Difficult Laparoscopic Cholecystectomy Prediction by the Use of Clinical Parameters

Haider Abdul Hussein Ahmed *, Haider Jalil Raheef **

ABSTRACT:

BACKGROUND:

Laparoscopic cholecystectomy has now replaced open cholecystectomy for the treatment of gallbladder pathologies (stones, polyps) , However, Laparoscopic cholecystectomy may be considered 'difficult' by various problems encountered during surgery, such as difficulties in accessing the peritoneal cavity, creating a pneumoperitoneum, dissecting the calot's triangle, extracting the gall bladder from the liver bed, or the excised gall bladder removal from the port.

OBJECTIVE:

This study was cond ucted to identify and evaluate whether preoperative clinical parameters in patient undergoing laparoscopic cholecystectomy for cholelithiasis can predict the levels of intra-operative difficulties.

PATIENTS AND METHODS:

100 patients who underwent laparoscopic cholecystectomy. All the patients were with symptomatic gallstone disease. Detailed clinical history, examination and Investigations were taken. Prospective analyses of different preoperative (patient-related) clinical parameters contributing to difficult laparoscopic cholecystectomy were performed. The study was performed in Al-Imamain Al-Kadhimain Medical City between October 2015 to October 2016.

RESULTS:

OF 100 patients with laparoscopic cholecystectomy, 33 patients (33%) developed difficulties during operation. Factors associating difficult laparoscopic cholecystectomy included; male gender, wall thickness more than 4 mm, previous upper abdominal surgery and BMI more than 35 and the most common (specific) type of intraoperative difficulties was bile leak due to gall bladder perforation and liver bed affecting 10 patients out of the 33 difficult cases (10%) from the total cases and the least difficulty was conversion to open cholecystectomy occurred in 2 patients (2%).

CONCLUSION:

The prediction of difficult laparoscopic cholecystectomy by the use of clinical parameters showed that male gender, wall thickness above 4mm, and history of previous upper abdominal surgery are statistically significant predictive factors.

Knowledge of these predictive factors preoperatively may help in improving patient safety with involvement of experienced laparoscopic surgeon who could better anticipate intraoperative risk & technical difficulty encountered while operating on these patients.

KEYWORDS: prediction, difficult laparoscopic cholecystectomy, clinical parameters

INTRODUCTION:

Laparoscopic cholecystectomy (LC) has become the procedure of choice for management of symptomatic gall stone disease [(1)], it has significantly replaced open cholecystectomy in the management of cholecystolithiasis [(2)]. It decreases post operative pain, ileus, allows earlier oral intake,better mobility, shorten hospitalization and improves cosmetic results[(3)].

Conversion to open cholecystectomy is neither a failure nor a complication but it's an attempt to avoid complication. It was stated that in acute cholecystitis (1st 72 hours) early laparoscopic cholecystectomy seems to be safe with shorter hospital stay than delaying the surgery until symptom settle[(4)]. Most of previous contraindication to laparoscopic cholecystectomy, such as morbid obesity, previous upper abdominal surgery and acute cholecystitis, are no longer absolute contraindication and can be handled by skillful hands[(5)].

*Iraqi Board for Medical Specializations

**Al-Imamain Al-Kadhimain Medical City

In spite of increasing expertise and advances in technology Conversion rate in laparoscopic cholecystectomy is still 1.5-19%. Our aim was to look for various factors and to make a predictive index which can predict the chances of conversion[6].. if the anatomy of calot's triangle is not clear or bleeding occurs to avoid further complications mainly CBD and common bile ducts injuries.

With the growing experience, a selection criterion has become more liberal. The levels of difficulties during laparoscopic cholecystectomy and conversion to open cholecystectomy can be predicted based on certain preoperative clinical parameters[7]. It is evident from the literature that clinical, laboratory and radiological parameters have been studied to predict difficult laparoscopic cholecystectomy.

