

## Conversion of laparoscopic cholecystectomy to open cholecystectomy

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### **Abstract:**

**Background:** laparoscopic cholecystectomy became the first choice of treatment for symptomatic cholelithiasis, but still we may be enforced during laparoscopic cholecystectomy to convert the operation to open cholecystectomy due to many reasons and factors which related to the patients, surgeons and gall bladder status and quality of the facilities .

**Objective:** We aim to reduce the percentage of laparoscopic cholecystectomy conversion by studying the causes and its percentage which impose the surgeon to convert the operation and the effect of that conversion on the operatives' outcome regarding morbidity and mortality and to study the importance of evaluation of the patient preoperatively.

**Patient and method:** We did a prospective study in AL-Kadhimiya teaching hospital including 700 patients came with gall bladder symptomatic diseases in the period from April 2014-November 2016, we exclude patient with cardiopulmonary diseases, gall bladder malignancy and major bleeding disorder. Information has been written including: history of present illness, jaundice, previous operation and any concomitant disease. Physical examination has been done .Lap investigation include: liver function test, WBC & complete blood picture, CXR, ultrasound abdomen and the indication of the operation. Three-four port technique has been used .The causes and rate of the conversion and the effect on morbidity have been written, the patients have been admitted one day preop. or the day of operation & the permission for conversion of lap. Cholely has been taken. We analyzed the data to find rate of conversion which was 4.51%, and the causes of conversion which included adhesion, hemorrhage, iatrogenic injury to the bile duct and other organs and other causes.

**Result :** We followed 700 patient in our study and after excluding malignant cases we had 686 patient which distributed according to the gender : 440 female and 246 male. The rate of conversion to open cholely 4.51% (31 patient) and these include 16 female and 15 male, the mean age was 50 year (range 30-70y) the conversion rate in male was 6.09% and in the female 3.8% .Of the causes for conversion which founded were : sever adhesion (18 patient) and fibrosis of Callot's triangle (3 patient), other causes were abnormal anatomy , equipment failure ,iatrogenic injury :including bowel injury in 0.3% ,vascular injury in 2% and biliary injury which was 0.3% we try to avoid its injury by using scope of 30 ,adequate identification of the structures in callot's triangle and avoidance of excessive use of diathermy near bile duct confluence. Many factors affect the conversion rate and related to the skill of the operator as it decrease with the senior operator 2.38% and increase with the junior operator 7.89% also the state of the gall bladder as it is acute or chronic, in acute cholecystitis the conversion rate was 18.3% while in chronic cholecystitis the conversion was 1.64%. The post-operative morbidity reported in 5 cases 16.12%.

**Conclusion:** Lapcholey can be done safely with conversion rate less than 5% in all patient groups. Many causes and factors encounter in conversion can be avoided by good training ,experience ,taking full history & full examination of the patient with proper selection of the case , good equipment .

**Keyword:** Lapcholey, conversion, open cholely, acute cholecystitis .

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### I. Introduction

Operation on gall stone diseases was developed over the last 2.5 decade to be done mainly by laparoscopic surgery, so it become the first choice for symptomatic biliary diseases since the first operation has been done by Dr. Med Erich Muhe of Boblingen , Germany on September 12 , 1985 [1]. This approach has many advantage as it shorten hospital stay and consequently patient return to work early, less abdominal pain, faster recovery and better cosmeses [2], also metabolic response to operative trauma & immune suppression is much less than that in open cholecystectomy [3,4]. But still there is challenge for conversion to open cholely. From 2.5-14% [5], the conversion rate affected greatly by surgeon training experience, skill and judgment [6]. In addition to that many other factors affect the conversion : male gender ,obesity ,old age more than 65 year, acute

cholecystitis ,cholidocolthiasis [7],previous abdominal operation, anomalous anatomy andhemorrhage[8,9].Technical difficulties cause many intra operative complications [10].CBD injury percentages in lap. Choley. about 0.2-3 % and this is about 5 times higher than that of the open choly [11], bile duct injury often associate with vascular injury[12]& this lead to increase in morbidity to 2.9%[13,14],bile duct injury mostly due to sever local factors like effect of acute cholecystitis in which bile duct injury is 3 times more than that in chronic cholecystitis [15],bleeding during which surgeon try to control bleeding by electrocautery and this cause injury ,it is better to apply pressure then we should do suction irrigation to identify bleeding point to use cautery , impact stone in Hartman pouch , fibrosis in callot’s triangle ,abnormal anatomy, excessive use of electrocautery and Mirrizi syndrome[16,17]. This syndrome described by Bablo mirrizi(Argentina/1948) its 2<sup>nd</sup> type is cholecystocholedochal fistula impose conversion,1<sup>st</sup> type is simple compression of common hepatic duct and can be treated by fundus 1<sup>st</sup> lap choley.[18] , other causes of injury :failure to proper occlusion of cystic duct, or entering a plane deep to facial plane of gall bladder bed which cause injury to duct in the liver bed, and tenting injury due to excessive pull on gall bladder [19].ductal injury can be treated by closure of the defect by fine absorbable sutures over Ttube for simpleinjury ,while complex injury need Roux en yhepaticoejejunostomy.[20].Surgeon experience improve and the outcome of the lapcholy become better inspite the accurate anatomical identification and the limit dissection within Calot’s triangle we still get biliary injury percentage (0.25-0.5%)[21] .

