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ORIGINAL ARTICLE

Preoperative Risk Facors to Convert from Laparoscopic Cholecystectomy to open Cholecystectomy

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ABSTRACT

Background: preoperative prediction difficult Laparoscopic cholecystectomy can help the patient as well as the surgeon prepare cholecystectomy

Aim to evaluate preoperative risk factors for conversion from Laparoscopic to open cholecystectomy in our setting

Patients and Methods: This prospective study include 210 patients who underwent Laparoscopic cholecystectomy from January 2014 to January 2016 in 3rd surgical unit, Baghdad Teaching Hospital ,Shahid ahmed ismail hospital , Heet General Hospital Full clinical history, preoperative examination, laboratory investigation U/S results and intraoperative details were analyzed to determine risk factors of difficult Laparoscopic cholecystectomy.

Results: Of 210 patients 12(5.7%) required conversion to open cholecystectomy Significant predictors of conversion were

1 Body mass index ≥ 30 kg/m2.
2 Male gender.
3 Past history of acute cholecystits.
4 Past history of upper abdominal surgery.
5 Gall Bladder wall thickness exceeding 3mm.

And the causes of conversion are:

1 In ability to delineate anatomy which occurred in (8) 66.7%.
2 Bleeding which occurred in (3) 25% and,
3 Suspected CBD injury which occurred in (1) 8.3%.

Conclusion: Clinical and U/S factors can help predict difficult Laparoscopic cholecystectomy and likelihood conversion of (Laparoscopic cholecystectomy) to (open cholecystectomy).

INTRODUCTION

Cholecystectomy was established as the surgical treatment for cholelithiasis in 1882, Carl Johan August Langenbuch was the first who performed this procedure ; Open cholecystectomy became the gold standard for the treatment of cholelithiasis till the introduction of Laparoscopic cholecystectomy in 1980, when Philip Mouret from France performed the first human Laparoscopic cholecystectomy in 1987 ; there is no doubt that Laparoscopic cholecystectomy replaced open cholecystectomy as a standard for the treatment of symptomatic cholelithiasis (1).

Decreased postoperative pain, earlier oral intake, shorter hospital stay, early return to normal activity, and improved cosmoses have been well recognized after Laparoscopic cholecystectomy. A significant reduction in incidence of wound complications and postoperative ileus has been documented in patients undergoing Laparoscopic cholecystectomy.

The spread of the procedure in most hospitals and advancement in surgeons experience and confidence has led to decrease the work with the open technique to be performed only in failures of the Laparoscopically attempted ones. Some patients require conversion to open surgery and several preoperative variables have been identified as risk factors that are helpful in predicting the probability of conversion (2).

However, there is a need to identified risk factors to predict the risk of conversion preoperatively for selected patients prepare the patient psychologically, arrange operating schedules accordingly and minimize the procedure-related cost and help overcome financial constraints, which is a significant problem in developing countries (3).

Laparoscopic cholecystectomy may be defined as difficult' by various problems encountered during surgery, such as difficulties in accessing the peritoneal cavity, creating a pneumoperitoneum, identification of Calots triangle, controlling of bleeding if present & dissecting the gall bladder(4).

Scoring systems to predict conversion to open cholecystectomy have drawn conflicting conclusions and have not been widely

incorporated into surgical practice for this reason, accurately identifying an individual patient's risk for conversion based on preoperative and information can result in more meaningful and accurate preoperative counseling, improved operative room scheduling and efficiency, inhibition of risk for technical difficulty, and appropriate duty of surgical assistant. In addition, it may improve patient safety by minimizing time to conversion and helping to identify patients in whom a planned open cholecystectomy is indicated (5,6).

