

FACTORS PREDICTING DIFFICULT LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Background

Laparoscopic cholecystectomy has become the standard operative procedure for cholelithiasis, but there are still some patients requiring conversion to open cholecystectomy, mainly because of technical difficulty.

Objectives

To identify the prediction of difficult laparoscopic cholecystectomy.

Materials and Methods

Preoperative clinical, laboratory, and radiologic parameters of 249 patients, who underwent laparoscopic cholecystectomy, were analyzed for their technical difficulty. Parameters (male sex, abdominal tenderness, previous upper abdominal operation, sonographically thickened gallbladder wall, age over 65 years, preoperative diagnosis of acute cholecystitis, history of ERCP) were found to have significant effect in multivariate analysis.

Results

Overall 54 operations (21.7%) were difficult; 36 operations (14.5%) took long time and 18 patients (7.2%) required conversion to open cholecystectomy.

Conclusions

Conversion risk can be predicted to some extent. Patients having high risk may be informed and scheduled appropriately. An experienced surgeon has to operate on these patients, and he or she has to make an early decision to convert in case of difficulty.

Keywords: *Cholelithiasis; Laparoscopic cholecystectomy, Risk factor.*

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INTRODUCTION

Gallstones (GS) are the most common biliary pathology. It is estimated that GS affect 10–15% of the population in western societies. They are asymptomatic in the majority of cases (>80%)⁽¹⁾. Patients with symptomatic GS need to be treated with cholecystectomy⁽²⁾.

Laparoscopic cholecystectomy (LC) has become the procedure of choice for management of symptomatic GS disease^(3, 4). Open cholecystectomy (OC) had been the gold standard treatment for the GS until the application of LC in France in 1987⁽⁵⁾.

Although LC is safe, effective and commonly performed operation, it has some difficulties in the different stages of the operation; difficult pneumoperitoneum, relaxation of adhesions, determination of anatomy, dissection of Calot's triangle and separation of the GB from liver and extraction of GB from abdominal cavity^(6, 7). Described some parameters in some studies predicting difficult operations like male gender, upper abdominal tenderness at the time of surgery, having previous upper abdominal surgery, age >60 years and diagnosis of acute cholecystitis⁽⁸⁾.

The aim of this study was to identify the prediction of difficult laparoscopic cholecystectomy.

PATIENT AND METHODS

This study included 249 patients with symptomatic GS, studied prospectively, during period from April, 13th, 2015 to April, 13th, 2016, at Sulaimani teaching hospital, Shar teaching hospital, Shorsh hospital and Barzi private hospital, in Sulaimani city. The study protocol was approved by the local ethical committee in Sulaimani Medical College.

Informed consent form was obtained from all participants included in the study. Demographic data (age, gender and residency), body mass index (BMI), liver function tests, comorbid diseases (diabetes mellitus (DM), coronary artery disease (CAD), chronic obstructive pulmonary disease (COPD), and cirrhosis), number and size of stones, previous cholecystitis, pancreatitis, endoscopic retrograde cholangiopancreatography (ERCP) and previous abdominal surgery were recorded before the operation.

We adopted the American technique of LC. Checking of GB was done, degree of dissection of adhesions around GB, dissection of Calot's triangle, separation of GB from liver and extraction of GB from abdomen;

fundus of GB grasped and, if GB is found to be tense, then the fundus was punctured and aspiration done, Calot's triangle was identified, the cystic duct and cystic artery dealt with and GB dissected. A number of operative modifications were necessary to successfully complete the procedure, these included aspiration of the GB, enlargement of the incision, copious irrigation of the peritoneal cavity, and the placement of subhepatic drains.

The epigastric port used to extract the GB. GB was checked and opened for detection the presence and number of GS. Duration of the operation and complications were recorded, which was estimated from the first skin incision until closing the port sites.

Statistical analysis

After data collection and prior to data entry and analysis, the questions of study were coded. Data entry performed via using an excel spreadsheet then the statistical analysis was performed by SPSS program, version 21 (IBM SPSS Statistical Package for the Social Sciences).

The data presented in tabular forms showing the frequency and relative frequency distribution of different variables of the study. The mean duration of the operation calculated in respect to each variable and then independent t-test and ANOVA test were used to compare the mean duration among these variables that thought to have an effect on the operation duration (excluding the converted cases). Then the operation was classified into difficult and non-difficult one based on long duration (when the duration were more than Mean plus 1 standard deviation) or when conversion occurred, Chi-square tests were used to compare the effect of different variables on making the operation a difficult or not, the chi-square test also used for other categorical data. Different types of Bar charts and Pie charts were used to describe the some variables of the study diagrammatically.

P values of 0.05 were used as a cut off point for significance of statistical tests.

