

## A study of conversion of laparoscopic to open cholecystectomy in teaching hospital.

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### Abstract:

**Background and aims:** To study the factors in conversion of laparoscopic to open cholecystectomy and establish the common causes of conversion, which can help in quick decision of conversion and to avoid complications of late conversion. **Material & Methods:** This is a prospective study over a period of 24 months (August 2015 to August 2017) in teaching institute. **Result:** In our study total of 1436 laparoscopic cholecystectomies were attempted, out of which 91 converted to open; thus, the conversion rate was 6.3%. Conversion rate is higher among males (6.7%) and more in elderly (8.9%) with majority of converted patients had duration of illness for >6 months and 67% had a preoperative diagnosis of Chronic cholecystitis. In more than 50% of cases, the per-operative finding that led to conversion was unclear Calot's triangle anatomy. 8.79% of the cases those were converted were post Endoscopic Retrograde Pancreatico-cholangiography. In 11% of cases bleeding was important cause of conversion and in majority of cases; conversion was required in the first hour of laparoscopic surgery. **Conclusion:** Factors which influence the conversion include male patient, advancing age and duration of illness of more than 6 months with recurrent attacks of cholecystitis and presence of Diabetes. Most important intra-operative factors that influence the conversion include adhesions, oedema and fibrosis with unclear Calot's triangle anatomy. Being able to accurately predict the chance of conversion preoperatively would be beneficial; the patient could be forewarned and the surgeon could prepare for a possible longer and more difficult procedure as conversion from laparoscopic to open cholecystectomy results in a significant change in the outcome for the patient.

**Keywords:** - Conversion rate, Laparoscopic cholecystectomy, Teaching hospital.

### Introduction:

Minimal access surgery is a marriage of modern technology and surgical innovation that aims to accomplish surgical therapeutic goals with minimal somatic and psychological trauma<sup>1</sup>. Laparoscopic surgeries have reduced wound access trauma, less figuring, offer increased safety in obese, less post operative pain, early ambulation, shorter hospital stay, decreased wound complications and hence, improved outcome<sup>1</sup>.

But every new innovation has a catch or drawback, so as with laparoscopic procedures. This requires expertise, restricted visual field,

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absence of tactile sensation and it comes with per operative surprises. These limitations can enforce the surgeon to convert laparoscopic approach to open. However, some surgeons may resort from the inevitable judicious conversion, prolong the operating time and induce more complications.

Hence, with this intention, this study was contemplated, in the pursuit of actual circumstances and factors influencing such conversions, so that well preparedness of the patient as well as the surgeon preoperatively can be made. And it must be emphasized in surgical training that conversion is not a complication but a way of preventing further complications and decision of conversion should be contemplated early and at appropriate time during surgery, so that morbidity of prolonged surgical time can be avoided.

Aim and objectives of this study is to study the factors in conversion of laparoscopic to open cholecystectomy, to establish the common causes leading to conversion and to determine the relation between preoperative and peroperative factors leading to conversion, so that well preparedness of the patient as well as the surgeon preoperatively can be made and hence quick decision of conversion can be made avoiding complications of late conversion.

#### **Materials and Methods:**

This is a prospective study carried out at Department of General Surgery, Civil Hospital and B. J. Medical College, Ahmedabad from August 2015 to August 2017. All patients admitted for elective laparoscopic cholecystectomies, irrespective of age or gender; all patients who were converted from laparoscopic to open cholecystectomy and patients who were willing to participate in study, were included in this study. Patients with critical illness medically unfit for surgery and patients having any abdominal operative history (except tubal ligation and lower segment cesarean section) were excluded from this study.