Our study analyzed causes of conversion and its frequency and how can we avoid it .

## II. Patients &methods

We did a prospective study on patients complaining symptomatic gall bladder diseases, they need laparoscopic cholecystectomy in the surgical department of Al-Kadhimiya teaching hospital from April 2014 – October 2016,including 700 patients ,our exclusion criterion involved patient with: gall bladder malignancy , cardiopulmonary diseases & hematological disorder. We started with document all information about the patient including: name, age, sex &weight. In addition we take full history of the present illness, jaundice, previous operation especially for upper abdomen , & any medical diseases as diabetes mellitus, cardiovascular diseases& respiratory diseases . Patient had been fully examined clinically & had been send for :lab. Investigations: liver function test, complete blood picture.

CXR,ultrasound of abdomen ,ECG & pulmonary function test .permission for lap conversion was taken.

In the operative note we wrote if operation done by senior or junior , type of anesthesia which was general anesthesia &using endotracheal tube .

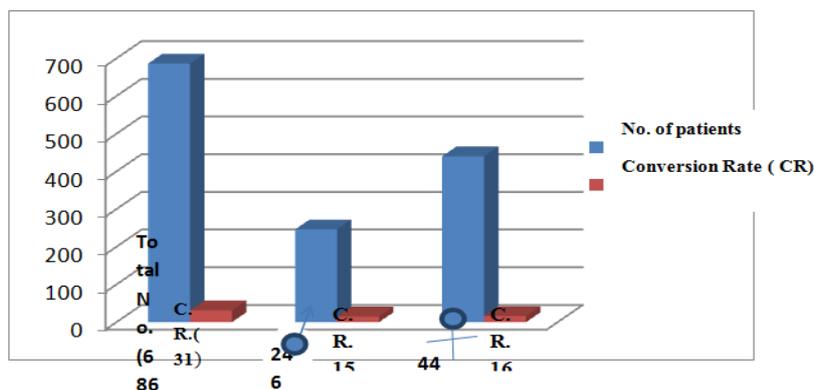
We used laproscopy of storz company and world of medicine company .

We gave the patient dose of ceftriaxone injection pre-operative. We used 3 or 4 port technique&pneumoperitoneum had been done by verres needle or few time by open Hassan’s technique .

Intra operatively we document intra operative findings and any cause which impose us to convert operation from lap. Choley. to open choley and any management we might need during operation to deal with any complication or difficulty faced us. Gall bladder extract through epigastric wound & closure of wounds with vicryl suture zero.

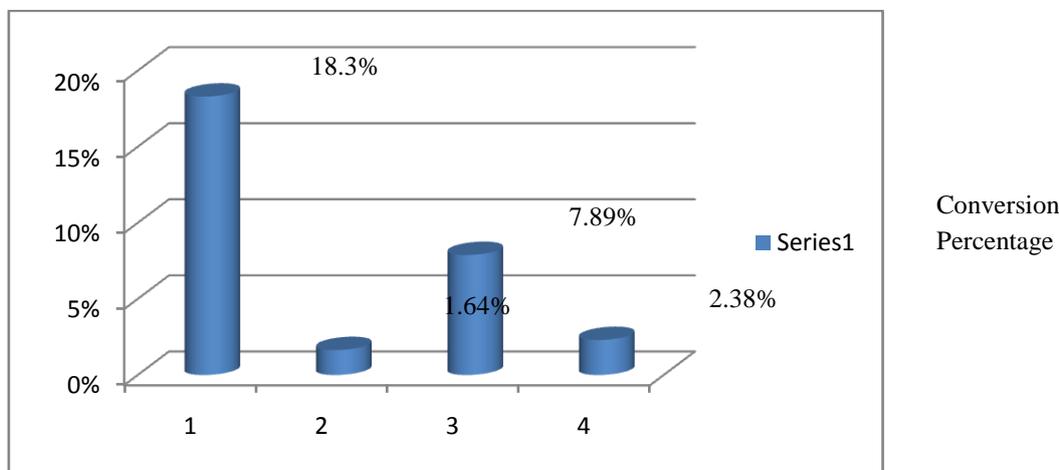
Post-operative period document include length of hospital stay ,if any drain removed ,any complication ,antibiotic had been given for 3 days especially in cases of acute cholecystitis. patient discharging day written,histopathological report was documented &follow up for 3 months done.

