e-ISSN: 0976-822X, p-ISSN:2861-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2023; 15(6); 55-62

Original Research Article

A Hospital-Based Assessment of the Utility of Abdomen Sonography Parameters that Predict the Conversion from Laparoscopic to Open Cholecystectomy

Kunal Choudhary[1*], Loveleen Kaur[2]

[1]Assistant Professor, Department of General Surgery, SRIMS and Sanaka Hospital, Durgapur, West Bengal, India

[2]Assistant Professor, Department of Pediatrics, SRIMS and Sanaka Hospital, Durgapur, West Bengal, India

Received: 14-02-2023/ Revised: 05-03-2023 / Accepted: 09-04-2023

Corresponding author: Dr. Loveleen Kaur

Conflict of interest: Nil

Abstract

Aim: The aim of the present study was to find the utility of abdomen sonography parameters that predict the conversion from laparoscopic to open cholecystectomy.

Methods: This observational study was conducted in department of General Surgery, SRIMS and Sanaka Hospital, Durgapur, West Bengal, India for the period of 12 months. A total of 100 patients were included in the study. Patients were explained the risks and benefits of the procedure.

Results: In the present study, there were 65 male and 35 females. Most of the patients belonged to 51-70 age group. Of 100 patients, 16% had a conversion to open cholecystectomy. There was no statistically significant difference between the two groups in relation to age groups and gender. There was no statistically significant difference between the two groups in relation to abnormal gallbladder, presence and number of calculi, size of the calculus (>6 mm), gallbladder thickness (>4 mm), pericholecystic collection, adhesions/fibrosis and size of the common bile duct.

Conclusion: Of 100 patients, 16 (16%) had a conversion to open cholecystectomy. There was no statistically significant difference of USG parameters studied such as gallbladder wall thickness >4 mm, pericholecystic fluid collection, common bile duct diameter >7 mm, presence of calculus, number of calculi, size of calculus >6 mm and adhesions/fibrosis in patients who required conversion to open cholecystectomy and who were operated laparoscopically.

Keywords: Laparoscopic cholecystectomy, Open cholecystectomy, Ultrasonography.

Introduction

Laparoscopic cholecystectomy (LC) has gained widespread acceptance as the procedure of choice for management of symptomatic gallbladder (GB) disease.[1-2] Its advantages are well documented like its minimal invasive nature, decreased postoperative pain, better cosmesis, shorter hospitalization, and early recovery.[3] However up to 15% of patients need conversion to open cholecystectomy (OC) for various reasons.[4,5] The degree of difficulty during LC and possibility of

conversion is almost impossible to predict clinically.

Gallbladder stone disease is seen in one of every third woman and fifth man, although half of the stone carriers become symptomatic.[6] Laparoscopic cholecystectomy (LC) is the gold standard therapy method in gallbladder diseases. It is widely used in routine treatment choice instead of open surgery (OS). LC improves not only patient satisfaction, but also shortens hospitalization period. Smaller scar tissue formation is the other cosmetic advantage of LC.[7,8] Calot's triangle is the main area between common bile duct, cystic duct and cystic artery in LC. The adhesions of pericholecystic area and the Calot's triangle, injury of gallbladder and/or bile ducts, risk of bleeding may lead the surgeon to OS.[9,10] Preoperative ultrasonography (US) is a valuable method that may indicate the surgical difficulties and predict the potential conversion from LC to OS.[11,12]

The revolution in laparoscopic surgery began three decades ago when laparoscopic cholecystectomy was introduced. It did not take long for a consensus to develop and for the national institute of health to pronounce laparoscopic cholecystectomy, as the procedure of choice for patients with symptomatic cholelithiasis.[13] Retrospective data showed that laparoscopic cholecystectomy is safe and effective when compared to open cholecystectomy. The advantages of laparoscopic cholecystectomy have been described as obvious and compelling. Laparoscopic cholecystectomy reduces hospital stay, decreases morbidity has a short recovery time and better cosmesis.[14,15] Ultrasonography is the most common noninvasive, safe, and highly accurate screening test for cholecystitis and cholelithiasis. It can also help surgeons to get an idea of potential difficulty to be faced during surgery in that particular patient.[16] In spite of the advances in technique, visualization and instrumentation in laparoscopy, there still are 1% to 13% of patients, who need an open procedure to complete the removal of the gallbladders during laparoscopic cholecystectomy.[17] This happens because of many factors like unclear Calot triangle anatomy, intensely inflamed and thick gallbladder, dense adhesions in the operative area, obscure biliary tree anatomy, local inflammation like pancreatitis and others.[18]

The aim of the present study was to find the utility of abdomen sonography parameters that predict the conversion from laparoscopic to open cholecystectomy.

