

## Factors determining conversion of laparoscopic to open cholecystectomy

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### Abstract

**Background and objectives:** Laparoscopic cholecystectomy (LC) has virtually replaced conventional open cholecystectomy (OC) as the standard procedure of treatment for cholelithiasis and cholecystitis. However, OC sometimes becomes a necessity considering the feasibility and safety of the surgical procedure. But the factors that demand conversion from LC to OC differ widely. The present study aimed to determine the prevalence of conversion from LC to OC and to assess the causes of conversion and risk factors related to conversion.

**Methods:** The study was conducted in a referral hospital – ‘Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorder (BIRDEM)’ from September 2014 to September 2016. Cases of cholelithiasis with or without cholecystitis, and other gall bladder pathology were included in the study. A team of experienced surgeon performed LC of all selected cases. The causes of conversion to OC were systematically recorded by the surgical team and the risk factors (age, sex, obesity, history of previous abdominal surgery, gallbladder thickness) related to conversion from LC to OC was investigated.

**Results:** A total of 261 (M / F = 87 / 174) patients were considered eligible for the study. The mean age of all patients was 43 ( $\pm 1.75$ ) years. For the male and female groups the mean ages were  $44 \pm 1.9$  and  $42 \pm 1.6$  years respectively. Of the total 261 cases, 210 (80.5%) patients had cholelithiasis with chronic cholecystitis, 47 (18.0%) had gallbladder stone plus acute cholecystitis and 4 (1.5%) had gallbladder polyp. Open conversion was required in case of 19 patients. Thus, overall conversion rate was 7.3%. The common causes of conversion were a) difficulty in defining Calot’s triangle (42.1%), b) injury to cystic artery (21.1%) and c) injury to bile duct (15.8%). Both male and female had equal risk for conversion. The investigated risk factors like history of previous abdominal surgery, preoperative ERCP, acute cholecystitis, obesity, increased gallbladder-wall thickness and older age showed no significant association with conversion.

**Conclusion:** The study revealed that a very few patents (7.5%) needed conversion from LC to OC. The commonest cause of conversion was difficulty in defining Calot’s triangle, injury to cystic artery and bile duct. The risk factors like previous abdominal surgery, preoperative ERCP, gallbladder wall thickness, obesity and old age were not found associated with conversion to OC.

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### Introduction

Laparoscopic cholecystectomy (LC) has been accepted as the most common surgical procedure

for the treatment of cholelithiasis and associated surgical conditions [1]. However, there are factors that have increased the risk of open conversion [1-3]. LC also introduced a new

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spectrum of complications [1]. It has been reported that conversion from LC to OC is less common as consultant caseload increases [4]. This indicates that LC should be undertaken only by the experienced surgeons who perform operation on a substantial number of cholelithiasis and or cholecystitis cases [4]. Some authors suggest that a history of preoperative endoscopic sphincterotomy and a thickened gallbladder wall contribute to the likelihood of conversion [5]. This study was undertaken to determine the prevalence of conversion from LC to OC and the risk factors related to conversion.

### Study population and Methods

The study was conducted at BIRDEM hospital in Dhaka city for consecutive two years starting from 30 September 2014 to 30 September 2016. All cases of cholelithiasis with or without cholecystitis, and other gall bladder pathology admitted in the hospital during the above period were included in the study. Detail clinical history was recorded in a predesigned data sheet. Clinical history included gender, age, previous abdominal surgery, preoperative ERCP, jaundice, acute cholecystitis, obesity, gallbladder wall thickness. The relevant biochemical and imaging investigations were performed on each case for the diagnosis of cholelithiasis and associated pathology. An experienced team of surgeon of BIRDEM hospital performed LC of all selected cases.

The data were presented as mean $\pm$ SD and percentages. Chi-sq tests were used to determine the factors related to conversion.

### Results

The age and sex distribution of the study population is presented in Table-1 which suggest that majority of the patients were female (66.7%). The mean ( $\pm$ SD) age was  $44 \pm 1.9$  years and  $42 \pm 1.6$  years in case of male and female patients respectively. Majority of the patients (80.5%) selected for laparoscopic cholecystectomy had chronic cholecystitis and 18.0% had acute cholecystitis and 1.5% had other pathology like gall bladder polyp (Table-2).

