

Laparoscopic cholecystectomy for gallbladder stone disease: preoperative factors associated with difficult operations.

Fuad Hassan Bin-Gadeem

General Surgery Department, Faculty of Medicine and Health Science, University of Aden.

E mail: fuadbingadeem@hotmail.com

DOI: <https://doi.org/10.47372/uajnas.2021.n1.a15>

Abstract

Laparoscopic cholecystectomy become the treatment of choice for symptomatic gallstone disease. Difficult procedure may confront the surgeon, but these situations are often predictable based on a number of clinical and paraclinical factors. This study aimed to determine which clinical and paraclinical factors are associated with difficult laparoscopic cholecystectomy.

Total of 405 patients with symptomatic gallstone disease, who underwent laparoscopic cholecystectomy between 1st Marc 2018 and 29th February 2020, in 22 May Hospital, Aden, were included in the study. Patient with gallbladder cancer or acalculous cholecystitis were excluded from the study. Relevant data which include clinical and paraclinical findings as well as operative findings were collected to a specially designed questionnaire form. Data analysis was done by SPSS version 17 software. Univariate analysis for categorical variables was done using Chi square or Fischer's exact test. Continuous data were tested for normal distribution and analyzed using Mann Whitney test. P- value <0.05 was considered statistically significant.

Female preponderance (88.1%) was observed. Mean age was 42.6 ± 13.7 . Difficult laparoscopic cholecystectomy found in 137 patients (33.8%). A statistically significant association were found between difficult laparoscopic cholecystectomy and gender (p-value <0.001), history of obstructive jaundice (p-value <0.001), previous endoscopic retrograde cholangio-pancreaticography (p-value <0.001), previous abdominal surgery (p-value =0.005), white blood cell count (p-value= 0.001), gallbladder wall thickness ≥ 4 mm (p-value <0.001), impacted stone in cystic duct (p-value <0.001), pericholecystic fluid collection (p-value <0.001), dilated common bile duct more than 7 mm (p-value =0.001), contracted gallbladder despite adequate fasting (p-value <0.001).

Number of preoperative factors were identified, which have statistically significant association with difficult laparoscopic cholecystectomy. Knowledge of these factors by the surgeon before operation is imperative to make the necessary precautions before operation.

Key words: difficult laparoscopic cholecystectomy, open conversion, gallbladder, bile duct.

Introduction:

Laparoscopic cholecystectomy has become the treatment of choice for symptomatic cholelithiasis [17], because it has several physiological advantages over open cholecystectomy, such as less post operative pain, faster return of bowel function, shorter hospital stay. It can be carried out with reduced morbidity and mortality [1,2,6,7,8]. Indeed, it is considered to be the most common laparoscopic procedure in general surgery [12].

With increasing experience, surgeons have started to take more difficult cases which were considered contraindication for laparoscopic removal of gallbladder few years back. For example, morbid obesity and previous abdominal surgery which were absolute contraindications for laparoscopic cholecystectomy have no longer remained absolute contraindication. Attempt can be made in all cases of gallstone disease with laparoscopic procedure except for patients with bleeding diathesis or patient not fit for general anesthesia [17].

Conversion to open surgery usually indicates difficult procedure, rather than being considered as complication or failure [10]. The decision to convert should be regarded as sign of good judgment in the presence of adverse operative conditions [5, 24].

The reported conversion rate from laparoscopic to open cholecystectomy varies substantially between individual surgeons, with most series reporting rate ranging from 2 to 15% [17,19, 24]. It is associated with increased morbidity, prolonged hospitalization, and longer recovery. Converted cases associated with increased number of infectious and other post operative complications, increased additional procedure and high 30 days readmission rate [27].

Laparoscopic cholecystectomy is a common operation which may vary in operative difficulty. Factors leading to difficult cholecystectomy can be predicted [3,26]. Thus for a surgeon, it would be helpful to establish the factors that lead to difficult cholecystectomy preoperatively. The greater understanding of these factors and the potential post operative complications is an essential part of safe surgical practice [17].

Therefore, this study aimed to determine factors associated with difficult cholecystectomy in 22 May Hospital, Aden.