Identifying these patients at risk for conversion remains difficult. This study identifies risk factors that may predict conversion from a laparoscopic to an open procedure [8]

PATIENTS AND METHODS:

A. Selection of patients:

The study was conducted prospectively in the surgical word at Al-Imamain Al-Kadhimain Medical City during the period from OCT. 2015 to OCT. 2016. The study sample consisted of 100 patients, all patients were admitted to the surgical ward and underwent elective laparoscopic cholecystectomy for their known cholelithiasis by a trained laparoscopic surgeon or general surgeons who had done more than 50 laparoscopic cholecystectomies.

The diagnosis of acute cholecystitis was based on patient's history ,clinical examination of acute pain and tenderness in the right upper abdomen (Merphy sign +ve), fever and sonographic finding of acute calculous cholecystitis

We excluded:

1. Laparoscopic cholecystectomies with other intervention at the same setting such as CBD exploration (not done at the same session by laparoscopy)
2. Patients with anesthetic complications.
3. Patients with jaundice, fever and pancreatitis

RESULTS:

100 patients admitted to surgical ward at Al-Imamain Al-Kadhimain Medical City for elective laparoscopic cholecystectomy after taking history, examination and investigation for cholelithiasis during the period between oct.2015 and oct.2016 were included in this study with their age ranging from (18-72) years. The most vulnerable age group affected by gall stone and underwent laparoscopic cholecystectomy. is between (30y-49y) comprising 45 patients (45%) followed by (10-29y) 29 patients (29%), while the older age group more than 70y comprising 2 patients (2%)

Preoperative clinical predictive factors:

1. Gall bladder wall thickness :

Out of the 100 cases included in the study 8 cases were difficult were having a wall thickness of more than 4mm as shown in Table (1):

Table 1: frequency of difficulties regarding gall bladder wall thickness

Wall thickness	No	%
<4 mm	92	92 %
>4 mm	8	8 %
Total	100	100%

2. Gender :

Among 100 patients admitted for laparoscopic cholecystectomy, male were 24 (24%) while female were 76 patients (76%) Female to male ratio = 3:1

3. Body mass index (BMI):

It was observed that 66 patients (66%) their BMI were between 25.1-30 followed by those with BMI between 30.1-35 (14 patients) (14 %). while only 1 patient(1%) their BMI less than 18 and no one included in this study had BMI more than 40. as shown in Table (2) :

Table (2): classification of patients according to BMI

BMI	No	%
< 18.5	2	2%
18.6- 25	12	12%
25.1-30	61	61 %
30.1- 35	22	22%
35.1- 40	3	3%
>40	Zero	Zero

4. Previous upper abdominal surgery:

7 patients (7%) were subjected to previous upper abdominal surgery (4 para umbilical hernias, 2 epigastric hernias & one hydatid cyst surgery) while 93 patients (93%) had no previous abdominal surgery

5. Previous attack of cholecystitis:

.It was noted that 35 patients (35 %) had previous attack of acute cholecystitis with admission to the hospital for treatment in 2 months to one year duration, while 65 patients (65%) had history of previous dyspeptic symptoms with no previous admission for acute cholecystitis

Frequency of occurrence of pre and intra operative difficulties :

I .Frequency of occurrence of difficulties:

It was seen that 33 patient (33%) had one or more difficulties during their operations, while 67 patients (67%) had no difficulties and their operations passed smoothly.

II .Frequency of occurrence of each type of difficulty:

Among 33 patients who had difficulties during their operation, some of them developed two or three factors of difficulties while others developed just one difficulty factor. In this study the most frequent (over all) type of difficulty encountered was prolongation of time of operation (>60 min) as a result to adhesions and dissection followed by bleeding and bile leak associating perforation and spillage of caliculi of the gall bladder & from the liver bed. The least frequent type of difficulty in patients studied was the decision of conversion of laparoscopic cholecystectomy to open cholecystectomy which was seen in 2 patients (3.22%). As shown in table (3)

Table 3: Frequency of occurrence of each type of difficulty:

Types of difficulties	NO.	%
Difficult access	7	12.9%
Prolonged time of operation	18	29.3%
Bleeding from dissection 9 16.1	16	12%
Bile leak (perforation)	10	12.9
Adhesion and difficult dissection	16	25.8%
Conversion to open	2	3.22%
Total	62	

III .Frequency of occurrence of difficulties regarding preoperative clinical predictive factors.