**Result:** In our hospital Al-Kadhymia teaching hospital we studied 700 case admitted for lapcholy from period may 2014- October 2016 we exclude cases with preoperative diagnosis of gall bladder malignancy ,cardio pulmonarydiseases and severhematological disorder so we included only 686 patient, in our study this involved 440 female 246 male .Rate of conversion in our study was 4.51%(31patients), and this include 15 male and 16 female (Fig.1).



**Fig.1:**Total number of patients laparoscopic cholecystectomy and the conversion rate with gender distribution and their conversion rate.

The mean age was 50 y (range from 30-70y). The conversion rate in male was 6.09% and in the female was 3.8%. The commonest causes for conversion were severe adhesion (18 patients) adhesion had been found between gall bladder and omentum, duodenum, stomach and transvers colon, the fibrosis of Calot's triangle (3 patients). The lap choly can be done in acute cholecystitis but the rate of conversion will increase, most of our cases was in chronic state 91%, while 9% in acute state, we need conversion in acute state in 18.3%, while in chronic state conversion was 1.64%. The conversion rate decrease with the senior experience where it reach 2.38% while with the junior surgeon it increase to 7.89% (Fig 2).



**Fig.2:** Rate of conversion according to the gall bladder state and experience.

we have many other causes for conversion : previous operation, trauma and inflammation, and this form 40 % of the cases where 55% had history of upper abdominal operation and 45% had no history of operation. Other cause is technical difficulty 25% which include inadequate visualization due to hepatomegaly and wide cystic duct in which there was difficulty in clipping the duct in (1) or inadequate pneumoperitoneum and failure of diathermy in (2) patient. Other causes include iatrogenic injury: gallbladder perforation (1) patients, perforation of gall bladder may occur during extraction or dissection of the gall bladder as it happened in our case where perforation occur during dissection & the gall bladder was filled of a lot of tiny stone lost in the peritoneal cavity, CBD injury (2) patients were identified intraoperatively, CBD injured patient managed according to type of injury, 1 of them there was tangential injury, treated by suturing the injury & putting T tube, in one patient total sectioning of CBD, this was treated by Roux en Y hepaticojejunostomy, why these injury happened, one case was due to using of electrocautery, the other due to severe adhesion which made obscure anatomy field. other causes for conversion include: duodenal injury (1) patient due to use of diathermy & severe adhesion, and common iliac artery injury (1) patient due to blind trocar introduction through umbilical wound, so in difficult cases as in severe adhesion or obesity we advise Hasson trocar or use of optical veress needle. Also we enforced to conversion due to: bleeding (4) patients which occurred from gall bladder bed during dissection (1) patient, the other three from injury to the cystic artery during dissection in Calot's triangle & this lead to complete section of cystic artery (Table.1).

**Table.1: Causes of conversion from L.Choley. to open Choley.**

Causes	No. of cases	Percentage%
Adhesion	18	58.0
Calot's triangle fibrosis	1	3.2
Technical difficulties:	4	12.9
a. Failure to clip wide cystic duct.	1	3.2
b. Failure of pneumo peritoneum	2	6.4
c. Diathermy failure	1	3.2
Iatrogenic injury :		
a. Gall bladder perforation	1	3.2
b. CBD	2	6.4
I: Tangential injury	1	3.2
II: Total section	1	3.2

c. Duodenal injury	1	3.2
d.Common iliac artery injury	1	3.2
Bleeding :		
a.gallbladder bed	1	3.2
b. Cystic artery injury	2	6.4

Our patient with lap choley return to work earlier with mean about 12 day, compare those need conversion was 28 day. Hospital stay in our patients in lap choley was 2.3 day while in converted cases it was 4 days . Postoperative morbidity were: one case developed collection (abscess) formation, one case had incisional hernia, one case had deep venous thrombosis, one case developed trocar site infection.

### III. Discussion

Open cholecystectomy was done 1<sup>st</sup> by Carl Langenbuch in 1882[ 22 ],were it became the standard operation for gall bladder diseases, then a big revolution occurred in the operation by introduction of laparoscopic instrument , the 1st laparoscopic surgery was done by Dr. Med Erich Muhe of Boblingen , Germany on September 12 , 1985 [1] .