Method:

This is a hospital based observational study. Total of 405 patients with symptomatic gallstone disease who underwent laparoscopic cholecystectomy between period of 1st March 2018 and 29th February 2020, in 22 May Hospital, were included in the study. Patients with gallbladder cancer or acalculous cholecystitis were excluded from the study. Difficult laparoscopic cholecystectomy was defined as operative time longer than 60 minute, blood loss more than 300 ml, need for senior surgeon assistance, conversion to open or partial cholecystectomy, or injury to bile duct. Relevant data, which include clinical and paraclinical findings as well as operative findings were collected to a specially designed questionnaire by the author. Data analysis was done by SPSS vs 17 software. Univariate analysis for categorical variables was done using Chi square or Fischer's exact test, p-value <0.05 was considered statistically significant. Continuous data were tested for normal distribution and analyzed using Mann Whitney test, p- value <0.05 was considered statistically significant.

Results:

Total of 405 patients were included in the study. They were prepared for intent to undergo laparoscopic cholecystectomy. Composed of 357 female (88.1%) and 48 males (11.9%). The mean age was 42.6 with standard deviation of 13.7, which ranged from 12 to 80 years. 75% of patients were below age of 50 and the frequency of age distribution showed positive skewness. The study population was originated from different governorates as illustrated in table 1.

Table 1: Socio-demographic characteristic of study population:

Variables	No.	%
Gender		
Male	357	88.1
Female	48	11.9
Age		
Mean age ± SD	42.6 ± 13.7	
Range	12-80	
Skewness	0.42	
Kurtosis	-0.355	
Origin		
Aden	144	35.6

Lahej	102	25.2
Taiz	44	10.9
Abjan	42	10.4
Dhala	28	6.9
Hudeida	25	6.2
Other	20	4.9
Total	405	100.0

137 patients (33.7%) fulfilled the criteria of difficult laparoscopic cholecystectomy, among them 26 patients (6.4%) had conversion of laparoscopic cholecystectomy to open cholecystectomy due to difficulties faced during the operation.

The study investigated 18 preoperative factors. They composed of clinical and paraclinical variables. Type of the variables were: 15 categorical variables and 3 continuous variables. The possible of association of these variables with difficult laparoscopic cholecystectomy were analyzed individually. The results of the univariate analysis shown in table 2.

Table 2: Univariate analysis of preoperative variables in relation to difficult laparoscopic cholecystectomy:

Variables (Factors)	Categories	Easy Lapchole	Difficult	p-value
1. Gender*	Male	21	27	<0.001
	Female	227	110	
2. Symptom duration*	<2 week	29	15	0.742
	2-4 week	23	16	
	1-3 months	62	25	
	4-12 months	52	32	
	1-3 years	60	29	
3. Diabetes mellitus*	No	248	124	0.565
	Yes	20	13	
4. Arterial hypertension*	No	255	127	0.365
	Yes	13	10	
5. ERCP*	No	266	10	<0.001
	Yes	2	15	
6. History of obstructive jaundice*	No	262	106	<0.001
	Yes	6	31	
7. Previous abdominal operation*	No	255	119	0.005
	Yes	13	18	
8. Number of stones*	Single	75	39	0.174
	Double	29	9	
	Triple	30	9	
	Quadruple or more	134	80	
9. Gallbladder wall thickness*	< 4mm	231	27	<0.001
	≥4 mm	37	110	
10. Impacted stone in cystic duct*	No	252	68	<0.001

	Yes	16	69	
11.Pericholecystic fluid collection*	No	266	111	<0.001
	Yes	1	26	
12.Dilated common bile duct > 7mm*	No	258	119	0.001
	Yes	10	18	
13. Contracted gallbladder*	No	259	109	<0.001
	Yes	9	28	
14. Sickle cell anemia*	No	263	132	0.316
	Yes	5	5	
15. Fatty liver/ cirrhosis*	No	248	122	0.369
	Fatty liver	18	12	
	Cirrhosis	2	3	
16. Age**				0.081
17. WBC total count**				0.001
18. Stone size (largest stone) in mm**				0.034