1-Wall thickness:

Wall thickness has been used as a radiological predictive value in assessing the difficulty of the operations represented by adhesions, grasping and perforations.

Out of the 100 total cases 92 were normal wall thickness **below 4 mm** and 8 cases were above 4 mm wall thickness .**6 cases from 8 cases were difficult intra operatively**.

2. Gender:

We found that 17 male out of 24 (70%) included in this study developed difficulties during operation while 23 female out of 76 (30%) developed difficulties during their operation.

3. Body Mass Index (BMI):-

in this study we observed that 2 out of 3 of patients who had body mass index between (35-40) developed difficulties during operation (mainly with 1st port placement due to obesity) followed by fatty heavy liver and calot's triangle fat , while from the largest group of patients with BMI between (25.1-30) constituting 61 patient 22 of them developed difficulties during operation. As shown in table (4).

Table (4): frequency of difficulties regarding BMI.

BMI	NO.	Difficulties	p-value	Significance
< 18.5	2	ZERO	0.3	Not significant
18.6-25	12	2	0.2	Not significant
25.1-30	61	22	0.6	Not significant
30.1-35	22	7	0,9	Not significant
35.1-40	3	2	0.2	Not significant
Total	**100**	**33**		

4. Previous upper abdominal surgery:-

7 patients had previous upper abdominal surgeries (4 para umbilical hernias, 2 epigastric hernias & one hydatid cyst surgery) and the main difficulty was the omental adhesions and dissections.

From the 7 patients in this study (7%) , (5) patients with previous abdominal surgery developed difficulties during operation while 93 of patients (93%) with no history of previous surgery developed 28 difficulties during operation.

Table (5): Frequency of occurrence of difficulties regarding presence or absence of history of previous upper abdominal surgery.

Previous abdominal surgery	NO.	Difficulties	p-value	Significance
YES	7	5	0.040	Significant
NO	93	28		
Total	**100**	**33**		

5. Previous attacks of acute cholecystitis:

(10) patients out of 35 patients with history of previous attack of cholecystitis (in a duration varying from 2 months to one year) developed difficulties during operation ,the difficulty was caused by the repeated attacks of chronicity causing adhesions and thickened wall of GB (mainly in males) while out of 65 patients with no history of previous attack of cholecystitis only 23 patients developed difficulties during operation.

Table (6): Frequency of occurrence of difficulties regarding presence or absence of history of previous attack of cholecystits.

Previous attack of cholecystitis	NO.	Difficulties	p-value	Significance
YES	35	10	0.620	Not Significant
NO	65	23		
Total	**100**	**33**		

DISCUSSION:

Laparoscopic cholecystectomy (LC) is the treatment of choice for symptomatic cholelithiasis, but sometimes conversion to open cholecystectomy (OC) is necessary[3]. The difficulty of LC or the risk of conversion to OC can be predicted by assessing some preoperative variables. Several studies have evaluated the risk factors for difficult laparoscopic Cholecystectomy and hence conversion to open cholecystectomy. In the present study, it was observed that majority of the patients under went laparoscopic cholecystectomy with gall bladder wall thickness >4 mm had a statistically **significant** increase in the difficulty rate intraoperatively and this finding is consistent with a similar findings of other studies like Nidoni et al. 2015[9], Saber et al 2015[10], Agrawal et al 2016 [11] and Sandhu and Rana 2016[12] which all stated that the increment in wall thickness above 4mm is associated with increased intra-operative difficulty.

