

## 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 Laparoscopic cholecystectomy 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 Laparoscopic cholecystectomy (LC), 12 patients (8.9 %) converted to open cholecystectomy. In conversion group American Society of Anaesthesiologist's (ASA III) and American Society of Anaesthesiologist's (ASA IV) categories predominate with American Society of Anaesthesiologist's (ASA IV) constitute about (66.7 %) of patients. Patients in age group 40-60years dominated study. Coronary artery disease (CAD) with Stent presents in (8.3 %) and CAD with previous surgical intervention as coronary artery bypass surgery (CABG) in (16.7 %) in converted group. Most common reason for conversion were adhesion in calot's triangle in 9/12 (75 %) of patients. Increase was noted in operative time by more than 30 minutes, postoperative complication by 25 % and total hospital stay by 24hours as compared to Laparoscopic cholecystectomy 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:** Laparoscopic cholecystectomy; Open cholecystectomy; Conversion rate; Risk factors; cardiopulmonary comorbidity

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### 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 Laparoscopic

Cholecystectomy (LC), and these complications and several other factors can necessitate the conversion from Laparoscopic Cholecystectomy (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 [9]. 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 ASA III & IV [10]. Despite the tremendous impact of Laparoscopic cholecystectomy on the management of biliary pathology, however surgeons continue to face challenges in application of Laparoscopic cholecystectomy in daily practice. Laparoscopic cholecystectomy today can be as straightforward operation, but may also be an operative approach fraught with underlying complexities necessitating conversion, leading to longer operative time, longer hospital stay and more postoperative morbidity and higher hospital costs [11,12] Conversion rates reported in literature range from 0-20% [13,14].

## 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, having 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 lifesaving 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 (CVP) monitoring and delivery of emergency drugs, secure epidural catheter for perioperative pain management.

### Establishment of pneumoperitoneum

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 3-4 Liter/minute, low average pressure pneumoperitoneum (PP) in range of 10-12 mmHg, minimising the time of pneumoperitoneum and intermittent Desufflation if time of pneumoperitoneum 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 laparoscopic cholecystectomy, 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 laparoscopic cholecystectomy 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 laparoscopic cholecystectomy group, whereas in converted group only ASA III and ASA IV categories predominate with ASAIV constitute about (66%) of patients (Table 1).

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

Multiple factors have resulted in conversion of LC to open cholecystectomy (Table 3). Most of factors were patient related, some technical factors and other anaesthesia related factors. 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 about (90.1%) of patients.

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

ASA Status	LC	LC to Open	Total
	n (%)	n (%)	n (%)
ASAII	37 -31.10%	0 0.00%	37 -27.60%
ASAIII	38 -31.90%	4 -33.30%	43 -32.10%
ASAIV	44 -37.00%	8.00% -66.70%	54.00% -40.30%
Total	119 -100.00%	12 -100.00%	134 -100.00%

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

Variable	Laparoscopic Cholecystectomy		Lap converted to open Cholecystectomy	
	N(119)	Percentage (%)	N(12)	Percentage (%)
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
Type 2 diabetes	19	16	4	33.3
Ejection fraction (30-40%)	4	9.2	5	41.7
Postoperative complication	19	16	3	25

**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

**Table 4** Conversion rate in various studies.

Study	Conversion Rate (%)
Pessaux et al.	10.2 (younger group), 21.6 (elderly group)
Malik et al.	8.9
Alexandros et al.	13.1
Dennis et al.	7.5
Gurkan et al	14.7
Costtantini et al.	2.7
Present Study	8.09

## 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 [12,15].

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 [16,17].

Although the numbers of female patients were more than

the males [14], the significance difference in the gender for conversion could not be ascertained.

Hypertension was found to be contribution factor in conversion to open cholecystectomy [12,18].

In relation to cardiovascular comorbidity in our study (41.7%) of patients had Ejection Fraction (EF) in range of 30-40%, (8.3%) patients had regional wall motion (RWM) abnormalities, about (25%) patients converted to open had Right bundle branch block (RBBB) and (16.7%) had Sick sinus syndrome (SSS). Cardiovascular diseases have shown to be a risk factor for the conversion [19,16].

**Table 4** Conversion rate [16,19,20] in our study was about 8.9% (12/134). Conversion to open cholecystectomy was mostly seen in ASA IV group of patients [19,17].

During this study we had encountered multiple factors that resulted in conversion of laparoscopic cholecystectomy 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 [16,21,23].

## Conclusion

The identification of the parameters as age, high risk comorbidities, American Society of Anaesthesiologist's 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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