WBC: white blood cell;

ERCP: endoscopic retrograde cholangio-pancreatography;

* : Categorical variable; ** : Continuous variable

10 factors out of 18 were found to have statistically significant association with difficult laparoscopic cholecystectomy namely, gender (p-value <0.001), history of obstructive jaundice (p-value<0.001), previous endoscopic retrograde cholangio-pancreaticography (p-value <0.001), previous abdominal surgery (p-value =0.005), white blood cell count (p-value= 0.001), gallbladder wall thickness \geq 4mm (p-value <0.001), impacted stone in cystic duct (p-value <0.001), pericholecystic fluid collection, dilated common bile duct more than 7 mm (p-value= 0.001), contracted gallbladder despite adequate fasting (p-value <0.001). The last five of the above mentioned variables are abdominal ultrasound findings.

Discussion:

Laparoscopic cholecystectomy become the modality of choice for the treatment of symptomatic gallbladder disease [12,16, 27]. Although difficulty during the surgery may astonish the surgeon, most of the difficult situations can be predicted preoperatively by a number of warning clinical and paraclinical findings [3,22, 24,29].

In this study, difficult laparoscopic cholecystectomy confronted the surgical team in 137 patients (33.8%), which is similar to what were reported by Atta H et al (32%) [7], Mudgal M (34%) [15], as well as Singh K et al (34%)[22], and located between the two extreme ratios which were mentioned by Nidoni R et al (24.4%) [17],and Verma D et al (46%)[29].

The study showed conversion rate of 6.4%, which compares well with the incidence reported in the literature, which varies from 2- 15% [6,17,21,22,23].

In many published studies, age is recognized as a risk factor for difficult laparoscopic cholecystectomy [2,6]. However, this study did not revealed statistically significant association

between age and difficult laparoscopic cholecystectomy. This is in consistency with the study by Jethwani U et al [11] and Sudhir M and Pruthvi R [25]. In their studies, age had no significant impact on prediction of difficult laparoscopic cholecystectomy.

In the current study found female preponderance (88.1%), a finding which is in consistence with several study reports [2,6,12,15,21,22,23,27,28]. High incidence of gallstones in females has been suggested due to the effect of estrogen and progesterone on biliary cholesterol level and gallbladder motility [2,6]. Interestingly, in the current study, male gender was identified as a risk factor for difficult laparoscopic cholecystectomy on univariate. Similarly, several reports in the literature have identified male gender as risk factor for difficult laparoscopic cholecystectomy[17,29]. In context of symptomatic gallbladder stones, inflammation and fibrosis are more extensive in men than women [31]. These findings help explain why the rate of conversion to open surgery is higher in male then female. By Vivek M et al, male sex was associated with difficulty in adhesiolysis and Callot's triangle dissection [30].

In the study, no statistical relation found between duration of symptoms and laparoscopic cholecystectomy. Some literature suggest that duration of symptoms is acceptable factor for prediction of difficult laparoscopic cholecystectomy [9]. An episode of biliary pain within 15 days prior to surgery was associated with longer operating time, but it did not affect the reported preoperative difficulty or the rate of conversion [13].

The present study did not identify diabetes mellitus (DM) as an independent risk factor for difficult laparoscopic cholecystectomy. Kulkarni S. and Kumar S. noticed that concomitant association of diabetes mellitus failed to show significant correlation with surgeon's difficulty or conversion rate [13]. Similarly, a meta-analytic study by Rothman J et al found no association between DM and difficult laparoscopic cholecystectomy [20].

Previous abdominal surgery is a clinical parameter, which was found to have statistical association with difficult laparoscopic cholecystectomy. Consistently, Abdulhamid M et al found significant association with it and open conversion [2]. Mudgal M et al regarded previous abdominal surgery as significant predictive factor for difficult laparoscopic cholecystectomy [15]. Leukocyte count showed statistically significant association with difficult laparoscopic cholecystectomy on univariate analysis (Man-Whitney test) with significance of $p= 0.001$. Similarly, Verma D. et al found statistically significant association between leukocytosis ($>11,000/\text{cu mm}$) and difficult laparoscopic cholecystectomy. However, they converted leukocyte count to categorical variable (leukocytosis or no leukocytosis) in their study [29].