On the other hand, in the current study, we observed that male gender was statistically **significant** pre op factor regarding the occurrence of difficulties during laparoscopic cholecystectomy these findings of male sex being identified as a significant risk factor for difficult laparoscopic cholecystectomy are consistent with similar findings of many studies like Kamal I. A et al [13] who found that male patient have longer operation time (>60 min) and higher conversion rate than female. Moreover, Theodoros E. et al [14]. And Simon E. et al[15] found that male gender significantly increase rate of conversion, mainly because men were more frequently had acute cholecystitis[15], while Yol S. et al[16] considered males more liable for difficulties because male had more pericholecystic fibrosis because macrophage were twice as numerous as in female sample while mast cell 4 time more numerous, eosinophils 6 time numerous in male than female and tissue collagen levels both in the sub mucosal area of gall bladder wall and in peri cholecystic tissue were significantly higher in men than women. Initially, laparoscopic Cholecystectomy was relatively contraindicated in obese patients mainly because of technical difficulties such as difficult access to thick abdominal wall creation of pneumoperitoneum, cannula displacement, fat-laden omentum or falciform ligamentand a heavy fatty liver difficult to retract. In this study it was observed that the largest group of patients under went laparoscopic cholecystectomy had ,BMI between (25.1- 30) 61 patients (61%) and difficulties increase with increase in BMI especially when BMI more than 35 but not to a statistically significant level, this is in contrary with M. Hussein et al[17] who considered obesity a significant risk factor for difficulty in addition the increased fat in calot's triangle which make dissection more difficult in obese patients. while Tionq L and Oh J[18] study showed that showed that LC can be performed safely in the morbid/super obese patients and should be the procedure of choice for those patients avoiding Complication of prolonged bed rest and wound complications, so common in these patients.as shown in table (4).

It was stated that previous upper abdominal surgeries (PUH ,Hydatid cyst and epigastric hernias) are not a contraindication to laparoscopic cholecystectomy[15]. Although, these patients may have failure of laparoscopic cholecystectomy procedure if adhesion present as it poses a problem in creating pneumoperitoneum and the need for adhesiolysis [19] Depending on the results in this study; we found that previous upper abdominal surgery was **statistically significant** in the occurrence of difficulties. These findings were in agreement with Akyurek N. et al[19] who considered previous abdominal surgery is associated with prolonged operation time but not contraindication for laparoscopic cholecystectomy. Also our study in agreement with A.J. Kavayinnakis et al[20] who found that previous upper abdominal surgery associated with increase need for adhesiolysis, a higher open conversion rate, a prolonged operation time ,an increase incidence of post operative wound infection and a longer post operative stay, but also he consider previous abdominal surgery not contraindication for laparoscopic cholecystectomy.

While the results of Ya Sc. Et al(21) contradict with our study where they found that laparoscopic cholecystectomy can be performed safely in patient with previous upper abdominal surgery if meticulous surgery done This factor of adhesion beside being assessed clinically preoperatively in this study, it can be further evaluated if preoperative sonographic mapping done as shown in table (5) .

One of the most important and independent predictor of difficult laparoscopic cholecystectomy is the presence of previous attack of acute cholecystitis(12). In this study, we noted that previous attack (within one year) of cholecystitis had **not statistically significant** increase the rate of occurrence of difficulties of laparoscopic cholecystectomy with its P-value & this result was in agreement with Kamal I.A *et al*(13). who demonstrated the safety and feasibility of laparoscopic cholecystectomy in both acute and chronic cholecystitis despite the greater rate of conversion in acute cholecystitis than in chronic cholecystitis as shown in table (6) .

CONCLUSIONS:

In this study, evaluation of preoperative clinical factors contributing to a possibility of encountering intraoperative difficulty during laparoscopy for cholelithiasis showed that **male gender, wall thickness above 4mm, and history of previous upper abdominal surgery are statistically significant**, while **the BMI and previous attacks of acute cholecystitis are statistically Not significant** Furthermore, the results of current study demonstrated that the most frequent types of intraoperative difficulties were prolong of time (>60 min), spillage of bile, stones and bleeding and the least is conversion to open cholecystectomy .