However, substantial proportions of patients in whom laparoscopic cholesystectomy cannot be successfully performed are converted to open cholecystectomy because of technical difficulty or intra operative complications. The current study is aimed at evaluating the risk factors for

conversion of laparoscopic cholesystectomy to open cholecystectomy in our set-up. It was hoped that the prediction of a difficult procedure would allow the surgeon to discuss the likelihood of conversion with the patient and prepare him/her psychologically as well as plan their recovery, These risk factors would be able to predict the probability of conversion for those at a higher risk of conversion. Another benefit would be to allow more efficient scheduling of the operating lists and ensuring the availability of a more experienced laparoscopic surgeon for the procedure(7,8**).**

Aim of The Study

1. Evaluate the safety and efficacy of laparoscopic cholecystectomy in our center (3rd surgical unit) as a sample for the work of laparoscopy in our locality comparing with other centers in our country and the world to rule out the main causes of conversion and difficulties facing our surgeons in this procedure.
2. Predict the risk of conversion preoperatively for selected patients
3. Minimize the procedure - related cost and help overcome financial constraints.

PATIENTS AND METHODS

In this prospective cohort study, **213** patients who admitted to do laparoscopic cholesystectomy between January 2014 and January 2016 in 3rd surgical unit, Baghdad Teaching Hospital ,Shahid ahmed ismail hospital , Heet General Hospital. Some patients had symptomatic cholelithiasis and the other were not, two patients with concomitant common bile duct stones and one patient with suspected malignancy were excluded.

Patients were admitted to the hospital one day prior to surgery. Abdominal ultrasonography was performed and investigated by LFT, RBS, RFT, CBP, Blood group, CXR and ECG before the surgery. Prophylactic antibiotic used routinely.

At the time of admission the following data were obtained age gender, Body Mass Index (weight in kg. divided by squared height in meters), sub costal angle, previous medical history, previous surgical history, u/s findings , xiphi-umbilical distance, and at the time of surgery the surgical difficulties & intraoperative findings were recorded

Data sheet (questionnaire) was prepared and the data collected and recorded by the researcher .

A standard technique for laparoscopic cholesystectomy was practiced. After general anesthesia and positioning of the patient insufflations achieved by either a veress needle or Hassun method.

Carbon dioxide used as the insufflations gas.30 degrees camera used through 10mm port. Standard procedures done through 4 ports technique .The instruments available were ; Graspers, dissectors, spatula ,L-shaped cauterization tool, suction-irrigation machine ,Babcock ,and veress needle.

Statistical Analysis: For data input and analysis we use SPSS v15 (statistical social sciences version 15). For studying the strength of association between exposure and outcome we used relative risk and we were finding with confidence interval that didn't include the value of 1 were considered significant P value< 0.05 was considered as statistically significant.

RESULTS

210 patients; 156 female (74.2%) & 54 male(25.8%) had been admitted to do laparoscopic cholesystectomy from January 2014 to January 2016, an average age of 47 years (range 15 to 79) and most age group which had admitted for laparoscopic cholesystectomy was (40-49), which also it was the most age group had probability for conversion as shown in(Table 1).

Table 1: Relationship between age & gender distribution to conversion rate

Age	15-19	20-29	30-39	40-49	50-59	60-69	70-79	Total N
Male	3	2	4	21	17	4	3	54
%	1.4	0.95	1.9	10	8.09	1.9	1.42	25.8
Femal	9	7	18	78	24	12	8	156
%	4.28	3.33	8.57	37.14	1142	5.7	3.8	74.2
Tota N	12	9	22	99	41	16	11	210
%	5.71	4.26	10.47	47.14	19.51	7.61	5.22	--
Converted	0	1	3	4	2	1	1	12
%	0	8.33	25	33.33	16.66	8.33	8.33	5.7

Table 2: Relationship between Age factor & conversion rate.

		Conversion		Total	p
		yes	no		
Age (year)	≥65	1 (5.88%)	16 (94.12%)	17 (8%)	0.44
	<65	11 (5.69%)	182 (94.31%)	193 (92%)	
	Tota	12	198	210	

The conversion rate is more common in patients <65 year which occurred in 11 patient from 193 patient(5.69%), and less in patients ≥65 year which occurred in one patient from 17 patients(5.88%) who admitted to do laparoscopic cholesystectomy.

So elderly age group isn't a risk factor (p>0.005) as shown in (table2)&(figure-2).

Table 3: Relationship of gender to conversion rate.

