagnosis

of acute cholecystitis have significant effect in conversion rate. Siddiqui MA et al¹⁰ found that ultrasound findings of GB wall thickness, distended GB, impacted stones and dilated CBD were statistically significant for preoperative prediction of difficult laparoscopic cholecystectomy. In our study, we have not included the effect of impacted stones and dilated CBD on the conversion rate.

The actual rates of conversion are quite variable; ranging from 0% to 20%.⁵ Overall conversion rates was 5.6% as reported by Nidoni R et al¹¹ which was 3.33% in our study. The total leucocyte count >11000 cells/mm³, more than 2 previous attacks of acute cholecystitis, GB wall thickness of >3 mm

Figure 1: Pre-operative patient factors and their significance in conversion from laparoscopic to open cholecystectomy



and pericholecystic collection were all statistically significant for predicting the difficult laparoscopic cholecystectomy and its conversion. Corr P et al¹² found that diminished gallbladder function and wall thickening were significantly associated with increased technical difficulty of the operation. There was no association between the gallbladder volume and the number of calculi with the operative difficulty. In our study, USG score > 10 was significant risk factor for conversion from laparoscopic to open cholecystectomy.

CONCLUSION

Laparoscopic cholecystectomy has become the standard treatment for gallstone disease in recent times. Most of the difficult gallbladders can be dealt laparoscopically nowadays, with the advancements in the

equipments and increasing experience in the field of laparoscopic surgery. Along with pre-operative patient factors, ultrasonographic assessment of the gallbladder status within 24 hours, prior to the surgery is a good predictor of difficult laparoscopic cholecystectomy in majority of the cases and it should be used pre-operatively as a routine screening tool to delineate biliary tree anatomy and pathology. It helps in predicting the conversion to open surgery and also helps in better counseling of the patient and patient's attendants about the probability of conversion to open surgery. We observed that, distended/contracted GB, thickened GB wall, presence of pericholecystic fluid and overall USG score of > 10 were significantly associated with increased risk of conversion from laparoscopic to open cholecystectomy.

Abbreviations : GB- Gallbladder, USG-ultrasonography, CBD – Common bile duct

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