

Laparoscopic Cholecystectomy to Open Cholecystectomy in Sulaymaniyah Teaching Hospital, Incidence and Risk Factors Assessment

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) is nowadays a standard procedure for the treatment of cholelithiasis; however still in some circumstances, it might become necessary to proceed to open cholecystectomy (OC).

Aim: To assess the incidence and risk factors of conversion of LC to OC in Sulaymaniyah teaching hospital.

Method: A prospective study includes 485 patients who underwent LC, from April 1st, 2019 to October 1st, 2019. The data collected by taking the proper history, careful examination, recording hematological, radiological and endoscopic results and operative findings.

Results: From 485 patients, 383 were females and 102 were males, with a mean age of (42.43±13.31) years. Twenty-two cases (4.5%) were converted into OC. The causes of conversion were dense adhesions and disturbed anatomy at Calot's triangle in 12 cases, bowel injury and bilio-digestive fistula in 4 cases, bile duct injury in 2 cases, bleeding in 2 cases, anatomical variation in 1 patient, and suspicious mass near gallbladder wall in 1 patient. Diabetic patients had higher rates of conversion than non-diabetic patients, (19.6%) compared to (2.56%).

Conclusion: The presence of dense and extensive adhesions at Calot's triangle is the commonest cause of conversion. Other risk factors included: age above 50 years, male gender, BMI more than 30, history of gall stone pancreatitis, history of upper abdominal surgery, and DM.

Keywords: Gall bladder stone, Laparoscopic, Cholecystectomy, Conversion incidence, risk factors.

INTRODUCTION

One-third of women and one-fifth of men have gallstone (GS), while half of these patients develop symptoms^[1]. No age range is safe from Gall bladder (GB) disease, however, they are more popular in the third, fourth and fifth decades of life². The risk factors for GS disease are female gender, increasing age, family history (genetic traits), obesity, metabolic syndrome, rapid weight loss, certain diseases (Liver cirrhosis, Crohn's disease) and GB stasis³.

Laparoscopic cholecystectomy (LC) was recognized in the 1980s, Philip Mouret from France who performed the first human LC in 1987⁴. Nowadays LC became a gold standard in the management of cholelithiasis^[5], and it has many benefits; less postoperative pain, shortened length of hospital stay, earlier return to daily activities, less surgical trauma, better cosmetics outcome, fewer wound infections, and reduced costs^[6]. LC is one of the most common surgeries performed in the world, and less than 15% of cholecystectomies are carried out by open cholecystectomy (OC)^{7,8}.

To decrease the risk of structural injury during LC, complete identification of the anatomy of porta hepatis and Calot's triangle is needed before ligation of any structure⁹.

Several preoperative factors will increase the risk of conversion to OC, which have been described in many studies: older age, male gender, acute cholecystitis, obesity, a higher leukocyte count and previous history of Endoscopic retrograde cholangiopancreatography (ERCP)^{7,10}. Preoperative assessment of patients with Ultrasound (US) is important in predicting the difficulty of

the surgery, and the possibility of conversion from LC to OC^{11,12}.

Although patient factors, surgeon factors, and equipment failure may contribute in conversion, the most common cause of conversion is due to obscure Calot's triangle, unclear anatomy of the critical view of safety and difficulty in dissection, or due to intraoperative complications such as bleeding, bile duct injury and intestinal perforation^{13,14}. Conversion is not considered a failure if the surgeon is unable to achieve the goal and it is a favorable decision to save the patient's life⁹.

This study aims to determine the rate of conversion to OC, and assessing the risk factors and causes of conversion from LC to OC, in Sulaymaniyah teaching hospital.

PATIENT AND METHODS

A prospective study; included 485 patients underwent elective LC in Sulaymaniyah teaching hospital- Iraq, from April 1st, 2019 to October 1st, 2019. The collected data included; age, gender, body mass index (BMI), history of pancreatitis, previous upper abdominal surgery, concomitant chronic disease like diabetes mellitus (DM) and hypertension (HTN), and history of US, esophagogastroduodenoscopy (EGD) and ERCP. After proper clinical examination, investigations performed accordingly: blood sugar, complete blood count (CBC), renal function tests, liver function tests, Electrocardiography (ECG), chest x-ray and the abdominal US. Then anesthetist assessment was done and informed consent was taken from each patient.