Previous ERCP, a disease related factor was found a significant predictor for difficult laparoscopic cholecystectomy. Similarly, Sutcliffe R et al found in their study, ERCP to be significantly associated with conversion to open surgery on univariate analysis [27]. According to Pol M. et al, previous surgery and adhesions following post ERCP cholelithiasis, constitute the major risk factor for laparoscopic cholecystectomy converted to open surgery [18].

Preoperative ultrasound finding of thickened gallbladder wall more than 4mm, was found to be a significant predictor of difficult laparoscopic cholecystectomy. Mudgal M et al found difficult laparoscopic cholecystectomy as well as conversion to open cholecystectomy significantly high in patient with thickened gallbladder wall [15]. Kulkarni S. and Kumar S reported that contracted gallbladder and gallbladder wall thickness $>4\text{mm}$ were strongly related to increased duration of surgery [13].

Impacted stone is another sonographic finding which found to have strong statistical association with difficult laparoscopic cholecystectomy. It was found to be a statistically significant factor in predicting difficulty of the procedure [4]. Similarly, Singh K et al concluded that ultrasound finding of impacted stone in the cystic duct is a significant predictor of difficult laparoscopic cholecystectomy. Likewise, Abdelhamid M et al found strong correlation between it as well as pericholecystic fluid collection and difficult laparoscopic cholecystectomy.

Conclusion:

Number of preoperative factors were identified which have statistically significant association with difficult laparoscopic cholecystectomy. Knowledge of these factors by the surgeon before operation is imperative to make the necessary precautions before operation.

References:

1. Aashu A, Bhattacharjee PK, Halder SK, Nidhi (2016). A prospective study of different complications following laparoscopic cholecystectomy in a tertiary care hospital in Eastern India. *IntSurg J.*3(4):2104-2108.
2. Abdelhamid MS, Gharib AZ, Mohammed MA, and Negida M (2020). Anticipation of difficulty during laparoscopic cholecystectomy. *Arch SurgClin Res.* 4:24-28.
3. Abdul-Razack GS, Avinash K, Manjunath BD, Harindranath HR, Archana CS, Ali MA (2019). Pre-operative evaluation with parkland grading system in assessing difficult laparoscopic cholecystectomy and expectant operative and post-operative complications. *International Journal of Surgery Science.* 3(3): 20-25.
4. Agrawal N, Singh S, Khichy S (2015). Preoperative prediction of difficult laparoscopic cholecystectomy: a scoring method. *Nigerian Journal of Surgery.* 21(2): 130 -133.
5. Ahmed ML, Lolah MA, Mohammed MA, Sharabash MM (2014). Difficulties during laparoscopic cholecystectomy. *Menoufia Medical Journal.* 27:469–473.
6. Alhamid MA. Difficult laparoscopic cholecystectomy (2019).*Global Journal of Health Science.* 11(9): 102-115.
7. Atta HM, Mohamed AA, Sewefy AM, Abdel-Fatah AS, Mohammed MM, Ahmed M. Atiya (2017). Difficult laparoscopic cholecystectomy and trainees: predictors and results in an academic teaching hospital.*Gastroenterology Research and Practice.* 2017:1-5.
8. Ghanem YB, Fahmy KS, Refaat DO, Mouhammed MB (2017). Preoperative prediction of difficult laparoscopic cholecystectomy: in ZagazigUniversity Hospitals.*Z.U.M.J.* 23(4): 208-220.
9. Gupta AK, Shiwach N, Gupta S, Gupta S, Goel A, Bhagat TS (2018). Predicting difficult laparoscopic cholecystectomy. *IntSurg J.* 5(3):1094-1099.
10. Iwashita Y, Ohyama T, Honda G, Hibi T, Yoshida M, Miura F (2016). What are the appropriate indicators of surgical difficulty during laparoscopic cholecystectomy? Results from a Japan-Korea-Taiwan multinational survey. *Journal of HepatobiliaryPancreat Sci.* 23:533–547.
11. Jethwani U, Singh G, Mohil RS, Kandwal V, Razdan S, Chouhan J (2013). Prediction of difficulty and conversion in laparoscopic cholecystectomy.*Minimally Invasive Surgery.* 1(1):2.
12. Kanakala V, Borowski DW, Pellen MGC, Dronamraju SS, Woodcock SAA, Seymour K (2011). Risk factors in laparoscopic cholecystectomy: A multivariate analysis. *International Journal of Surgery.* 9: 318-323.
13. Kulkarni SV, Kumar SS. (2018). Preoperative predictors of a difficult laparoscopic cholecystectomy. *IntSurg J.* 5(2):608-613.
14. Kumar Singh RJ, Shakya P, Sutnga B (2020). Ultrasonographic predictors of difficult laparoscopic cholecystectomy. *International Journal of Research and Review.* 7(4): 223-231.
15. Mudgal MM, Kushwah N, Singh R, Gehlot H (2018).A clinical study to determine predictive factors for difficult laparoscopic cholecystectomy. *International Journal of Medical Science and Public Health.* 7(2): 116-120.
16. Mushtaque M, Kema AR, Khanday SA, Bacha UQ (2019). Difficult laparoscopic cholecystectomy and postoperative requirement of analgesics: An observational study. *Saudi J Laparosc;*4:24-8.