**Table-1:** Age and sex distribution of study population

Age in years	Male		Female		Total	
	n	%	n	%	N	%
20-30	01	0.4	02	0.8	03	1.1
31-40	13	5.0	23	8.8	36	13.8
41-50	43	16.5	98	37.5	141	54.0
51-60	21	8.0	39	14.9	60	23.0
> 60	09	3.4	12	4.6	21	8.1
Total	87	33.3	174	66.7	261	100
Mean $\pm$ SD	$44 \pm 1.9$		$42 \pm 1.6$		$43 \pm 1.75$	

SD – standard deviation

**Table-2:** Diagnosis following laparoscopic cholecystectomy

Final diagnosis	N	%
Cholelithiasis and chronic cholecystitis*	210	80.5
Cholelithiasis and acute cholecystitis*	47	18.0
Gallbladder polyp*	4	1.5
Total	261	100

Note: \*Based on histopathology findings.

Of the total 261, the conversion from LC to OC was performed in 19 patients. Thus, the conversion rate reached 7.3%. The causes for conversion are shown in Table-3. The most common cause of conversion was a difficulty to define the anatomy of Calot's triangle, which comprised 42.1%. The other major causes were injury to cystic artery (21.1%) and bile duct (15.8%). The risk factors for association with conversion of LC to OC were shown in Table-4. There was no significant association of gender, age, history of previous abdominal surgery, preoperative ERCP and jaundice with conversion. Likewise, acute cholecystitis, obesity, gallbladder wall thickness were also found not significant.

**Table-3:** The causes for conversion from LC to OC

Cause for conversion	n	%
Difficult to define anatomy of Calot's triangle	08	42.1
Suspicion of CBD injury	02	10.5
Bowel injury	01	5.3
Cystic artery bleeding	04	21.1
Bile duct injury	03	15.8
Suspicion of gall bladder cancer	01	5.3
Total	19	100

Note: CBD – Common bile duct.

**Table-4:** Factors associated with conversion to open cholecystectomy

Variables	Categories*	No conversion		Conversion		<i>p</i> †
		n	%	n	%	
Gender	Female (174)	163	93.7	11	6.3	<i>ns</i>
	Male (87)	79	90.8	08	9.2	
Age	≥60 years (21)	19	90.5	02	9.5	<i>ns</i>
	<60 years (240)	223	92.9	17	7.1	
Previous surgery	Upper abdominal (29)	26	89.6	5	11.6	<i>ns</i>
	Lower abdominal (43)	38	88.6	3	10.3	
	No surgery (189)	178	94.2	11	5.8	
Acute cholecystitis	Yes (47)	43	91.5	04	8.5	<i>ns</i>
	No (214)	199	93	15	7.0	
History of jaundice	Yes (21)	19	95.5	2	9.5	<i>ns</i>
	No (240)	223	92.9	17	7.1	
Obesity	Yes (97)	89	91.8	8	8.2	<i>ns</i>
	No (164)	153	93.3	11	6.7	
Gall bladder wall	Thick (81)	75	92.4	8	7.4	<i>ns</i>
	Normal (180)	169	93.9	11	6.1	
Preoperative ERCP	Yes (13)	12	92.3	1	7.7	<i>ns</i>
	No (248)	230	92.7	18	7.3	

\*The dichotomized categories are tested by chi-sq; parenthesis indicates number.

† *p* after chi-sq; *ns* – not significant

## Discussion

For many years LC has been the standard treatment for symptomatic gallbladder disease [2,3,5]. The identification of factors that reliably predict the likely need to convert LC to an open procedure is important and beneficial in terms of patients' education and postoperative expectations [3]. This study did not consider the risk score as suggested by CholeS study group [3]. However, the conversion rate of this study is consistent with the other studies [4,5,6]. A study in England reported the overall conversion rate as 5.2% [4]. Ishizaki *et al* observed the conversion rate from 5.3% to 10.6% [5]. It may be mentioned that Sippey M *et al* [7] found age, male gender, obesity, pre-operative alkaline phosphatase level, white blood cell count were independently associated with conversion to OC. In the present study age, gender and obesity were investigated but found not significant. Alkaline phosphatase and white blood cell count were not included in the study. Further study may be conducted to reveal the association of these factors to conversion.

Patients with chronic cholecystitis were found as the most common candidates undergoing laparoscopic cholecystectomy. Very few patients required conversion from laparoscopic to open cholecystectomy. The most common cause of conversion was a difficulty in defining Calot's triangle followed by injury to cystic artery and bile duct. The other reported risk factors like previous abdominal surgery, preoperative ERCP, gallbladder thickness, obesity and old age were found not associated with conversion to OC.

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