Laparoscopic cholecystectomy become the 1<sup>st</sup> line choice for treatment of symptomatic Gall bladder diseases[1] ,but it still carries slightly higher risk of few complication like injury to CBD [23],&still we face challenge enforce us to convert to open choley& this increase hospital stay &postoperativecomplication[24].

Conversion rate range from 1.9% -7.5% as shown in the table( 2 ), while in our study 4.51%.

**Table.2: Comparison of conversion rate in lap.choley.**

Authors	Conversion%
Vikas Gupta et al <sup>[35]</sup>	7.5
Adnan Mehraje et al <sup>[48]</sup>	3.6
Orlando et al <sup>[49]</sup>	6.9
S. Duca et al <sup>[32]</sup>	1.9
Cuschieri et al <sup>[39]</sup>	3.6
Sujit et al <sup>[1]</sup>	4.9
Khush et al <sup>[34]</sup>	2.9
Muhammad Shamim et al <sup>[27]</sup>	6.5
VolkanGenc et al <sup>[41]</sup>	3.16
Our study	4.51

Conversion lead to high risk of postoperative complications and longer hospital stay [24], which depends on experience of the surgeon and degree of difficulty at the operation which can beaffected by many factors like history of previous operation,recurrent attack of cholecystitis, acute cholecystitis, male gender and the advanced age of the patient [25].

Conversion rate & complications depend on experience of the surgeon ,in our study conversion rate was 3% with senior operatorand it was 6.4 % with junior operator, in other study as in Mattioli et al [26] found that conversion rate was 2.8% with senior while it was 10% with junior operator ,and in Muhammad Shamim et al[27] it was 6.3% with expertise surgeon and 9% with trainee, other factors include : history of previous abdominal operation, recurrent attack of cholecystitis ,male gender &state of gall bladder.

During lap choley we may have many complications : hemorrhage, gall bladder perforation, bile leak, bile duct injury, visceral injury, intra-abdominal collection, and other rare complications :as external biliary fistula ,wound sepsis, hematoma, foreign body inclusion and adhesion and some of them necessitate conversion to open choley[28] .

In our study conversion rate was 4.51%, and we found the main reason for conversion was previous history of acute cholecystitis or new cholecystitis. acute cholecystitis & adhesion may cause difficulty in identifying the anatomy of Calot’s triangle due to sever inflammatory edema or dense adhesion,pericholecystitis increase difficulty in identifying anatomy of calots’ triangle, CBD, and increase risk of hemorrhage from cystic bed and cystic artery also it increase risk of gall bladder perforation ,conversion rate in cases with acute cholecystitis may reach 24.3%, while in chronic cholecystitis 5.06%,this found in Muhammad Shamim et tal[27], inChahin et tal[29] found conversion in acute cholecystitis 22% and in chronic 5.5%,in Tan et tal[30]found conversion in acute cholecystitis 20% and in chronic cases 4.2% ,in our study conversion rate in acute cholecystitis was 18.3%and in chronic cases 1.64%.

Other causes for conversion was the adhesions due to previous operation ,obesity which increase fatty infiltration of the cystic pedicle , stone in the common bile duct , buried gall bladder , thick gall bladder wall . In our study we found adhesion percentage after exclude adhesion due to acute cholecystitis 14% of the patient need conversion, in Waheeb R Al-Kubati

[31]conversion was 11.2% due to adhesion , in S Duca et al [32] adhesion was 3.35% as acause of conversion ,in Muhammad Shamim [27] it was 6.17% . Dissection (adhesionalysis) can lead to excessive

bleeding and failure to identifying anatomy of portahepatis which may cause injury to the biliary system or hepatic artery or even bowel injury [28].

Bleeding was one of the causes of conversion, incidence is 0.25-8% [32],and this due to trocar , dissection or poor retraction. Vessel mostly injured is epigastric and the cystic artery by trocar, others are mesentric ,omental ,falciform and splenic artery by verresneedleor by dissection . the most serious risk here is blind application of clips to control bleeding or blind use of electrocautary and these may cause sever injury to the CBD.Bleeding increase with acute cholecystitis [32]. In Kaushik R study [33] reported 10% ,in Khush Muhammad et al [34] bleeding incidence was3.18%,as a cause for conversion bleeding, in Shea et al [32] bleeding form 9.8 % , in MuhammedShamim et alstudy [27] it was 7.4% in our study the rate was 9.6% .Table( 3) .