Those patients with jaundice and common bile duct (CBD) stone dealt with by ERCP after performing Magnetic Resonance Cholangiopancreatography (MRCP) and/or Endoscopic Ultrasonography (EUS), and then LC was attempted after clearance of CBD.

The patients were categorized into two main groups; those who completed LC were classified as a non-converted group, which served as a control group, and the patients who required conversion were classified as converted group.

The Procedure: The operations were performed with standard four ports under general anesthesia, with insufflation of carbon dioxide (CO₂) with a pressure of 12-15 mmHg, through open method or verse needle technique. Calot's triangle was dissected using low voltage hook diathermy or Maryland grasper. The cystic artery and duct were skeletonized and clamped with metallic clips separately, and the GB was dissected off from the liver bed.

The operative findings were recorded. The causes for conversion to OC were reported and right subcostal (Kocher) incisions were used for the open surgeries.

Statistics and analysis: The biostatic method was used in data analysis, utilizing software IBM SPSS statistics version 24. Student t-test is used for obtaining P-value; analytical statistics were used to establish the association between the variables of interest. Numerical variables were compared by CHI square test, and the contentious variable was compared by the Student t-test. P-value < 0.05 was considered significant.

RESULTS

This study included 485 patients. The age varied from (14-81) years, the mean±SD deviation was (42.43±13.31), 131 patients were >50 years and 354 patients were <50 years, 383 patients (79%) were female, and female to male ratio was (3.8:1). Approximately (80%) of patients were overweight and obese. The main presentation was chronic calculus cholecystitis; 400 patients (82.5%). Thirteen patients (2.7%) had a history of upper abdominal surgery. (Table 1).

Twenty-two patients (4.5%) had been converted from LC to OC. The age >50, male gender, BMI>30, history of pancreatitis and history of upper abdominal surgery were the significant risk factors for conversion. Also, diabetic patients had higher rates of conversion than non-diabetic patients; 11 out of 56 diabetic patients (19.6%) were converted, compared to 11 out of 429 non-diabetic patients (2.56%) who were converted. (Table2).

Two patients had ductal anomalies; one had a double cystic duct, and the other had accessory bile duct, both of them were converted (Table 2).

The main intra-operative finding as a cause for conversion from LC to OC was difficulty in defining anatomy due to dense adhesions which found in 12 patients (54.5%), then injury to other organs; stomach injury: 1, duodenal injury: 1, and jejunal injury in another patient, followed by bile duct injury in 2 patients (9%); one of CBD injury and one of an accessory duct, and in 2 patients (9%) hemorrhage was the cause: uncontrolled bleeding from GB bed in one patient, and uncontrolled bleeding from Calot's triangle in another one which occurred during dissection of cystic duct and artery, and then bilio-digestive fistula between the fundus of GB and pylorus found in one patient. In one patient the conversion was due to anatomical variation (double cystic duct), and another one had a suspicious mass near the GB wall. (Table 4).

Intraoperatively 248 out of 485 patients had adhesions between GB and omentum, small bowel, large bowel or stomach, and 54 patients had stones in the cystic duct. (Table 3).

Table 1: Socio-demographic and clinical characteristics:

Variable	No.	%
Sex		
Male	102	21%
Female	383	79%
BMI		
<18.5	3	0.6%
18.5-24.9	99	20.4%
25-30	225	46.4%
>30	158	32.6%
Presentation		
Chronic calculus cholecystitis	400	82.5%
Gall stone Pancreatitis	26	5.4%
Common bile duct stone	25	5.2%
Gall bladder polyp	25	5.2%
Acalculous cholecystitis	3	0.6%
Chronic calculus cholecystitis + polyp	6	1.2%
Upper Abdominal surgery		
Yes	13	2.7%
No	472	97.3%
Conversion		
Yes	22	4.5%
No	463	95.5%
Chronic disease		
No chronic disease	335	69.1%
HTN	76	15.7%
DM	17	3.5%
Other diseases	18	3.7%
HTN+DM	29	6%
HTN +DM +Other diseases	10	2.1%
Procedures	Yes	
EGD	77	%15.9%
ERCP	35	%7.2%
	No	
	408	84.1%
	450	92.8%