Materials And Methods

This observational study was conducted in department of General Surgery, SRIMS and Sanaka Hospital, Durgapur, West Bengal, India for the period of 12 months. A total of 100 patients were included in the study. Patients were explained the risks and benefits of the procedure. Patients aged between 20 and 75 years with a diagnosis of cholelithiasis/cholecystitis were included. Patients with choledocholithiasis on USG, having co-morbid conditions like uncontrolled diabetes mellitus, uncontrolled hypertension, coagulopathies, chronic obstructive pulmonary disease, severe cardiac failure, jaundice, cholangitis, body mass index (BMI) >30 kg/m2 and a history of upper abdomen surgery were excluded.

The data was collected by pre-tested study proforma, which included general information, clinical details of the patient and investigations. Every patient underwent USG. The USG findings such as gallbladder wall thickness, presence or absence of stones, number of calculi, the size of the calculi, presence of adhesions/fibrosis, pericholecystic fluid collection and common bile duct diameter was recorded. All the patients underwent diagnostic laparoscopy. If feasible,

laparoscopic cholecystectomy was performed. If not, the procedure was converted to open. All patient's findings at laparoscopy were compared to USG findings and the reason for conversion in each patient was documented in detail. Association of USG findings was correlated with conversion to open cholecystectomy.

Pneumoperitoneum was created by insufflating the peritoneal cavity with CO2 gas by using a veress needle inserted through the sub-umbilical port site. Electronic insufflators produced pneumoperitoneum to a pressure of 12-15 mm of Hg. A 10 mm trocar was inserted through the sub-umbilical incision using a rotatory movement and entry into the peritoneal cavity was confirmed. The telescope with the camera mounted was inserted through the cannula and initial diagnostic laparoscopy was carried out visualizing the gallbladder and abdominal viscera. The other three ports were inserted under vision.

The port in the epigastrium was a 10 mm cannula inserted just below the xiphisternum based on the inferior liver edge. This port was used for dissection of the Calot triangle, application of various clips, suction irrigation and for extraction of the gallbladder specimen. The port in the mid-clavicular line (5 mm) was inserted through a right sub-costal incision slightly lateral to the fundus of the gallbladder. This was used to pass a grasper to manipulate the gallbladder (body and neck) for dissection of the Calot triangle. The final port, another 5 mm cannula, was placed laterally in the anterior axillary line at the level of the umbilicus. This port was directed towards the fundus of the gallbladder and used for its retraction.

The patient was positioned in the reverse Trendelenburg position with a tilt to the left of approximately 30 degrees to the horizontal for better visualization of the gallbladder. A grasping forceps was inserted and the gallbladder fundus was held and pushed upwards and laterally towards the patient's right shoulder (superolateral). After the fundus of the gallbladder was retracted up and to the right over the liver using an atraumatic forceps, the further retraction was accomplished by a second atraumatic grasping forceps holding the gallbladder neck and retracting it laterally to expose the Calot triangle for achieving the critical view of safety (Figure 1). Once adhesions from neighboring structures were released from the gallbladder and peritoneal lining was taken down, gentle anterior and posterior dissection with straight and curved blunt dissector (Maryland forceps) was continued with alternating inferolateral and superomedial retraction of the neck until the gallbladder was dissected away from the liver, creating a "window" crossed by two structures: the cystic duct and artery. The cystic duct was skeletonized and exposed up to its junction with the common bile duct. Polymer clips were applied to the cystic duct and it was divided. The cystic artery was doubly clipped and divided similarly. The gallbladder was lifted from its bed, exposing the connective tissue between it and the liver. Using the grasping forceps, the gallbladder was held close to the area to be dissected and traction was maintained to expose the fibrous tissue, which was then divided by a diathermy hook. Thus, the gallbladder was gradually dissected until completely freed and placed on the surface of the liver for easy access. Extraction of the dissected gallbladder was done through the epigastric port. The gallbladder extraction forceps were passed through the port and the neck of the gallbladder was grasped in the region of the previously applied cystic duct clips. The neck of the gallbladder was then gently maneuvered into the port and the port was slowly extracted from the abdomen. The gallbladder was externally held with artery forceps and opened externally while continuing a laparoscopic

visualization of it. The suction cannula was inserted and gallbladder decompression was done. The gallbladder was then gradually removed. Once the specimen was extracted, the 10 mm epigastric port was placed back in position. If laparoscopic cholecystectomy was not possible, it was converted to open cholecystectomy.