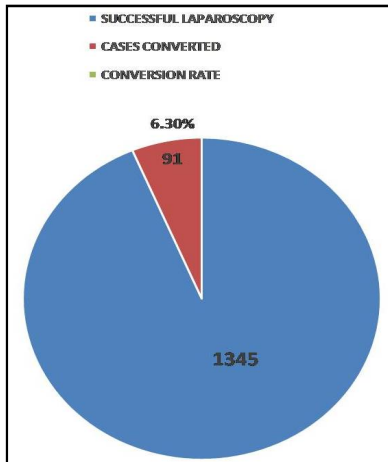
Patients were followed from the time of admission, perioperative period, till the time of discharge, with pre op routine blood investigations, imaging (when required). Detailed proforma was developed to record information on demographic data, admission details, present history findings, past medical history of Diabetes Mellitus Type-2 and hypertension. The operating details like circumstances of conversion, reasons of conversion were recorded.

Patients admitted from surgical Outdoor Patient Department were labeled as elective admissions. Patients were kept as nil by mouth from 10 pm on the preceding night and posted for surgery. All received perioperative antibiotic injection. The chief operating surgeons were Professors, Associate or Assistant professors, under training general surgery residents post graduate students were taken as assistants but no critical surgical step in study period was performed by them. All patients were given general anesthesia with controlled ventilation. Operating surgeon decides the route of access to abdomen (open or closed) and port placement. Pneumoperitoneum was developed using CO<sub>2</sub> at pressure of 10 to 12mm of hg. 30 degree and 0 degree scopes were used. Hook cautery, graspers, Maryland forceps, scissors were used for dissection. Decision of conversion was made by the chief operating surgeon. For calculation and charts construction and division of variables, Microsoft software was used.

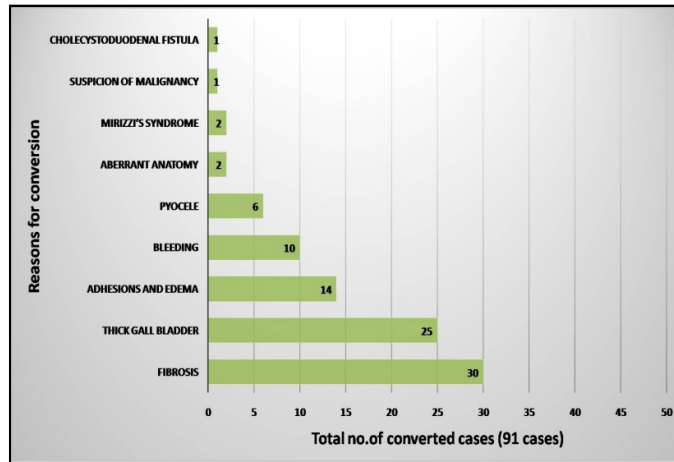
**Results:**

In our study total of 1436 laparoscopic cholecystectomies were attempted in the study period, out of which 91 converted to open; thus, the conversion rate was 6.3%. [Image 1] Conversion rate is higher among males (6.7%) and more in elderly (8.9%).

**Image 1: Ratio of Successful laparoscopy surgery vs converted cases with conversion rate.**



**Image 2: Reasons for conversion with total number of converted cases**



The patients were divided in two groups  $\leq 50$  and  $> 50$  years. 5.5% rate in less than 50 years age group and 8.9% in more than 50 years age group. This increased conversion in elderly patients is explained by the recurrent attacks and longer duration of symptomatology.

**Table 1: Age wise distribution of patients**

Age (year)	Procedure		
	Total lap attempted	Converted	Conversion rate (%)
$\leq 50$	834	46	5.5%
$> 50$	502	45	8.9%
Total	1436	91	

Laparoscopy was attempted on 1436 patients, 462 were males and 974 were females, their conversion rate is displayed in the table. Male sex has been universally affiliated with high incidence of conversion.

**Table 2: Gender wise distribution of patients**

Sex	Procedure	
	Total lap attempted	Converted
Male	462	31 (6.7%)
Female	974	60 (6.16%)
Total	1436	91 (6.34%)

Factors which are studied in detail are:

1. Duration of illness:

Out of total converted cases, maximum cases had duration of illness for >6 months (39.1%), and 12.74% of the total converted cases had duration of illness for >1 month to 6 months.