Gender	N	%	converted	% of conversion	p
Male	54	25.8	5	9.25	0.03
Female	156	74.2	7	4.48	
Total N	210	100	12	5.7	

The total number of patients who converted is 12 (5.7%) from 210 which less occur in female patients : 7 (4.84%) from 156 (74.2%) and more in male patients which

occur in 5 (9.25%) from 54(25,8%) patients who did laparoscopic cholesystectomy. .

So Male Gender is important risk factor for conversion($p<0.05$)as shown in (table-3)&(figure-3).

Difficulty in access to peritoneal cavity occurred in 27 patients (12.8%) was encountered significantly more often in obese patients ($p<0.05$) and in patients with past history of upper abdominal surgery ($p<0.01$) as shown in(table-4).

Table 4: Relationship of difficulty in access to peritoneal Cavity (n=27) with various variables.

Various variables	Total N	Difficulty in peritoneal access	%	p
Upper abdominal Surgery	19	15	78.9	0.0007
Obese patients	30	8	26.6	0.004
Narrow Subcostal Angle	44	7	15.9	0.49
Xiphi-Umbilical Distance < 18 cm.	72	5	6.94	0,07

Moderate bleeding during surgery occurred in 23 Patients (10.9%) and

None had severe bleeding . Bleeding occurred more often in patients with previous upper abdominal surgery ($p<0.05$), those having gall

bladder wall thickness exceeding 3 mm ($p<0.05$), and those with past history of acute cholecystitis ($p<0.05$) as shown in(table-5)&(figure-5).

Table 5: Relationship of moderate bleeding (IFB) with various variables.

Various variables	N	Positive for moderate bleeding	%	p
Upper abdomen Surgery	19	6	31.6	0.001
Previous Acute Cholecystitis	18	9	50	0.0002
Gall Bladder Wall Thickness > 3 mm.	32	5	15.6	0.003
Size of Calculus >1 cm.	43	5	11.6	0.87
Multiple Calculi	67	7	10.4	0.95

Table 6: Relationship of difficulty in gall bladder bed (n=75) with various variables

Various variables	N	Difficulty in Gall bladder bed dissection	%	p
Upper abdomen Surgery	19	1	5.2	0.06
Previous Acute Cholecystitis	18	12	66.6	0.005
Gall Bladder Wall Thickness > 3 mm.	32	9	28.12	0.04
Distended Gall bladder	26	6	45	0.06
Multiple Calculi	67	7	10.4	0.14

dissection of gall bladder bed was more often difficult in 25 patients (11.9%) and more in patients with past history of acute cholecystitis

($p<0.01$), and in those with gall bladder wall thickness exceeding 3 mm ($P<0.05$)as shown in(table-6).

Twelve patients (5.7%) required conversion from laparoscopic cholecystectomy to open cholecystectomy, because of the following

Reasons:

1- Inability to delineate anatomy which occurred in (8) 66.7% patients from(12) converted patients from laparoscopic cholesystectomy to open cholecystectomy and the risk factors related to this causes were(upper abdominal surgery , previous acute cholecystitis and gall bladder wall thickness> 3mm).

2- Bleeding which occurred in(3)25% and

3- Suspected CBD injury (1) 8.3% as shown in (table-7)&(figure-7).

Table 7: Relationship between conversion with various causes:

Causes of Conversion	N	%
Obscure Anatomy	8	66.7
Bleeding	3	25
Suspected CBD injury	1	8.3
Total N	12	100

Five factors were significantly associated with conversion to open cholecystectomy; these included:

1 Obesity
2 Patient gender
3 Past history of acute cholecystitis
4 Past history of upper abdominal surgery
5 Gall bladder wall thickness >3 mm (table-8).