The closure of 10 mm ports with 1-0 or 2-0 absorbable, synthetic, braided polyglactin 910 sutures (Vicryl) and skin closure with 3-0 non-absorbable-synthetic-monofilament nylon sutures (Ethilon) were done. Pain relief was obtained by intravenous (IV) diclofenac or paracetamol injections. IV antibiotics were continued for 48-72 hours. Patients were ambulated on the first post-operative day and were discharged on the 3rd or 4th post-operative day in most of the cases. The primary outcome measure was conversion to open cholecystectomy.

Statistical Methods

Data collected were entered in excel 2007 and analysis of data was done using statistical package for social sciences for windows, version 20.0 from IBM corporation, Armonk, NY, USA. The data on categorical variables are shown as n (% of cases) and the data on continuous variables are presented as mean and standard deviation (SD). The comparison of qualitative variables was done using Fisher's exact test. The confidence limit for significance was fixed at a 95% level with a $p<0.05$.

Results

Table 1: Baseline characteristics

Variables	Conversion to open cholecystectomy, n (%)			P value
	Yes	No	Total	
Age group (years)				
≤30	3	9	12	0.940
>31-40	4	11	15	
41-50	4	16	20	
51-60	2	20	22	
61-70	2	20	22	
>70	1	8	9	
Gender				
Male	10	55	65	0.655
Female	5	35	35	

In the present study, there were 65 male and 35 females. Most of the patients belonged to 51-70 age group. Of 100 patients, 16% had a conversion to open cholecystectomy. There was no statistically significant difference between the two groups in relation to age groups and gender.

Table 2: Correlation of ultrasonographic findings of abdomen and conversion to open cholecystectomy

Variables	Conversion to open cholecystectomy, n			P value
	Yes	No	Total	
Gallbladder				
Normal	8	57	65	0.185
Abnormal	8	27	35	
Presence of calculus				
Yes	16	78	94	0.940

No	0	6	6	
No. of calculi				
No	0	5	5	0.825
1-2	0	10	10	
Multiple	16	69	85	
Size of the calculus (mm)				
Small (≤6)	6	34	40	0.745
Large (>6)	8	52	60	
Gallbladder wall thickness (mm)				
≤4	4	28	32	0.635
>4	12	56	68	
Peri-cholecystitis collection				
Present	7	20	27	0.175
Absent	9	64	73	
Adhesion/fibrosis				
Present	9	81	90	0.062
Absent	7	3	10	
Size of common bile duct (mm)				
Dilated (>7)	6	9	15	0.910
Normal	10	75	85	

There was no statistically significant difference between the two groups in relation to abnormal gallbladder, presence and number of calculi, size of the calculus (>6 mm), gallbladder thickness (>4 mm), pericholecystic collection, adhesions/fibrosis and size of the common bile duct.

Discussion

Gallstone disease is a common problem affecting women more than men in the ratio of 4:1.[19] Obese, fertile and middle-aged females are more at risk. Autopsy reports have shown the prevalence of gallstones is 11% to 36% in the Central Indian population.[20] USG of the abdomen is an extremely useful and accurate method for identifying gallstones and pathologic changes in the gallbladder. It has a high specificity of >98% and sensitivity of >95% in diagnosing cholelithiasis.[21] Laparoscopic cholecystectomy has rapidly become the procedure of choice for routine gallbladder removal and is currently the most commonly performed major abdominal procedure worldwide.[22] Mouret introduced laparoscopic cholecystectomy in 1987, which brought a radical change in the treatment of patients with gallstones. Although laparoscopic cholecystectomy has numerous advantages including reduced hospitalization, decreased morbidity, short recovery time, and better cosmesis,[23-25] it has increased risk of injury to common bile duct (CBD), duodenum, bowel, iliac vessels, and so on; high conversion rate in acute cholecystitis, and difficulty in management of simultaneous CBD stones.[16,26]

