

## Assesment of Risk Factors For Conversion To Open Surgery In Patients Undergoing Laparoscopic Cholecystectomy

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### Abstract

**Background:** Laparoscopic cholecystectomy has become the gold standard for the surgical treatment of gall bladder disease, but conversion to open cholecystectomy is still inevitable in certain cases. Knowledge of the rate and impact of the underlying reasons for conversion could help surgeons during preoperative assessment and improve the informed consent of patients. This study was undertaken to review the rate and causes of conversion from laparoscopic to open cholecystectomy.

**Objectives:** The aim of the study was to assess the risk factors for conversion of laparoscopic cholecystectomy to open cholecystectomy. **Material And Methods:** A Prospective non randomized study was conducted in the Department of General Surgery, Fortis Hospital Mohali, Punjab. Data collected will be fed in Microsoft excel work sheet and statistical analysis will be performed with SPSS software (SPSS, Chicago, Illinois, USA) using Chi Square Test. A univariate and multivariate analysis comparing the variables with conversion will be done.  $p$  value  $<0.05$  will be taken as significant.

**Results:** Out of 100 patients with gallbladder disease, 15 patients (15%) were converted to open cholecystectomy. Elderly males  $>60$  years were at significant risk for conversion to open procedure ( $p=0.004$ ). 5 patients presented with symptoms of acute cholecystitis were converted to open procedure ( $p = 0.00004$ ). Ultrasonography finding of acute cholecystitis was highly significant ( $p<0.00004$ ). Adhesions and fibrosis of Calot's triangle all were converted to open surgery ( $p<0.001$ ). 5 out of 6 patients who underwent LC following ERCP required conversion to OC ( $p<0.001$ ).

**Conclusion:** In conclusion significant risk factors for conversion were male gender, acute cholecystitis, dense adhesions, post ERCP and pre-operative USG findings.

**Keywords:** Laparoscopic cholecystectomy, conversion rate, male gender, acute cholecystitis, dense adhesions

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### I. Introduction

Laparoscopic cholecystectomy ( LC ) has become the standard treatment for symptomatic gallstones replacing open cholecystectomy ( OC )<sup>1,2,3,4</sup>. More than 90% of cholecystectomies are performed laparoscopically for its well documented advantages<sup>4</sup>. Cholecystectomy cannot be completed laparoscopically in all patients and conversion to OC is then required<sup>5</sup>. A conversion to open surgery is reported to be necessary in 2% to 22% of cases in the literature of all attempted cholecystectomies<sup>1,2</sup>. Nearly two decades into the laparoscopic era in USA nationwide laparoscopic cholecystectomy conversion rates remain around 5% to 10%.<sup>3</sup> Factors prompting conversion from LC to OC are not completely understood<sup>4,5</sup>. Various conversion reasons have been Identified- dense and extensive adhesions precluding clear vision in Calot's triangle Is the most common reason for conversion ( reported in upto 40% ), acute cholecystitis the reported conversion rate of 14% to 50%, and small fibrotic contracted gallbladder making grasping and dissection of the gallbladder difficult (12% ). Other reported reasons for conversion are empyema of the gallbladder and gangrenous cholecystitis. Operative complications ( 8% to 15% )- uncontrolled bleeding or injury of the extrahepatic bile ducts also necessitate conversion to an open procedure<sup>1</sup>. The conversion to an open procedure should not be regarded as a failure or complication but as a conscious attempt to avoid life threatening complications. It is thus important to recognize patients with a higher risk of conversion in order to optimize planning the surgical procedure. Identification of risk factors for possible conversion to OC would be useful for both surgeons and patients. The present study is aimed at determining the conversion rate of LC and to identify the risk factors associated with conversion of LC to OC.

### AIMS AND OBJECTIVES

To assess the risk factors for conversion of laparoscopic cholecystectomy to open cholecystectomy.

### II. Material And Methods

#### Study Design

A Prospective non randomized study was conducted in the department of surgery in department of General Surgery, Fortis Hospital, Mohali Punjab, India. One hundred patients who underwent LC between February 2009 to December 2010 were studied. Data was Categorized accordingly to age, gender,

comorbidities, preoperative investigations, operative findings, and factors for conversion to an open procedure. The inclusion criteria of cases In the study included symptomatic gallstone disease.

### **Exclusion Criteria**

Suspicion of gallbladder cancer based on ultrasonography and computed tomography. A conversion to open procedure was needed when even after appropriate attempts, the procedure could not be accomplished laparoscopically without breaching the principles of the safety of laparoscopic procedure.