REFERENCES:

1. Randhawa J.,Pujahari A.,Preoperative prediction of diffi cult lap chole: a scoring method , Indian J Surg 2009;71:198–201
2. Takegami K. , Sata N. , Kawaguchi Y. , etal :A New Preoperative Garding System for Predicting the Operative Condition for Abdominal Wall-Lifting Laparoscopic Cholecystectomy. Surgery Today 2002;32:129-133.
3. Nurullah Bulbuller , Yavus Selim Ilhan, Ahmet Baktir , etal : Implementation of a Scoring System for Assessing Difficult Cholecystectomies in a Single Center. Surgery Today 2006;36:37-40.
4. Bilal O.,MMehmet T., Ersin G ,Etal : early versus delayed laparoscopic cholecystectomy for acute cholecystitis 2014 ; 99(1): 56–61
5. Sharma SK., Thapa PB., Pandeg A. etal : Predicting Difficulties During Laparoscopic Cholecystectomy by Preoperative Ultrasound. Kathmandu University Medical Journal 2007; 5(17):8-11.
6. Kumar S, . Tiwary S, Agrawal N, etal: Predictive Factors for Difficult Surgery in Laparoscopic Cholecystectomy for Chronic Cholecystitis . The Internet Journalof Surgery 2007;16(2):17-60.
7. Lipman JM. , Claridge JA. , Haridas M. etal : Preoperative Finding Predict Conversion From Laparoscopic to Open Cholecystectomy. Sixty Fourth annual meeting of the Central Surgical Association, Chicago , Illinois 2007 Oct;142(4):556-63.
8. Rosen M., Brody F. and Ponsky J ,Predictive factors for conversion of laparoscopic cholecystectomy 2002 ;184(3):254-258
9. Nidoni R. , Udaghan TV. , Sasnur P. , Baloorkar R. ,Sindgikar V., Narasangi B. . Predicting Difficult Laparoscopic Cholecystectomy based on Clinicoradiological Assessement.J of clinical and Diagnostic research 2015; 9(12):9-12.

10. Saber A., Abu-Elela ST., Shaalan KM., Al-Masry AR..Preoperative Prediction of the Difficulty of Laparoscopic Cholecystectomy. J Surg Surgical Res 2015;1(1): 1-4.
11. Agrawal D. , Arora D. , Avasthi A. , Kothari A. , Dangayach KK . Study of 292 patients for Prediction of difficult laparoscopic cholecystectomy using detailed history, clinical and radiological parameters.Int Surg J 2016; 3(1):393- 353.
12. Sandhu G. and Rana ML . . Prospective Prediction of Difficult Laparoscopic cholecystectomy: A Scoring Method . Indian J . Appl.Research2016;6(6):1-7.
13. Kamal I.A,Gharaibeh,Found A.,etal: laparoscopic cholecystectomy for gall stones:Acomparism of outcome between acute and chronic cholecystitis .annals of Saudi Medicine 2001;21(5,6):312-316.
14. Theodoros E. ,Georgios N., Konstantions B.,etal:risk factors influencing conversion of laparoscopic to open cholecystectomy .Journal of Laparoscopic and advanced surgical technique 2007;17(4):414-419.
15. Simon E., kirstine M. ,Linda B.,etal;sex differences in laparoscopic cholecystectomy .surgical endoscopy 2010;24(12):3068-3072.
16. Yol S. ,Vatanseev C. ,etal:sex as a factor in conversion from laparoscopic cholecystectomy to open surgery. JSLS.2006;10(3):359-363.
17. Hussein M. ,Appadurai I. ,Delicata R.,etal: laparoscopic cholecystectomyinthe grossly obese :4 years experience and review of literature. HPB(oxford)2002;4(4):157-161.
18. Tionq L and Oh J: Safety and efficacy of a laparoscopic cholecystectomy in the morbid and super obese patients. 2015 Jul;17(7):600-4.
19. Akyurak N.,Salman B.,Irkorucu o.,etal: laparoscopic cholecystectomy in patient with previous abdominal surgery .JSLS 2005;9(2):178-183.
20. Karayiannakis AJ., polychronidis A., perent S.,etal: laparoscopic cholecystectomy in patient with previous upper or lower in surgery .surgical endoscopy 2004; 18(10)97-101.
21. Yu Sc.,Chen Sc.,Wang Sm.,etal is previous abdominal surgery a contraindication laparoscopic cholecystectomy.J laparoscopic surgery 2009; 4(1): 31-35.