## 2. Preoperative clinical diagnosis

Out of total converted cases, in 33%, pre-operative clinical diagnosis was acute cholecystitis, while in 67%; pre-operative clinical diagnosis was chronic cholecystitis.

## 3. History of presenting illness

All of the cases had complaint of abdominal pain, while 11% presented with fever and 5% with jaundice as clinical feature along with pain.

## 4. Co-morbid illness

Out of total converted cases, 7.6% had diabetes mellitus type2 while 4.39% had hypertension as co-morbid illness.

## 5. Ultrasonography parameters

Out of total converted cases, in preoperative ultrasonography, 23.07% had presence of gall bladder wall edema while in 76.93% of the cases; there was no gall bladder wall edema. Out of total converted cases, in 27.4% of cases, the wall thickness of gall bladder was > 5mm in preoperative ultrasonography, while it was ≤5mm in rest of the cases. Out of total converted cases, 16.5% cases had raised pericholecystic echogenicity with fluid, while it was absent in majority (83.5%) of cases.

## 6. Post ERCP cholecystectomy

In 8 cases of the total converted cases, there was preoperative diagnosis of Gall bladder with Common bile duct calculi, so ERCP (Endoscopic Retrograde Cholangio Pancreatography) was done, and patients were planned for laparoscopic cholecystectomy.

## 7. Intra-operative findings

In more than half of the total converted cases (51.65%), anatomy of calot's triangle was not clear. Out of total converted cases, in 1 case there was biliary injury (1.09%), while in 10 of the cases, there was bleeding (10.09%).

**Table 3: Intra operative injury**

Intra-operative injury	Number of patients	% out of total converted cases
Biliary	1	1.09%
Vascular	10	10.9%
Total cases	91	100%

## 8. Malfunction in laparoscopy setup

In two of the total converted cases (2.19%), poor visibility of the camera was the contributing factor in conversion to open procedure.

### 9. Reasons for conversion

**Table 4: Reasons for conversion to open cholecystectomy**

Reasons for conversion	Number of cases	% out of total converted cases
Fibrosis	30	33%
Thick gall bladder	25	27.4%
Adhesions and edema	14	15.3%
Bleeding	10	11%
Pyocele	6	6.6%
Aberrant anatomy	2	2.2%
Mirizzi's syndrome	2	2.2%
Suspicion of malignancy	1	1.1%
Cholecystoduodenal fistula	1	1.1%
Total number of cases	91	100%

### 10. Time of conversion

Majority of the cases were converted to the open procedure within one hour of starting the laparoscopic procedure. In only 10% of the cases, procedure was converted to open after one hour.

#### Discussion:

Laparoscopic cholecystectomy has become the gold standard treatment for patients with gallstones due to less morbidity, lesser hospital stay and early return to normal activities<sup>2,3,4</sup>. It has gradually replaced open cholecystectomy in the treatment of patients with benign gallbladder disease. With the advancement in equipment and experience in laparoscopic surgery, most of the difficult gallbladder can be dealt laparoscopically.

In our study we analysed various factors such as patient's age, sex, blood investigations such as WBC count, Total bilirubin, ultrasonographic factors such as gallbladder status, gallbladder wall thickness, presence or absence of pericholecystic collections. In our study, all the patients admitted for elective laparoscopic cholecystectomy during the study period were included in the study (n=1436). And all the patients that were converted to open were taken as cases (91 cases).

Conversion rate is 6.3%. Benjie Tang et al<sup>1</sup> states that although the range of conversion rate of laparoscopic cholecystectomy to the open approach is commonly reported as 1.5%-10%, actual reported rates in different series can vary depending on the target patient populations and the associated risk factors for conversion<sup>5</sup>.