### **Methods**

The preoperative work up included routine blood tests, liver and renal function tests, chest x ray, electrocardiography and ultrasonography of the abdomen. The patients were asked to sign a consent form for the surgery after discussing the benefits and risks of the procedure. The patients were admitted to the surgical ward for immediate postoperative care. All patients had oral liquids in the evening. They were discharged on next day after the operation.

### **Operative Procedure**

The procedure was carried out using the standard four-port technique. The first port is a 10mm infraumbilical camera port inserted using the open technique method of CO<sub>2</sub> insufflation. The other three ports 10mm dissecting port in epigastrium, and two 5mm ports in midclavicular line, and anterior axillary line are inserted under direct camera vision . The gallbladder was retracted from the fundus above the right lobe of the liver by the assistant. The anterior edge of the Hartman's pouch was retracted by the surgeon's left hand in an outward and lateral direction through the 5mm port thus opening space for establishing the triangle of safety. The cystic artery was identified by gentle sweeping of the peritoneal covering. Lateral peritoneal attachment is then released. The cystic artery was then clipped and divided over the gallbladder wall. Cystic duct was then clipped and divided near its junction with the gallbladder infundibulum.

### **Statistical analysis**

Data collected will be fed in Microsoft excel work sheet and statistical analysis will be performed with SPSS software ( SPSS, Chicago, Illinois, USA ) using Chi Square Test. A univariate and multivariate analysis comparing the variables with conversion will be done. p value <0.05 will be taken as significant.

## **III. Results**

One hundred patients were taken up for laparoscopic cholecystectomy. Out of these 100 patients with gallbladder disease, 15 patients (15%) were converted to OC . 95 patients were taken up for elective laparoscopic cholecystectomy and 5 were taken up as emergency procedure. All 5 patients taken up for emergency laparoscopic cholecystectomy were operated in first 48 hours of acute attack of cholecystitis. No patient presenting with an attack of acute cholecystitis was taken up for emergency surgery more than 48 hours later. In the elective setting 95 patients were taken up for elective laparoscopic cholecystectomy. 14 patients were taken up after conservative trial of 6 weeks, for acute cholecystitis 5 patients needed conversion.. 5 cases were asymptomatic and no conversion was needed. 76 patients had chronic cholecystitis and 8 patients required conversion. There were 34 male, and 66 female patients. Out of 34 male patients 10 needed conversion to OC. Only 5 of 66 female patients were converted to open procedure. There were 24 males < 60 years of age of which 6 required conversion to open procedure ( 25% ), as compared to 10 males > 60 years of age of which 4 required conversion to open procedure ( 40% ), ( p=0.004 ) [Table 1], which was significant. Out of 52 females < 60 years of age 3 required conversion to open procedure ( 5.7% ) and of 14 females > 60 years only 2 were converted to open procedure ( 14.2% ). This signifies elderly males >60 years were at significant risk for conversion to open procedure. Clinically patients presented with history of fever and pain in right hypochondrium. A ultrasound study was performed in all the patients 5 patients presented with symptoms of acute cholecystitis which was confirmed radiologically on USG and computed tomography were taken for emergency LC within 48 hrs of their presentation. All 5 ( 33.3% ) patients were converted to open procedure because of inflamed , oedematous gallbladder with dense adhesions ( p = 0.00004) [Table 2]. Conversion to OC was significant in patients electively taken up for LC following an attack of acute cholecystitis. 5 ( 33.3% ) out of 14 patients required conversion to OC ( p= 0.034 ). On ultrasonography finding of acute cholecystitis was highly significant , present in 5 (33.3%) patients of which all 5 were converted (p<0.00004). 86 patients had chronic cholecystitis but only 8 (53.3%) patients were converted (p=0.108). 4 patients had empyema gall bladder but only 2 (13.3%) patients were converted (p= 0.693). Thickened gallbladder wall was present in 33 patients of which 10 required conversion ( p<0.001) [Table 3]. On ultrasonography presence of single or multiple stones (p=0.058) was not significant. Conversion to OC was needed in two patients with cholecystoduodenal fistula discovered at