RESULTS

We had 249 patients, with 196 (78.7%) females and 53 (21.3%) males. Mean time of the operations was (34.94±14.98min). Difficult operations found in 54 patients (21.7%); 18 cases (7.2%) converted to OC and 36 cases (14.5%) took long time.

Factors Predicting Difficult Laparoscopic Cholecystectomy

From 196 female patients 36 cases were difficult (18.35%), while from 53 male patients 18 cases (33.96%) were difficult, more difficult in males, with significant P-value of (0.02).

Age was ranging from 9 to 96 years; with mean of (44.5±15.9) years. The peak incidence was between 21-35 years (34.5%).

Those bellow 65 years old were 221 patients (88.75%), the mean time of operation was (34.42±14.90 min) and 15 of them (6.78%) converted, and those above 65 years old were 28 cases (11.24%), the mean time was (38.80±14.79 min) and 3 of them (10.71%) converted. From those bellow 65 years: 43 from 221 were difficult

(19.45%) and those of above 65 years: 10 from 28 were difficult (35.71%), with P-value (0.051).

From 249 patients; 50 patients (20%) were with normal BMI, mean time was (33.57±13.94 min) and 2 of them (4%) converted, 132 patients (53%) were overweight, mean time was (36.45±15.59 min) and 11 of them (8.3%) converted, 56 patients (22.5%) were obese, mean time was (33.51±15.0 min) and 3 of them (5.35%) converted, and 11 patients (4.4%) with morbid obesity, mean time was (32.89±12.15 min) and 2 of them (18.18%) converted; P-value was of (0.95). Conversion in morbid obesity was high (18.18%). (Table 1).

Table 1. Distribution of patient demographics and predictive factors affecting difficulty of LC.

Patient characteristics		Difficult operation*		P value ⁽¹⁾
		Yes	No	
Gender	Male	18	35	0.02
	Female	36	160	
Body built (BMI)	Normal	11	39	0.95
	Overweight	29	103	
	Obese	11	45	
	Morbid Obesity	3	8	
Age	< 65 Years	43	178	0.051
	≥ 65 Years	10	18	

* Difficult operation when the time is more than Mean + 1SD or there is conversion.

⁽¹⁾ Performed by chi-square test.

Preoperative investigations

ERCP: Twenty nine (11.6%) cases underwent ERCP; of these cases 23 (79.3%) cases had mean time of (38.09±14.54 min) and 6 (20.68%) of them were converted. Nineteen of 29 (65.5%) had difficult operation, with significant P-value (0.001), Figure 1.

GB size by US: Normal size GB found in 159 cases (63.85%) mean time was (33.67±15.08 min) and 7 of

them (4.4%) converted, contracted GB found in 35 cases (14.1%), mean time was (36.97±13.50 min) and 6 of them (17.14%) converted, distended GB found in 55 cases (22.1%), mean time was (37.80±15.38 min) and 5 of them (9%) converted, with significant P-value (0.03), Figure 2.

Other preoperative US findings didn't interfere significantly with difficulty of the operation, Table 2:

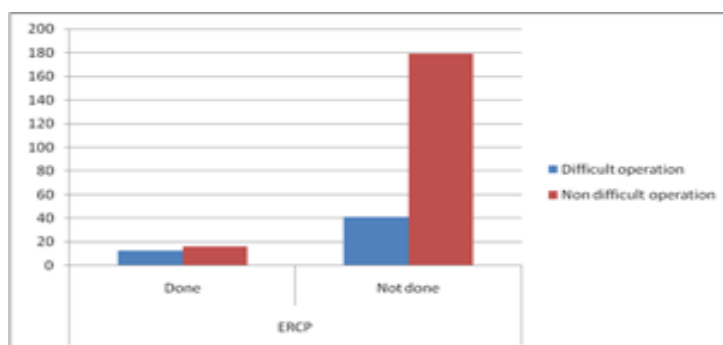


Figure 1. Difficult operation in respect to Preoperative ERCP.

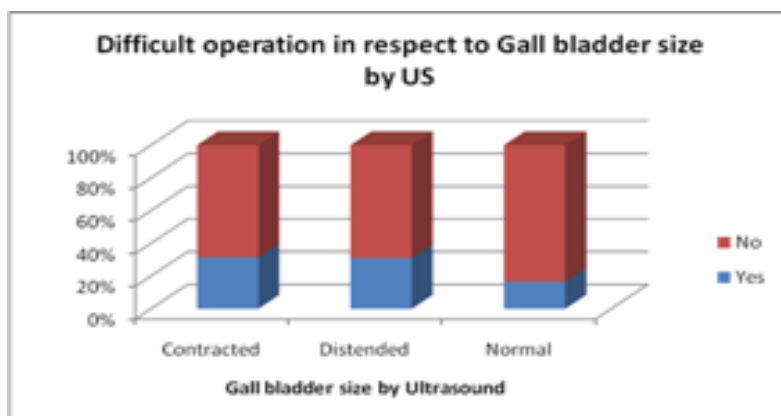


Figure 2. Difficult operation in respect to GB size by ultrasound.