Laparoscopic cholecystectomy is the gold standard for symptomatic gallstones. The present study was conducted to evaluate some pre-operative abdominal USG findings, which can reliably predict the chances of conversion from laparoscopic cholecystectomy to open cholecystectomy. In the present study, there was no statistically significant difference between the two groups in relation to abnormal gallbladder, presence and number of calculi, size of the calculus, gallbladder thickness, pericholecystic collection, adhesions/fibrosis and size of the common bile duct. In the present study, the

conversion rate to open cholecystectomy was 16%. Singh et al, Rosen et al, Sultan et al, Liu et al, Ishizaki et al and Nidoni et al reported that the conversion from laparoscopic cholecystectomy to open cholecystectomy was 19/255 (7.4%), 71 (5.3%), 234 (5.3%), 45/500 (9%), 7.5%, and 10/180 (5.6%) respectively which is similar to our study.[20,18,27-30]

There was no statistically significant difference between the two groups in relation to age groups and gender. There was no statistically significant difference between the two groups in relation to abnormal gallbladder, presence and number of calculi, size of the calculus (>6 mm), gallbladder thickness (>4 mm), pericholecystic collection, adhesions/fibrosis and size of the common bile duct. Rosen et al[18], Chindarkar et al[32], Stanisic et al[31], Liu et al[28], Ishizaki et al[29], Sikora et al[2], Daradkeh et al[24] and Jansen et al[11] reported a significant correlation between gallbladder wall thicknesses >4 mm with the conversion from laparoscopic cholecystectomy to open cholecystectomy. Chindarkar et al[32], Daradkeh et al[24] and Jansen et al[11] reported a significant correlation between the diameter of the common bile duct with the conversion from laparoscopic cholecystectomy to open cholecystectomy. Sultan et al[27] and Daradkeh et al[24] reported a significant correlation between adhesion/ fibrosis of gallbladder with conversion from laparoscopic cholecystectomy to open cholecystectomy. Daradkeh et al[24] reported that to improve the predictability of operative difficulty of laparoscopic cholecystectomy, other non-ultrasonographic factors must be included as independent variables, such as age, sex, BMI of the patient and the presence of adhesions.

Conclusion

Of 100 patients, 16 (16%) had a conversion to open cholecystectomy. There was no statistically significant difference of USG parameters studied such as gallbladder wall thickness >4 mm, pericholecystic fluid collection, common bile duct diameter >7 mm, presence of calculus, number of calculi, size of calculus >6 mm and adhesions/fibrosis in patients who required conversion to open cholecystectomy and who were operated laparoscopically.

References

1. Corr P, Tate JJ, Lau WY, et al. Preoperative ultrasound to predict technical difficulties and complications of laparoscopic cholecystectomy. Am J Surg 1994 Jul;168(1):54-6.
2. Sikora SS, Kumar A, Saxena R, et al. Laparoscopic cholecystectomy can conversion be predicted? World J Surg 1995 Nov-Dec;19(6):858-60.
3. Dubois F, Berthelot G, Levard H. Coelioscopic cholecystectomy: experience with 2006 cases. World J Surg 1995 Sep-Oct;19(5):748-52.
4. Alponat A, Kum CK, Koh BC, et al. Predictive factors for conversion of laparoscopic cholecystectomy. World J Surg 1997 JuleAug;21(6):629e33.
5. Rosen M, Brody F, Ponsky J. Predictive factors for conversion of laparoscopic cholecystectomy. Am J Surg 2002 Sep;184(3):254-8.
6. Ibrahim S, Hean TK, Ho LS, et al. Risk factors for conversion to open surgery in patients undergoing laparoscopic cholecystectomy. World J Surg 2006 Sep;30(9):1698-704.
7. Dinkel HP, Kraus S, Heimbucher J, Moll R, Knüpffer J, Gassel HJ, Freys SM, Fuchs KH, Schindler G. Sonography for selecting candidates for laparoscopic cholecystectomy: a prospective study. American Journal of Roentgenology. 2000 May;174(5): 1433-9.
8. Strasberg SM. Laparoscopic biliary surgery. Gastroenterol Clin North Am. 1999; 28:117.
9. Morrin MM, Kruskal JB, Hochman MG, Saldinger PF, Kane RA.