Conversion rate is higher among males (6.7%) and more in elderly (8.9%). Male sex has been universally affiliated with high incidence of conversion. Almost every study either corroborated this or further cemented this observation. Yol S et al<sup>6</sup> conducted a trial in which tissue hydroxyproline and collagen were measured in sample taken from gall bladder wall and pericholecystic tissue of both genders. They observed that inflammatory cells were more numerous in the tissue samples taken from men. Dense collagen accumulation was seen in the submucosal region of the gall bladder wall in males<sup>6</sup>. This increased conversion in elderly patients is explained by the recurrent attacks and longer duration of symptomatology.

Kartal A et al<sup>7</sup> state that estrogen inhibits connective tissue deposition in peritoneal inflammation (adhesion formation) by suppressing macrophage activation. This fibrosuppressive effect of estrogen may explain the decreased incidence of adhesion formation in women.

Majority of converted patients had duration of illness for >6 months and 67% had a preoperative diagnosis of Chronic cholecystitis. A prospective comparative study in patients with acute vs chronic cholecystitis by P. Pessaux, J. J. Tuech, C. Rouge, R. Duplessis, C. Cervi, J.P Arnaud<sup>8</sup>, in 1999, in 796 patients. In this study, the conversion rates were 38.6% in acute cholecystitis and 9.6% in chronic cholecystitis, however, in our present study, more of the converted cases had chronic cholecystitis, not in accordance with the other international study. The reasons behind this are- As ours being tertiary centre, maximum number of cases reported are referred and with long duration of symptoms and multiple recurrent attacks of cholecystitis. Very less number of cases present within 10 days of the presentation.

Out of total converted cases, 23.07% had presence of gall bladder wall edema, in 27.4% had gall bladder wall thickness >5mm, 16.5% had raised pericholecystic echogenicity with fluid in pre-operative ultrasonography. A prospective study was conducted over a period of 24 months by Thyagarajan, Mohanapriya & Singh, Balaji & Thangasamy, Arulappan & Rajasekar, Shobana. (2017)<sup>9</sup> A total 500 patients were electively posted for laparoscopic cholecystectomy and 50 got converted into open cholecystectomy, were included in the study. Thickened gall bladder wall and peicholecystic fluid were statistically highly significant for conversion of laparoscopic to open cholecystectomy. However, in our present study, only 16.5% cases had raised periechogenicity and fluid, while it was absent in majority of the cases, hence, our study is not in accordance with the international study. The reason behind this is that, being the tertiary centre, maximum number of cases present late to our hospital, with long duration of symptoms, hence more patients present to us with changes of chronic cholecystitis, only few come to us within 3 days of commencement of symptoms. In more than 50% of cases, the preoperative finding that led to conversion was unclear calot's triangle anatomy. Out of total converted cases, in 1 case there was biliary injury(1.09%), while in 10 of the cases, there was bleeding(10.09%). Bleeding was also the important cause of conversion, comprising 11% of the total cases converted. After reviewing the literature as well as the present study; adhesions, edema and fibrosis around gall bladder have made the dissection of calot's triangle both unsafe and difficult laparoscopically, and is the most common reason for converting the procedure to open. Bleeding was also the important cause of conversion in the present study, as studies by Ibrahim S et al, shares the same observation, strengthening the evidence for the same.

In two cases, it was technical failure. It has been speculated that the two dimensional image, limited visual field, absence of tactile sensation may be responsible for this trend<sup>10</sup>. In majority of cases, conversion occurred in the first hour of laparoscopic surgery.

Hence, factors that are important in influencing conversion of laparoscopic to open cholecystectomy in our hospital, as per the present study comprise of male patient, advancing age and duration of illness of more than 6 months with recurrent attacks of cholecystitis and presence of Diabetes. Most important intraoperative factors that influence the conversion

include adhesions, edema and fibrosis with unclear Calot's triangle anatomy.

### Conclusion:

Being able to accurately predict the chance of conversion preoperatively by studying these factors would be beneficial; the patient could be forewarned and the surgeon could prepare for a possible longer and more difficult procedure as conversion from laparoscopic to open cholecystectomy results in a significant change in the outcome for the patient.

"Need to convert is neither a failure nor a complication, but an attempt to avoid complication".

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