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## Conversion of laparoscopic cholecystectomy to open cholecystectomy: An analysis in a high risk group of patients

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### Abstract

**Background:** Laparoscopic cholecystectomy (LC) has revolutionized minimally invasive surgery, considered as gold standard and increasing number of procedures are done for patients with various high risk comorbid conditions. LC today can be as straightforward operation, but may also be an operative approach fraught with underlying complexities necessitating conversion to open cholecystectomy leading to longer operative time, longer hospital stay and more postoperative morbidity and higher hospital costs. We have tried to estimate the rate and risk factors which are associated with the conversion.

**Materials and Methods:** In this prospective and retrospective hospital based observational study, we included 134 patients that underwent LC and laparoscopy converted to open cholecystectomy from May 2012 to May 2016. Patient records were analyzed and their demographic, physical and clinical examination details were taken into account.

**Results:** 134 patients were enrolled for LC, 12 patients (8.9%) converted to open cholecystectomy. In conversion group ASA III and ASA IV categories predominate with ASA IV constituted about (66.7%) of patients. Patients in age group 40-60 years dominated study. Coronary artery disease (CAD) with stent in (8.3%) and (16.7%) patients having CAD with previous surgical intervention as coronary artery bypass surgery (CABG) were present in converted group. Most common reason for conversion were adhesion in Calot's triangle in 9/12 (75%) of patients. Increase in operative time by more than 30 minutes, postoperative complication by 25% and total hospital stay by 24 hours as compared to LC group.

**Conclusions:** A thorough review of all the risk factors if performed based on the physical, clinical, comorbid status and intraoperative findings helps the surgeon in proper patient counselling and early conversion to open cholecystectomy for patient safety.

**Keywords:** LC, Open cholecystectomy, Conversion rate, Risk factors, cardiopulmonary comorbidity

### Introduction

Laparoscopic Cholecystectomy (LC) was first reported in Germany (1985) and France (1987) more than two decades ago [1, 2]. Although not immediately universally adopted, laparoscopic cholecystectomy has revolutionized minimally invasive surgery [3, 4]. The appeal of diminished pain and fatigue, early return to normal activities and superior cosmesis has made it a popular surgery [5]. By now laparoscopic cholecystectomy has emerged as new gold standard for treatment of symptomatic cholelithiasis and increasing number of procedures are done for acute cholecystitis [6-8]. Several complications related to anaesthesia, peritoneal access, pneumoperitoneum, surgical exploration, anatomical and pathological have been reported during LC, and these complications and several other factors can necessitate the conversion from LC to open cholecystectomy (OC). Conversion should not be considered a technical failure but rather, accepted as a better surgical practice by the patient and surgeon when indicated [15]. Carbon Dioxide and elevated intraabdominal pressure due to pneumoperitoneum has potential harmful intraoperative circulatory and Ventilatory effects are assumed to be deleterious for high risk patients included in American Society of Anaesthesiologist's (ASA) group III & IV [20]. Despite the tremendous impact of LC on the management of biliary pathology, however surgeons continue to face challenges in application of LC in daily practice.

Underlying anatomical and pathological complexities confront during LC necessitates conversion to OC thereby leading to longer operative time, longer hospital stay and more postoperative morbidity and higher hospital costs [16, 17]. Conversion rates reported in literature range from 0-20% [18, 19].

### Materials and Methods

Data was collected from department of Minimal invasive surgery SKIMS from May 2012 to May 2016. Preoperatively every patient underwent thorough assessment include complete history, general physical examination along with cardiologist and anaesthesiologist consultations. The patients were grouped according to the American Society of Anaesthesiologist's (ASA) functional classification system. Patients belonging to ASA II, III and IV were included in this study.

Intraoperative management included providing balanced anaesthesia, keeping ready life saving measures as temporary pacing, defibrillator and life saving drugs such as esmolol, ephedrine, atropine, adenosine and adrenaline. Prior to the surgery, the mode of permanent pacemaker was changed with help of a cardiologist. Other patient directed measures included securing A-line, central line for central venous pressure monitoring and delivery of emergency drugs and securing epidural catheter for perioperative pain management.

**Establishment of pneumoperitoneum (PP):** One of the critical components is to establish Pneumoperitoneum in cardiopulmonary high risk patients. In our study pneumoperitoneum was established in every patient with some specific considerations with slow rate of insufflation at rate of 3-4liter/minute, low average pressure PP in range of

10-12 mmHg, minimising the time of PP and intermittent desufflation if time of PP gets prolonged.

**Conversion to open cholecystectomy:** When required the conversion to open cholecystectomy was made on instant basis without prolonging operative time. The reasons for conversion, as stated in the operative report and database entry were compiled. Causes for conversion were stratified into the following categories: adhesion in calot's triangle, intolerance to pneumoperitoneum, bleeding and acute inflammatory changes.

### Results

Total of 134 patients were enrolled for LC, 12 patients (8.9%) converted to open cholecystectomy. Whereas there were 86 females (72.3%) and 33 males (27.7%) in the laparoscopic group, there were 7 females (58.3%) and 5 males (51%) in the converted group. Majority of patients belonged to age group of 40-60year (51.5%) in LC group and (66.7%) in converted group. Although the rate of comorbid diseases in the converted group was higher than that in the laparoscopic group. Most of our patients belonged to ASA II, ASA III and ASA IV categories in LC group, whereas in converted group only ASA III and ASA IV categories predominate with ASA IV constitute about (66.7%) of patients (Table 1).