17. Nidoni R, Udachan TV, Sasnur P, Baloorkar R, Sindgikar V, and Narasangi B (2015). Predicting difficult laparoscopic cholecystectomy based on clinicoradiological assessment. *J ClinDiagn Res.* Dec; 9(12): 9-12.
18. Pol MM (2020). The Effect of Various Surgical Techniques on Difficult Cholecystectomy Operations: A Retrospective Cohort Study. *Colorectal Res.*8(1):23-28.
19. Robb WB, Falk GA, Larkin JO, Waldron JrR, Waldron RP (2012). A 10-step intraoperative surgical checklist (ISC) for laparoscopic cholecystectomy—can it really reduce conversion rates to open cholecystectomy? *J Gastrointest Surg.* 16:1318–1323.
20. Rothman JP , Burcharth J, Pommergaard H, Viereck S, Rosenberg J (2016). Preoperative risk factors for conversion of laparoscopic cholecystectomy to open surgery - a systematic review and meta-analysis of observational studies. *Dig Surg.* 33(5):414-23.
21. Shrestha S, Shah S, Poudyal S, Shah YN, Jaiswal VK (2014). Conversion from laparoscopic to open cholecystectomy. *Journal of Patan Academy of Health Sciences.*1(1):30-32.
22. Singh K, Ohri A (2005). Laparoscopic cholecystectomy – is there a need to convert? *Journal of Minimal Access Surgery.* 1(2): 59-62.
23. Soltes M, Radoňak J (2014). A risk score to predict the difficulty of elective laparoscopic cholecystectomy. *VideosurgeryMiniinv;* 9 (4): 608–612.
24. Subhas G, Gupta A, Bhullar J, Dubay L, Ferguson L, Goriel Y (2011). Prolonged (longer than 3 Hours) laparoscopic cholecystectomy: reasons and results. *The American Surgeon.* 77: 981-984.
25. Sudhir M, Pruthvi R (2018). Preoperative Grading System versus Intraoperative Grading System as Predictors for Difficult Laparoscopic Cholecystectomy: A Comparative Validation Study.*JCBR.* 2(1): 39-47.
26. Sugrue M, Coccolini F, Bucholc M, Johnston A, and contributors from WSES (2019). Intraoperative gallbladder scoring predicts conversion of laparoscopic to open cholecystectomy: a WSES prospective collaborative study. *World Journal of Emergency Surgery.*14:12.
27. Sutcliffe RP, Hollyman M, Hodson J, Bonney G, Vohra RS, Griffiths EA (2016). Preoperative risk factors for conversion from laparoscopic to open cholecystectomy: a validated risk score derived from a prospective U.K. database of 8820 patients. *HPB.* 18: 922–928.
28. Tayeb M, Raza SA, Khan MR, Azami R (2005). Conversion from laparoscopic to opencholecystectomy: Multivariate analysis of preoperative risk factors. *J Postgrad Med.* 55(1):17-20.
29. Verma D, Ratan, Chand N (2020). Study of preoperative clinical and investigative factors predicting difficult laparoscopic cholecystectomy. *International Journal of Research.* 8(3): 207-213.
30. Vivek MAK, Augustine AJ, Rao R (2014). A comprehensive predictive scoring method for difficult laparoscopic cholecystectomy. *Journal of Minimal Access Surgery.* 10(2): 62-67.
31. Yol S, Kartal A, Vatanssev C, Aksoy F, Toy H (2006). Sex as a factor in conversion from laparoscopic cholecystectomy to open surgery. *JSLs.*10:359–363.