Table 2: Sociodemographic and clinical characteristics of the two groups with a comparison:

Variables	Conversion%	No Conversion%	P-Value
Age (Mean±SD)	52±17.3	41.98±12.94	0.014
Age:			
<50	10 (2.82)	344 (97.17)	0.003
>50	12 (9.16)	119 (90.83)	
Male	11 (10.78)	91 (89.21)	0.001
Female	11 (2.87)	372 (97.12)	
BMI			
<18.5	0 (0)	3 (0.6)	0.600
18.5-24.9	4 (18.2)	95 (20.5)	
25-30	8 (36.3)	217 (46.9)	
>30	10 (45.5)	148 (32)	
Presentation			
Chronic calculus cholecystitis	14 (63.6)	386 (83.4)	<0.001
Gall stone Pancreatitis	6 (27.3)	20 (4.3)	
Common bile duct stone	1 (4.5)	24 (5.2)	
Gall bladder polyp	0 (0)	25 (5.4)	
Acalculous cholecystitis	0 (0)	3 (0.6)	
Chronic calculus cholecystitis + polyp	1 (4.5)	5 (1.1)	
Upper Abdominal surgery			<0.001
Yes	4 (18.2)	9 (1.9)	
No	18 (81.8)	454 (98.1)	
Chronic disease			
No chronic disease	7 (31.8)	328 (70.8)	<0.001
HTN	2 (9.1)	74 (16)	
DM	4 (18.2)	13 (2.8)	
Other diseases	2 (9.1)	16 (3.5)	
HTN+DM	6 (23.7)	23 (5)	
HTN +DM +Other diseases	1 (4.5)	9 (1.9)	

Table 3: Intraoperative findings in relation to conversion:

Variables	Conversion No. (%)	No conversion No. (%)	P-value
Adhesion			
Yes	21 (95.5)	227 (49)	<0.001
No	1 (4.5)	236 (51)	
Stone in the cystic duct			
Yes	4 (18.2)	50 (10.8)	0.282
No	18 (81.8)	413 (89.2)	
Calot's triangle			
Clear	2 (9.1)	458 (98.9)	<0.001
No clear	20 (90.9)	5 (1.1)	
Anomaly			
Yes	2 (9.1)	0 (0)	<0.001
No	20 (90.9)	463 (100)	

Table 4: Causes of conversion:

Causes	Frequency
Adhesion & disturbed anatomy at Calot's triangle	12 (54.5%)
Bleeding	2 (9%)
Bile duct injury	2 (9%)
Other Injuries (bowel and stomach)	3 (13.6%)
Fistulae between gall bladder and bowels.	1 (4.6%)
Suspicion of gall bladder cancer	1 (4.6%)
Anatomical variation	1 (4.6%)

DISCUSSION

LC is a minimally invasive procedure, providing advantages to the patient, as well as economic benefits¹⁵, but there is always the possibility of conversion to open surgery, and in some circumstances conversion to OC is mandatory. The conversion is ranging between (2%) to (22%) in different studies^{16]} In our study the conversion rate was (4.5%) which is within the usual rates of conversions reported by other studies, we compare our conversion rate to some other studies, as shown in table 5.