**Table.3: Incidence of bleeding in conversion**

Authors	Conversion%
Kaushik R. et al <sup>[33]</sup>	10
Khush Muhammad et al <sup>[34]</sup>	3.18
Muhammad Shamim et al <sup>[27]</sup>	7.4
S. Duca et al <sup>[32]</sup>	2.3
Our study	9.6

Bile duct injury was another cause of conversion , injury in lap choley was 1% while in open choley was 0.5% [32] , in Deziel DJ [36] it was 0.58%, in Vikas Gupta [35] was 0.75%,in Holland,shol et al [37]cbd injury was 0.8%, in Kaushik R study [33] 0.27% in our study bile duct injury was 0.3% table.4.

**Table.4: Incidence of bile duct injury impose conversion**

Authors	Conversion%
Dezielet al <sup>[36]</sup>	0.58
Vikas-Gupta et al <sup>[35]</sup>	0.75
Holland,Shol et al <sup>[37]</sup>	0.8
Kaushik-R. et al <sup>[33]</sup>	0.27
Our study	6.4

it is advisable to put clip away from cysticocholedocaljunction, long cystic duct without stone doesnotcause postoperative pain .some time CBD mistaken as cystic duct,some advices to avoid injury by :for better visualization of Calot’s triangle do maximum cephalic fundal traction and do lateral and inferior traction on Hartmann’s pouch to open angle between cystic duct and CHD, removal of the fat and areolar tissues should start near neck of gall bladder (cysticlumph node is good land mark),avoid use ofelectrocautary near CBD,also Rouviere’s sulcus use as a landmark for safe dissection as it run right to hepatic hilum anterior to caudate lobe and indicate CBD plane [32] .

Previous abdominal surgery is not contraindication for lapcholey even in upper abdominal operation, but carries high risk of conversion & complication. This due to adhesion around gall bladder ,limit visualization &restriction of dissection [38].

Erc et al [38] found that previous operation had affect conversion rate in 2963 patient study as there were 37.2% had history of previous operation. In our study previous operation in the upper abdomen founded in 55% of patients had conversion. Male gender also a factor for conversion, and this is may be due to the severity of the gall bladder disease attack in male [39].in our study adhesion is the most common finding & form 50% of the converted cases.

Our study revealed male conversion rate twice high than female,in our study male conversion rate was 6.09% while in female it was 3.8% , in other study as in Muhammad shamim et tal [27] it was 16.45 % in male and 5.09% in female ,and in Gharaibeh et tal[40]it was 24% in male and 4% in female, in VolkanGenc et tal [41] found conversion in male gender was 5.6% while in female was 2.2% . In our study acute cholecystitis has been founded 20% in male vs 9%in female, also comorbid disease has been founded in 20% male & 7% female, in Volkan[41] it was 17% in male and 9.05% in female, and comorbid diseases was 22.2% in male and 24% in female .Older age group had high risk of conversion, in our study older patient more than 50year had high rate of conversion 5.8% while for age less than 50y it was 3.2% ,this explain by that these older ages have sever attack of gall bladder pathology ,increase incidence of comorbid diseases as cardiopulmonary diseases , choledocolithiasis&previous operation [8],in otherstudy as in Ibrahim et tal [8] and Brodsky et al [42]they found that age more than 60y was significant risk impose conversion. Equipment failure and technical difficulty were another causes for conversion they caused failure in maintaining pneumoperitoneum and bad exposure of the field due to bad quality of instruments , in our study conversion was 6% ,in Muhammad Shamim [27]it was 14.8% ,in Shea et al [43] it was 2.1% . Hospital stay is one of the advantage of the lap chley it increase due to

conversion in our study it was 2.3 day in lap choley and 4 days in converted cases .in Kani [43] it was 1.6 in lap choley and 4.3 in open choley , in Barkunjs [44]it was 2 days in lap choley and 6 days in open choley . Regarding morbidity our study found it was 16.12% in the converted cases and 3.5 % in lap choley,in S Duca [32] the rate was 7.7 % in open choley and 1.9 % in lap choley , in Jatzko et al [45] it was 8.3 % in open choley and 1.5% in lap choley ,in Cawich [46] it was 11 % in open choley and 4% in lap choley .

#### IV. Conclusion

Conversion was 4.5% , many factors impose us for conversion including factor related to the surgeon as the experience ,factors related to the patients as male gender and the increasing age , other factors related to finding at operation as the adhesions and acute cholecystitis and these maylead to injury of the CBD which has bad effect and need to be reduced ,also vascular injury ,equipment also need to be in good state . Conversion increase hospital stay and morbidity and delay return of the patient to the work and it mean scars and increase postoperative pain .So we need to reduce conversion by good training ,good experience ,good selection of the patient ,good instrument not refurbished , well identification of the anatomy.

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