استئصال المرارة بالمنظار لمرضى حصى المرارة: العوامل المرتبطة بصعوبة إجراء

العملية أثناء استئصال المرارة بالمنظار

فؤاد حسن بن قديم

قسم الجراحة العامة، كلية الطب و العلوم الصحية، جامعة عدن

DOI: <https://doi.org/10.47372/uajnas.2021.n1.a15>

الملخص

أصبحت عملية استئصال المرارة بالمنظار العلاج المفضل لإمراض الحصى في المرارة ذات الأعراض. قد يواجه الجراح صعوبة في إجراء العملية لكن في أحوال كثيرة ممكن التنبؤ بهذه المواقف بناء على مجموعة من العوامل السريرية و النظرية السريرية.

هدفت الدراسة الى تحديد العوامل السريرية والنظرية السريرية التي لها علاقة بصعوبة إجراء عمليات استئصال المرارة بالمنظار.

الدراسة تضم 405 حالة، تقدموا بمرض الحصى المرارة العرضي من فترة 1 مارس 2018 الى غاية 29 فبراير 2020 م، في مستشفى 22 مايو. تم استقصى من الدراسة مرضى سرطان المرارة و مرضى التهاب المرارة من غير حصى. تم جمع و تدوين المعلومات وثيقة الصلة على استبيان صممت لهذا الخصوص. تم تحليل المعلومات باستخدام برنامج ال SPSS vs 17. تم دراسة عوامل الخطورة باستخدام مربع كاي او اختبار دقيق فيشر للمتغيرات الفئوية. بينما تم دراسة المتغيرات المستمرة باستخدام اختبار مان ويتني.

ضمت هذه الدراسة 405 مريضا انطبقت عليهم مواصفات البحث، كان اكثر المرضى نساء (88.1%) ومتوسط الاعمار 42.6 ± 13.7 . وجد صعوبة في عملية استئصال المرارة بالمنظار في 137 حالة (33.8%). وجد ارتباط ذو أهمية إحصائية بين صعوبة إجراء عملية استئصال المرارة بالمنظار و الجنس (p-value < 0.001)، سيرة مرضي بصفر انسدادى (p-value < 0.001)، أو تصوير البنكرياس والاقنية الصفراوية بالتنظير الداخلي بالطريق الراجع (p-value < 0.001)، عملية جراحية سابقة للبطن (p-value = 0.005)، عد خلايا الدم البيضاء (p-value = 0.001) كذلك تضخم في سمك جدار المرارة > 4 ملم (p-value < 0.001)، حصى منحشر في مسال المراري (p-value < 0.001) وجود ارتشاح حول المرارة (p-value < 0.001)، توسع في القناة الصفراوية المشتركة اكثر من 7 ملم (p-value = 0.001)، مرارة متقلصة بالرغم من فترة صيام كافي (p-value < 0.001).

تم تحديد العديد من العوامل المسبقة للعملية و التي لها علاقة ذو دلالة إحصائية مع صعوبة إجراء عملية استئصال المرارة بالمنظار. من المهم معرفة هذه العوامل من قبل الجراح حتى يتسنى اتخاذ الاحتياطات الضرورية قبل العملية.

الكلمات المفتاحية: صعوبة إجراء عملية استئصال المرارة بالمنظار، تحول إلى عملية مفتوحة، مرارة، قناة الصفراوية.