Table 5: Comparison of our conversion rate with some other major published similar studies:

Study	Place	Year	N	Conversion rate
Our study	Sulaymaniyah- Iraq	2019	485	4.5%
shammariRJ et al ^[9]	Baghdad- Iraq	2018	150	6%
Utsumi M et al ^[17]	Japan	2017	236	8%
Beksac K et al ^[8]	Turkey	2016	1335	7.7%
Sutcliffe RP et al ^[10]	UK	2016	8820	3.4%
DALAL AS, et al ^[2]	India	2014	945	1.27%
Lim et al ^[18]	Singapore	2005	443	11.5%
Tarcoveanu et al ^[19]	Romania	2005	6985	3.2%
Tayeb et al ^[20]	Karachi	2005	1249	7.5%
Tan et al ^[21]	Australia	2006	202	4.2%

In this study, the mean age was (42.43) years, which is less than Bingener et al study²²: (47.2) years, and older than Daradkeh study²³ who reported mean age of (40) years. Over 75% of patients were females; the ratio to males was 3.8:1.

The conversion rate was higher in patients above 50 years (9.1%) vs (2.8%) in those less than 50 years, with significant p-value (0.003), and it is similar to a studies have been done by Ibrahim et al²⁴, Masashi Utsumi et al¹⁷ and Sutcliffe RP et al¹⁰, which were higher in older ages.

Male gender was found to be associated with increased risk of conversion in our study, similar to the studies that have been done in Singapore²⁴, Bagdad⁹ Japan¹⁷ and Birmingham^[10], all showed higher percentages of conversion in male patients. However, one study that was carried out in Iraq showed a higher conversion rate in females²⁵. The reason why men and older ages have a higher conversion rate is frequently associated with severe inflammation and dense adhesions had been postulated in men and old age²⁶.

In this study the conversion rate was higher in obese patients (BMI>30), which also reported in other studies^[27, 28], the reason can be attributed to the difficulty in handling, negotiation of the field by the ports, obscure anatomy due to excessive intraperitoneal fat, and inability to retract the liver sufficiently.

History of biliary pancreatitis was found to be associated with increased risk of conversion in this study, also reported in a study that was carried out in Turkey²⁹, this is due to obscured biliary tract anatomy with pericholecystic and peripancreatic inflammation that makes dissection harder³⁰.

Patients with histories of upper abdominal surgery were found to have increased conversion rate, this is because of the many adhesions attached to GB and the anterior abdominal wall, as previously reported by other authors^{7, 31}.

Adbikardid Bedirli, Erdogan M. Sozuer et al³² carried out a study between 1993 to 2000, noted that the conversion rate was higher in DM as compared to non-DM patients, a similar finding to our study.

In this study, the major cause for conversion was the inability to define the anatomy clearly due to dense adhesions and a frozen triangle of Calot, attempts to release the adhesions by cauterization and dissection failed to ensure clear anatomy, this was the case for 12 patients (54.4%), this finding was similar to other studies^{22, 24, 33}.

The second most common cause of conversion was gastrointestinal injury and bilio-digestive fistulae in 4 patients (18.3%), due to difficult dissection during operation and one bilio-digestive fistulae between the fundus of GB and pylorus, and bile duct injury was the reason for conversion in 2 patients (9%).

Bleeding from the cystic artery and excessive uncontrolled oozing from liver bed, resulted in poor visualization, were causes of conversion in 2 patients (9%). Masashi Utsumi et al^[17] reported (10.5%) bleeding as a cause of conversion, but it was (16%) in Al-Ghadhban study²⁵ and (21%) in Sutcliffe RP et al study¹⁰

Suspicious mass was found near the GB wall in one case was leading to conversion, similar results were reported in

the study carried out in Al-Karama teaching hospital in Bagdad^[34].

CONCLUSION

The risk factors for conversion in this study included: age more than 50, male gender, BMI more than 30 kg/m², gall stone pancreatitis, patients with a history of upper abdominal surgery and DM.

The most common cause for conversion was the presence of dense adhesions and unclear anatomy at Calot's triangle, so it is mandatory to clarify the possibility of conversion to OC while taking consent for LC. The limitation of this study was that all the data were collected from one center and from different surgeons, which may affect interpretation and limit generalization of the results.

Recommendation: Proper preparation of patients preoperatively is required. Predictive factors could be used to plan the intervention, and the surgeons could inform the patients for the possibility of conversion to OC while taking consent for LC.

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