Table 8: Relationship of conversion to open cholecystectomy (n=12) with various variables

Various variables	N	converted	Estimated Risk Ratio
Upper abdomen Surgery	19	4	3.09 (1.04 ; 9.17)
Previous Acute Cholecystitis	18	5	3.30 (1.10: 9.86)
Gall Bladder Wall Thickness > 3 mm.	32	4	1.7 (1.3 ; 6.07)
Obese Patients	30	7	2.54 (1.06 ; 6.10)
Male Gender	54	5	1.9 (1.07 : 9.30)

DISCUSSION

The need for conversion to laparatomy is neither a failure nor a complication, but an attempt to avoid complications. It may be helpful to determine the risk of conversion of a laparoscopic cholesystectomy to open cholecystectomy beforehand (1)

The well-documented advantages and safety of laparoscopic cholesystectomy have made it standard of care for the management of paients with symptomatic gallstones. Despite these advantages, Conversion to open procedure is required in a varying proportion of patients which ranges from 2% to 15% in different studies (4).

The risk of conversion to open cholecystectomy is related to surgeon factors, patient factors and, possibly, equipment factors (5).

In this study the conversion rate was 5.7% which was less than conversion rate in previous studies in Mosul university and Sulaimaniyah university which were 8.7% and 12.5% respectively (7).

Table 9: Conversion Rate in different studies.

Study	Conversion Rate
Georgia Baptist Medical Center(1999-2002)	2.3%
Aga Khan University / Karachi / Pakistan(2001-2003)	7.5 %
University of Texas , The National Hospital(2003-2005)	5 %
RIPAS Hospital/Begawan/Brunei (2001-2004)	4%
Al Sulaimaniyah Teaching Hospital/ Iraq	12.5 %
University of Mosul (College of Medicine / Al Jumhoory Hospital (2004-2005)	8.7 %
Baghdad Teaching Hospital / Medical City! Baghdad / Iraq(2008-2010)	5.7 %

The approximate rate of conversion in our study with those from different studies may indicate increasing in skills of our doctors and a success in laparoscopic surgery in our centers although it is still in its

First steps: The most common reason for conversion in our study was inability to delineate the anatomy in (8) cases (66.7%). Three factors, namely. Were associated with difficulty in defining the anatomy.

1- Past history of upper abdominal surgery
2- Past history of acute cholecystitis
3- Greater thickness of the gall bladder wall, were associated with difficulty in defining the anatomy.

Upper abdominal surgery causes problems during starting of pneumoperitoneum and during adhesiolysis to gain adequate exposure to the operative field; these problems depend in a large measure on the location of previous surgery(8),(9).

Prior acute cholecystitis results in a scarred and fibrosed gall bladder, and in dense fibrotic adhesions that render laparoscopic dissection difficult. Gall bladder wall thickness is related to the inflammation or fibrosis that follows previous attacks of cholecystitis, and thus may reflect difficulty in delineation of the anatomy during surgery(10).

The major cause of conversion in our study is dense adhesions and frozen triangle of Calot,(8) cases recorded to have dense adhesions attempts to release the adhesions by cauterization and dissection failed to ensure clear anatomy Safe lysis of adhesions requires a combination of attention & skillful technique.

If the line of tissue adherence can be recognized ,it will provide the most expeditious path to follow , with the least chance of causing significant bleeding and visceral injury ,principles of traction are essential components of this of operation, and the surgeon may occasionally need to experiment with varying directions of pull on the tissues to clearly display the boundary lines(11).

A study carried out in Georgia(1999-2002)by the Georgia Baptist medical center, from the conversion rate which is about 2.3%, also dense adhesion was the main cause for conversion. Another study in Pakistan by Aga Khan Hospital in Karachi (20012003),conversion rate is 7.5% and also dense adhesion were the mai cause for conversion (56.3%)(12). In USA Texas a study carried out by Texas University and North Texas Health Centers (2003-2004),conversion rate 5% and they consider male sex,sever obesity and acute cholecystitis as a major risk factors for conversion(13).

Between (2001-2004) a study carried out in Brunei by the RIPAS Hospital to evaluate the efficacy of laparoscopic cholesystectomy as new procedure in their country, conversion rate 4% and adhesions from acute cholecystits were the main cause of conversion and they consider this result as a successful introduction of this procedure(14).

From comparing with these studies our results are similar to them as adhesions from previous surgeries and acute cholecysitits were the main cause of conversion in our study.

In a prospective study of 1,676 patients, Fried et. Al. found that age, male gender, acute cholecystitis, obesity, and thickened gall bladder wall were significant predictors for conversion from laparoscopic cholesystectomy to open cholecystectomy (15).