operation and all were converted to open surgery. The defect in duodenum was repaired by absorbable sutures (  $p=0.020$  ). Adhesions and fibrosis of Calot's triangle was encountered in 12 patients (80%), and all were converted to open surgery ( $p<0.001$ )[Table 4]. Injury of the bile ducts occurred in only 1 patients (0.12%), and the injury was identified . Intraoperatively ( $p=0.150$ ). in this case the anatomy was obscured by adhesions caused by severe tissue inflammation.Four out of 7 patients having 1 or more episodes of gall stone pancreatitis were converted to OC . All 4 patients were males; 2 of them were > 60 years of age.Post ERCP laparoscopic cholecystectomy showed higher significant conversion rate to open procedure compared with patients who had no prior ERCP intervention. 5 out of 6 patients who underwent LC following ERCP required conversion to OC ( $p<0.001$  ) [Table 5].Previous surgery in the upper abdomen had occurred in 11 patients of which only 1 ( 6.7% ) require conversion to open surgery (  $p=1$  ). Co-morbid illness like diabetes and hypertension had no significant contribution leading to open surgery in the study group. There were 22 patients in the study group who had diabetes of which 6 ( 40% ) required conversion to open surgery (  $p=0.068$  ). 6 ( 40% ) patients out of 35 who had hypertension required conversion to open surgery ( $p=0.660$ ). Demographic data and reasons for conversion are listed in [ Table 6].

**TABLES**

**Table 1- Impact of gender on conversion**

Sex	Total Cases	Converted Cases	% In Converted Group	p-value
Male	34	10	66.7	<b>0.004</b>
Female	66	5	33.3	0.009
Total	100	15		

**Table 2: Patients presenting with acute and chronic cholecystitis**

	Laparoscopic Cases	Converted Cases	%age	p-value
Emergency				
<48 Hrs	5	5	100	0.00004
>48 Hrs	0	0	0	0
Elective				
Conservative treatments for 6weeks	14	5	35.71	0.034
Asymptomatic gall stones	5	0	0%	-
Chronic cholecystitis	76	8	10.52	0.108

**Table 3-Factors on USG**

	Total no. Patients	Converted cases	%age	p-value
Acute cholecystitis	5	5	33.3	0.00004
Chronic cholecystitis	86	8	9.3	0.108
Thick walled	33	10	66.7	<0.001
Pus / empyema	4	2	13.3	0.105
Single stone	11	4	26.7	0.058
Multiple stone	89	11	73.3	0.098

**Table 4- Intra operative factors – need for conversion**

	Total no. Patients	Converted cases	% age	p-value
Gall bladder densely adherent with Omentum/ Colon/ Duodenum/ Cholecystoduodenal fistula	2	2	13.3	0.02
Gall bladder cannot be grasped/thick edematous	33	10	66.7	<0.001
Gall bladder needed to be aspirated Pus (Empyema)	4	2	13.3	0.105
Calot's and anatomy undefinable	12	12	80	<0.001
Right sectoral duct injury	1	1	6.7	0.150

**Table 5 Multivariate Analysis for Other Factors**

	Total no. Patients	Converted cases	%age	p-value
H/o 1 or more attacks of acute pancreatitis	7	4	26.7	0.009
H/o jaundice	2	1	6.7	0.279
Post ERCP	6	5	33.3	<0.001
Diabetes	22	6	40	0.068
Hypertension	35	6	40	0.660
Previous upper abdominal surgeries	11	1	6.7	1.0

**Table 6-Reasons for conversion to open cholecystectomy**

Reason	Total Nos. of patients	Converted cases	% in converted gp	p value
Sex	34	10	66.7%	<b>0.004</b>
Male				

Female	66	5	33.3%	0.113
Age	24	6	40%	0.116
>60 yrs				
≤ 60 yrs	76	9	60%	
Diabetes	22	6	40%	0.068
Hypertension	35	6	40%	0.660
Upper AbdSurg	11	1	6.7%	1.0
H/o Ac. Cholecystitis	14	5	33.3%	<b>0.034</b>
H/o Ac. Pancreatitis	7	4	26.7%	0.009
H/o Jaundice	2	1	6.7%	0.279
ERCP	6	5	33.3%	<b>&lt;0.001</b>