Table 2. Distribution of preoperative factors affecting difficulty of laparoscopic cholecystectomy.

Variable	Difficult operation*		P value (1)	
	Yes	No		
GB size by U/S	Contracted	11	24	0.03
	Distended	17	38	
	Normal	26	133	
Presence of GS	Yes	51	188	0.53
	No	3	7	
Number of the stones	Single	13	46	0.91
	Multiple	38	152	
Size of the stones	Small	29	122	0.87
	Large	20	78	
Wall thickness	Normal	48	173	0.97
	Abnormal	6	22	
Biliary dilatation	Yes	4	17	0.64
	No	49	179	
CBD Stone	Yes	6	11	0.15
	No	45	187	
ERCP	Yes	13	16	0.001
	No	41	179	

Factors Predicting Difficult Laparoscopic Cholecystectomy

The intraoperative results were as follow:

Visualization of GB (at the first entrance of the scope of the laparoscope): GB was visualized in 211 cases (84.73%) and mean time was (34.04±13.63 min) and 9 of them (4.26%) were converted, while in 38 cases (15.26%) GB was not visualized, mean time was (41.83±21.40 min) and 9 of them (23.68%) were converted, with P-value of (0.01). Thirty four cases from 211 were difficult (16.11%) and 20 from 38 non visualized GB (52.63%) were difficult, with significant P-value of (<0.001).

Adhesions (the degree of pericolic and right upper quadrant adhesions, especially in patients who have had previous upper abdominal surgery and the presence of complicated cholecystitis) found in 131 (52.6%) cases, mean time was (39.76±15.91 min) and 16 (12.21%) were converted, with significant P-value (<0.001). From those 131 patients 45 of them (34.35%) had difficult operation (P-value <0.001) Figure 3.

GB size: There were 157 cases (63%) had normal GB size, mean time was (31.28±14.24 min) and 8 of them (5%) converted, and 19 of them were difficult (12.1%).

Seventy four cases (29.7%) were distended, mean time was (40.74±14.28 min) and 6 of them (8.1%) were converted, and 26 of them (35.13%) were difficult. Eighteen cases (7.2%) were contracted, mean time was (45.86±13.02 min) and 4 of them (22.22%) were converted, and 9 of them (50%) were difficult, with significant P-value of (<0.001).

Wall thickness: Normal wall thickness of GB was found in 175 patients (70.28%) and mean time was (32.87±14.54 min), and 5 of them (2.85%) converted. Thick wall GB found in 74 patients (29.71%), mean time was (41.13±14.78 min), and 13 of them (17.54%) were converted, with significant P-value of (<0.001).

Anomaly (vascular and bile duct anomalies): found in 11 cases (4.41%); mean time of 9 of them was (35.22±15.33 min), and 2 of them (18.18%) converted. So 5 of 11 cases (45.45%) had difficult operation, with significant P-value of (0.03) Figure 4.

Other intraoperative findings (**Overhanging of liver edge and Liver cirrhosis**) didn't interfere significantly with difficulty of the operation (Table 3):

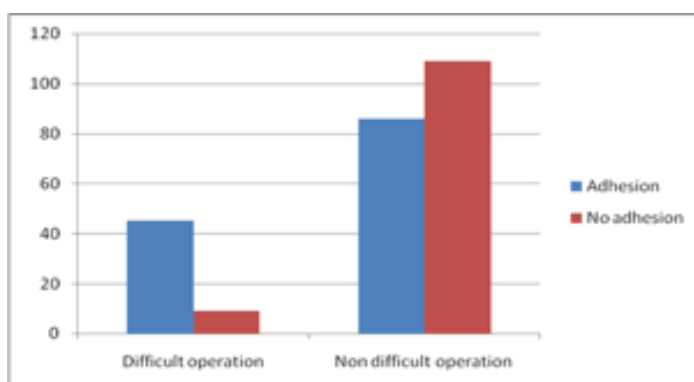


Figure 3. Difficult operation in respect to adhesion.