Our results are similar to his findings except age factor that our study shows it is not a risk factor . Per-operative bleeding was the second cause of conversion occur in 3 cases (25%) which is also associated with 3 risk factors:

1- past history of acute cholecystitis
2- greater thickness of the wall
3- upper abdominal surgery.

to avoid it should identify patient with high risk with understanding of laparoscopic anatomy. When the bleeding vessel is identified , a fine tipped grasper can be used to grasp it and apply either electrocautery or clip otherwise uncontrolled arterial bleeding from the cystic artery and its branches is a serious problem that may increase the risk of intra operative lesion to vital vascular and biliary structures We should remember that in addition to the cystic artery, gall bladder also receives small vessels from the visceral surface of the liver. When a bleeding site appears during detachment of gall bladder , the dissection should be carried a little further to adequately expose the bleeding point after that, direct application of the electrocautery. If there is no control of bleeding ,conversion to open cholecystectomy should be carried out(16).

In one study carried out in University of Mosul /College of Medicine / Al Jumhoory Hospital (2004-2005), conversion rate was 8.7% and in 2 cases from 9 cases which were converted the causes of conversion were one bleeding from cystic artery (in the patient had previous surgery) and another excessive oozing from gall bladder bed (in acutely inflamed gall bladder),converted to open because of uncontrolled bleeding this result also similar to our study result

U/S signs of inflammation: 2 Age >65. also it is similar to our result according to U/S finding but not for age factor, Ultrasonographic signs analysed in this study were:gall bladder wall thickness, oedematous wall, and gall bladder distension ,size and number of gall stone. Of these, gall bladder wall thickness was strongly associated with conversion(20).

Other variables were not consider as an important risk factors for

conversion in our study these include:

1 Age
2 Size and number of gall stones
3 Gall Bladder distension.

Older patients are probably at a greater risk of conversion due to complications of metabolic decompensation, although the result in our study showed the age as a not significant factor because of lower age incidence (4" decade) of patients subjected to laparoscopic cholesystectomy in our hospital.

This result is similar to study done in Sulaimaniyah teaching hospital by dr.Zanco Sherko fathalla from (2002-2005) and similar to study carried out by University of Mosul /College of Medicine / Al Jumhoory Hospital (2004-2005) (Dr.Sahir Mahir Al-azawi but differs from a study carried out by Proph.Dr. Momtaz Khedr Hana in Al-Kendy Hospital (2009)when depending elderly patients as high risk factor and give him high score in his scoring system for conversion from laparoscopic cholesystectomy to open cholecystectomy (20,21).

So in our study there are five risk factors:

1 Obesity
2 Patient gender
3 Past history of acute cholecystitis
4 Past history of upper abdominal surgery
5 Wall thickness >3 mm. Prediction of a difficult laparoscopic cholesystectomy which was converted to open cholecystectomy may be helpful, Patients with a high predicted risk of conversion could be operated on either by or under the supervision of a more experienced surgeon, Surgeons in the early phase of their training could operate on patients with low risk of conversion, especially if they are not operating under

predicted decision to encounter surgery and the superpervision of an experienced laparoscopic surgeon Aliso a high predicted risk of conversion may allow the surgeon to take an early decision to convert to open cholecystectomy when difficulty is encountered during dissection this may shorten the duration of surgery and decrease the associated morbidity(21)

CONCLUSIONS

patient factors, presentation, and preoperative ultrasonographic endings can all contribute to the prediction of conversion

Recognition of these factors is important for understanding the characteristics of patients at a higher risk of conversion since they require longer hospital stay and place more demands on the health care facilities

The knowledge of these risk factors might help in better psychological preparation of the patient for open surgery and for prolonged convalescence. It will also allow for better organization of the operating room schedule ultimately leading to reduction in procedure-related costs

Recommendations

1 Initiation of international criteria for patients with high risk of conversion and for selection of patients for open cholecystectomy primarily

2 Further evaluation of new risk factors responsible or contribute for conversion like history of previous ERCP intervention history of pancreatitis and elevated LFT

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