#### IV. Discussion

Laparoscopic cholecystectomy is now the standard of care for symptomatic gallstone disease. Between 75% to 95% of all cholecystectomies are now performed laparoscopically. The well documented advantages are decreased postoperative pain, shorter hospital stay, early resumption of normal activity and improved cosmesis. Efforts to further improve outcome of conventional LC has resulted in advent of single port laparoscopic cholecystectomy to mini laparoscopic techniques. However, the superiority of these new advanced technique is still being evaluated. For safe completion of cholecystectomy, conversion of LC to OC is required in certain situations. The risk for conversion has been estimated on the basis of clinical, laboratory and radiographic parameters. Recognition of these factors is important for understanding the characteristics of patients at a higher risk of conversion. Preoperative predictions of a difficult LC helps the surgeon to prepare better for the intraoperative risk and the technical difficulties expected to be encountered. Many workers believe that the need for conversion can only be established with certainty during surgery, and the value of these variables is relative rather than absolute. In the literature widely varying conversion rates have been reported ranging from 2% to 15%. In the present study, the conversion to open procedure was required in 15 patients (15%). The most common reason for conversion to OC are difficult dissection and the inability to define the anatomy. The influence of age on conversion rate remains controversial. Patients older than 70 years have a two-fold increase in conversion rate. Various series have reported conversion rates of 4% to 16% in elderly patients scheduled for LC. Pavlidis et al (2008) in their study of LC in the extremely elderly ( $\geq 80$  years group), had a conversion rate of 19%. Another study has reported a 7.8% conversion rate in patients aged 80 years and older with complicated gallstone disease and this was not statistically different from the uncomplicated disease group. Previous abdominal surgery is generally regarded as one of the factors of conversion for LC to OC, particularly after upper abdominal operations. In one study adhesions were found in 62% of patients after previous abdominal surgery, and this study documented that patients undergoing LC after previous abdominal surgery had a higher conversion rate (19% vs 52%) compared with patients who had no prior surgery (5.4% vs 1.2%), or compared with previous lower abdominal surgery (3.3% vs 0.7%). In the present study 11 patients had previous upper abdominal surgery and conversion to OC was required in only one patient (9%). Our results corroborate other reports that document that previous abdominal surgery has little impact on the feasibility and safety of LC. The thickened gallbladder wall is regarded as a risk factor for conversion. It is possible that recurrent episodes of acute cholecystitis in association with gallstones inevitably result in thickening and fibrosis of the gallbladder making grasping and dissection of the gallbladder very difficult. Other reports also confirm a higher conversion rate in patients with a thickened gallbladder wall on ultrasonography. Complicated gallstone disease - severe acute cholecystitis, empyema, gangrenous cholecystitis, Mirizzi syndrome, gallstone associated pancreatitis, and cirrhotic portal hypertension are all risk factors for higher conversion rate. Because of the small number of patients with complicated gallstone disease in the present study, their relevance to conversion rate cannot be commented upon. Two patients had cholecystoduodenal fistula and both were converted to an open procedure.

In both these patients, cholecystectomy and closure of the duodenal opening was performed. Conversion is needed for empyema and gangrenous cholecystitis. It is advocated that once such pathologies are identified, excessive time should not be spent in laparoscopic trial dissection before converting to an open operation. In this study four patients had empyema and two patients were converted to open procedure. LC for acute cholecystitis incurs an overall increased incidence of conversion compared with elective LC. The risk in reported studies varies from 8% to 25%. All five patients with acute cholecystitis in the present study needed conversion to OC. Lower conversion rate is reported if duration of symptoms is less than 96 hours. The recognition of bile duct injury during LC is an indication for conversion. Majority of bile duct injuries are diagnosed during surgery and necessitate conversion. Out of 100 LC in the present study, there was one patient with right sectoral duct injury which was identified at surgery and appropriately managed and gallbladder bed drained. This patient had an uneventful recovery.

We attempted to study the conversion rate and identify the risk conversion factors necessitating conversion of laparoscopic cholecystectomy to open procedure. The data of patients who were attempted

laparoscopic cholecystectomy was analysed in relation to conversion rate and reasons influencing conversion to open procedure. The study included 100 patients, 66 women, 34 men, with mean age of 51.87 years ( range 9 to 80 years ).Laparoscopic cholecystectomy was successfully performed in 85 patients. Conversion to open procedure was needed in 15 patients with conversion rate of 15% of all attempted laparoscopic cholecystectomies. Various conversion reasons identified were male sex, h/o acute cholecystitis, h/o of ERCP, USG findings suggestive of acute cholecystitis, dense adhesions, unclear anatomy due to dense adhesions in diagnosis of Calot's triangle were found to be associated with higher conversion. The conversion rate in this study was high. The most common reason was dense adhesions in Calot's triangle, and thickened, contracted gallbladder. Male gender with symptomatic cholelithiasis was associated with higher conversion. Patients undergoing emergency laparoscopic cholecystectomy had higher conversion rate. Significant conversion rate was seen in pre-operative USG confirmed cases of acute cholecystitis and post ERCP patients undergoing laparoscopic cholecystectomy.

## V. Conclusion

In conclusion significant risk factors for conversion were male gender, acute cholecystitis, dense adhesions, post ERCP and pre-operative USG findings. Advanced age, previous upper abdominal surgery, jaundice, h/o pancreatitis, number of stones, biochemical profile were not found to be risk factors in our study. None of these risk factors were absolute contraindications to laparoscopic cholecystectomy but this may help predict the difficulty of the procedure and permit the surgeon to better inform patients about the risk of conversion. Knowledge of these factors may help in arranging operative schedule, psychological preparation, and planning of duration of convalescence.

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