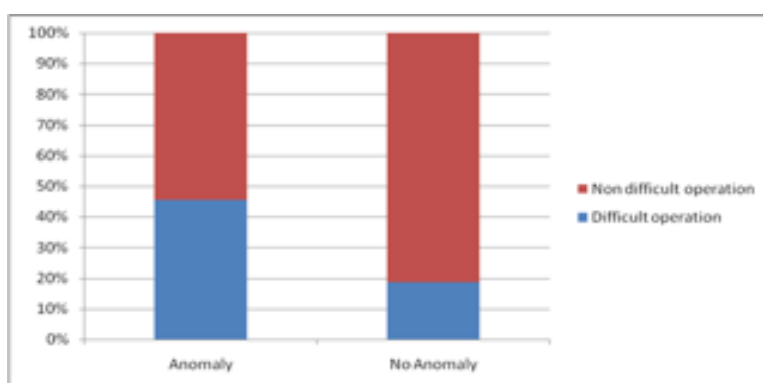


Figure 4. Difficult operation in respect to vascular and bile duct anomalies .

Table 3. Distribution of intraoperative factors affecting difficulty of laparoscopic cholecystectomy.

Variable Operative finding	Difficult operation		P value
	Yes	No	
Adhesion	Yes	45	< 0.001
	No	86	
GB is visualize	Yes	9	< 0.001
	No	109	
Overhanging of liver edge	Yes	34	0.30
	No	177	
Liver cirrhosis	Yes	10	0.17
	No	25	
Gall Bladder size	Normal	43	< 0.001
	Distended	171	
	Contracted	2	
Wall thickness	Normal	2	< 0.001
	Thick	193	
Anomaly	Yes	19	0.03
	No	48	

DISCUSSION

Cholecystectomy is one of the more unpredictable operations in general surgery, due to variable operative finding. Publications reported outcomes including conversion to open surgery^(9, 10).

The etiology underlying variable outcome from LC is complex in origin, relating to disease severity, surgical experience and available instrumentation. LC is now the gold standard replacing OC.

Lal⁽¹¹⁾ and colleagues suggest that a difficult cholecystectomy is one taking longer than 90 min, but in our study we defined difficult cholecystectomy when the time is more than (mean +1 SD), which was about 50 min (34.94±14.98 min), while in a study of Jaskiran and colleagues⁽¹²⁾ it was (60-90 min); we estimate the time between the first skin incision and the last port site suturing.

Many factors are given as difficult predictors; age above 65 years was not clear prediction of difficulty in our study (P-value: 0.051) may be due to wide variability in ages; we had a patient aged 96 years, but in Kama and colleagues⁽¹³⁾ age above 60 was difficult and conversion was higher with increasing age in Kanaan and colleagues⁽¹⁴⁾. In our study although the operation took longer time in those of above 65 years, but the conversion rate was low (3.57%) with comparison of (7.69%) of those bellow 65 years.

Male sex makes the surgery difficult⁽¹⁵⁾. Conversion rate and significantly higher mortality rate reported in male sex⁽¹⁶⁾. In our study male patients were have more mean time, with significant (P-value: 0.02).

Rosen et al⁽¹⁷⁾ found that acute cholecystitis (AC) in obese is the most important factor for conversion, but in our finding; we found that BMI factor is not significant (P-value: 0.91).

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Thick wall GB is one of the predictor of conversion of 4.3 %⁽¹⁸⁾ and 5.6% in Fried GM and colleagues⁽¹⁹⁾, in our study it was also significant (17.54%), with (P-value <0.001).

Upper abdominal surgery is reported to have high rate of conversion (37.5%)⁽¹⁸⁾, and attributed to dense adhesions⁽²⁰⁾. With increasing experience on adhesiolysis and advanced laparoscopic surgeon, conversion is less often seen⁽²¹⁾. In our study 52.6% of the cases had adhesions of previous surgery and adhesions of inflammation, with high mean time (39.76±15.91 min) and (12.21%) were converted.

Jaskiran. and colleagues found conversion rate was (1.31%) and all were due to anomalous ducts, which were not detected on US⁽¹²⁾, but in our study there were 11 cases of 249 (4.41%), 5 of them were difficult by time mean of (35.22±15.33 min), and (18.18%) conversion (P-value: 0.03).

Pre-operative ERCP is a factor responsible for a difficult Calot's triangle dissection⁽⁶⁾. There are certain structural changes that develop after ERCP which obscure the anatomy and make handling difficult⁽²²⁾ and they found conversion rate of 14% in their study. In our study the conversion rate of those had ERCP was (20.68%) and (65.5%) had difficult operation, with significant P-value (0.001).

In conclusion, conversion risk can be predicted to some extent by collecting factors; like gender, age, history of previous abdominal surgery, previous attack of cholecystitis and ERCP, and wall thickness by US. Patient having high risk may be informed and scheduled appropriately. An experienced surgeon has to operate on these patients; he or she has to make an early decision to convert in case of difficulty.

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