Coronary artery disease (CAD) with stent presents in (3.7%) of patients in LC group, (8.3%) in converted group and CAD with previous surgical intervention as coronary artery bypass surgery (CABG) in (1.5%) in LC group, (16.7%) in converted group. Table 2 comparing various comorbid conditions playing role in conversion to open cholecystectomy. The operative time duration for LC converted open cholecystectomy has increased by more than 30 minutes as compared to LC.

**Table 1:** Comparing ASA status of LC and converted group

ASA Status	Procedure		Total N (%)
	LC N (%)	LC to Open N (%)	
ASA II	37	0	37
	(31.1%)	(0.0%)	(27.6%)
ASA III	38	4	43
	(31.9%)	(33.3%)	(32.1%)
ASA IV	44	8	54
	(37.0%)	(66.7%)	(40.3%)
Total	119	12	134
	(100.0%)	(100.0%)	(100.0%)

**Table 2:** Comparing various variables between LC and converted group

Variable	Laparoscopic Cholecystectomy		Lap converted to open Cholecystectomy	
	N(119)	%	N(12)	%
Age (40-60) Years	58	48.7	8	66.7
ASA IV	44	37	8	66.7
Hypertension	69	58	9	75
CAD with CABG	1	0.8	1	8.3
CAD with stent	3	2.5	2	16.7
RBBB (Right bundle branch block)	10	8.4	3	25
SSS (Sick sinus syndrome)	2	1.7	2	16.7
MS/MR (Mitral stenosis /Regurgitation)	1	0.8	1	8.3
MI ( Myocardial infarction)	8	6.7	1	8.3
COPD (Chronic obstructive pulmonary disease)	11	9.2	2	16.7
Type2 Diabetes	19	16	4	33.3
Ejection Fraction (30-40%)	4	9.2	5	41.7
Postoperative complication	19	16	3	25

Multiple factors have resulted in conversion of LC to open cholecystectomy (Table3). Most common reason being adhesion in calot's triangle in 9/12 (75%) of patients. Prolonged pneumoperitoneum (PP) or intolerance to pneumoperitoneum (PP) complicates 5/12 (41.6%) followed

by bleeding and acute inflammatory changes around gall bladder. In conversion group there is increase in duration of total hospital stay by more than 24 hours in (90.1%) of patients.

**Table 3:** Reason for conversion

Reason for conversion	Number(N)	Percentage (%)
Adhesion In Calot's	9	75
Bleeding	3	25
Intolerance To Pneumoperitoneum	5	41.6
Acute Inflammatory Changes	2	16.6
Total	12	100

### Discussion

Conversion to open surgery from laparoscopic cholecystectomy was encountered because of recurrent management of multiple episodes of acute cholecystitis and avoiding definitive surgery because of associated comorbidities. It is considered as a sound judgment to avoid complications and reduce morbidity [17, 21].

The identification of the risk factors for conversion helps in predicting the rate of conversion and counselling the patients and their families accordingly. Elderly age is itself a high risk for laparoscopic cholecystectomy and conversion to open cholecystectomy. Patients above 60 years showed a higher tendency towards conversion [10, 11]. Although the numbers of female patients were more than the males [19], the significance difference in the gender for conversion could not be ascertained.

Hypertension was found to be a contribution factor in conversion to open cholecystectomy [17, 22, 23].

In relation to cardiovascular comorbidity in our study (41.7%) of patients had Ejection Fraction (EF) in range of 30-40% and (8.3%) patients had RWM (regional wall motion) abnormalities. About (25%) patients converted to open had Right bundle branch block (RBBB) and (16.7%) had Sick sinus syndrome (SSS). Cardiovascular diseases have been shown to be a risk factor for the conversion [9, 10]. Conversion rate [9, 10, 12] in our study was about 8.9% (12/134). Conversion to open cholecystectomy was mostly seen in ASA IV group of patients [9, 11].

During this study we had encountered multiple factors that resulted in conversion of LC to open cholecystectomy with adhesion in calot's triangle dominated the intraoperative findings, followed by bleeding and acute inflammatory changes around gall bladder and intolerance to pneumoperitoneum [9, 10, 11, 12].

Study	Conversion Rate (%)
P Pessaux <i>et al</i> 2000 [10]	10.2 (younger group), 21.6 (elderly group)
Malik <i>et al</i> 2007 [11]	8.9
Alexandros <i>et al</i> 2008 [14]	13.1
R Dennis <i>et al</i> 2009 [12]	7.5
Gurkan <i>et al</i> 2009 [13]	14.7
Costantini <i>et al</i> 2012 [17]	2.7
PRESENT STUDY	8.09

### Conclusion

The identification of the parameters as age, high risk comorbidities, ASA status and others helps in predicting the conversion rate and counseling the patient about postoperative complications. Among the intraoperative findings that resulted in conversion adhesions dominated the scene followed by acute inflammatory changes and bleeding. Moreover, surgeons should lower their threshold for conversion to open cholecystectomy in these high-risk patients when laparoscopic difficulty begins to compromise patient safety, especially in patients with cardiopulmonary dysfunction.

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