Radiologic features of complications arising from dropped gallstones in laparoscopic cholecystectomy patients. American Journal of Roentgenology. 2000 May;174(5):1441-5.
10. Peters JH, Krailadsiri W, Incarbone R, Bremner CG, Froes E, Ireland AP, Crookes P, Ortega AE, Anthone GA, Stain SA. Reasons for conversion from laparoscopic to open cholecystectomy in an urban teaching hospital. The American journal of surgery. 1994 Jan 1;168(6):555-9.
11. Jansen S, Jorgensen J, Caplehorn J, Hunt D. Preoperative ultrasound to predict conversion in laparoscopic cholecystectomy. Surgical Laparoscopy & Endoscopy. 1997 Apr 1;7(2):121-3.
12. Cho KS, Baek SY, Kang BC, Choi HY, Han HS. Evaluation of preoperative sonography in acute cholecystitis to predict technical difficulties during laparoscopic cholecystectomy. Journal of Clinical Ultrasound. 2004 Mar;32(3):115-22.
13. Gollan JL, Kalser SC, Pitt HA, Strasberg SM. Foreword: Gallstones and laparoscopic cholecystectomy. Am J Surg. 1993;165(4):388-9.
14. Begos DG, Modlin IM. Laparoscopic cholecystectomy: from gimmick to gold standard. J Clin Gastroenterol. 1994;19(4):325-30.
15. Macintyre IMC, Wilson RG. Laparoscopic cholecystectomy. Br J Surg. 1993;80(5):5529.
16. Lal P, Agarwal PN, Malik VK, Chakravarti AL. A difficult laparoscopic cholecystectomy that requires conversion to open procedure can be predicted by preoperative ultrasonography. JSLS: Journal of the Society of Laparoendoscopic Surgeons. 2002 Jan;6(1):59.
17. Kim JY, Khavanin N, Rambachan A, McCarthy RJ, Mlodinow AS, De Oliveria GS, Stock MC, Gust MJ, Mahvi DM. Surgical duration and risk of venous thromboembolism. JAMA surgery. 2015 Feb 1;150(2):110-7.
18. Rosen M, Brody F, Ponsky J. Predictive factors for conversion of laparoscopic cholecystectomy. Am J Surg. 2002;184(3):254-8.
19. Brett M, Barker DJP. The World Distribution of Gallstones. Int J Epidemiol. 1976;5(4):335-41.
20. Singh AP, Sharma P, Sajith Babu SM, Gaharwar APS. Predicting the conversion of laparoscopic to open cholecystectomy: an experience in a tertiary care hospital of central India. Int Surg J. 2016;3(4):1898-900.
21. Tsai J, Sulkowski JP, Cooper JN, Mattei P, Deans KJ, Minneci PC. Sensitivity and predictive value of ultrasound in pediatric cholecystitis. J Surg Res. 2013;184(1):378-82.
22. Litwin DEM, Cahan MA. Laparoscopic cholecystectomy. Surg Clin North Am. 2008;88(6):1295-313.
23. Mouret P. How I developed laparoscopic cholecystectomy. Ann Acad Med Singapore. 1996;25(5):744-7.
24. Daradkeh SS, Suwan Z, Abu-Khalaf M. Preoperative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. World journal of surgery. 1998 Jan; 22:75-7.
25. Corr P, Tate JJ, Lau WY, Dawson JW, Li AK. Preoperative ultrasound to predict technical difficulties and complications of laparoscopic cholecystectomy. The American journal of surgery. 1994 Jul 1; 168(1): 54-6.
26. Fletcher DR, Hobbs MS, Tan P, Valinsky LJ, Hockey RL, Pikora TJ, Knuiman MW, Sheiner HJ, Edis A. Complications of cholecystectomy: risks of the laparoscopic approach and protective effects of operative cholangiography: a population-based study. Annals of surgery. 1999 Apr; 229(4):449.

27. Sultan AM, El Nakeeb A, Elshehawy T, Elhemmaly M, Elhanafy E, Atef E. Risk factors for conversion during laparoscopic cholecystectomy: retrospective analysis of ten years' experience at a single tertiary referral centre. Dig Surg. 2013;30(1):51-5.
28. Liu CL, Fan ST, Lai EC, Lo CM, Chu KM. Factors affecting conversion of laparoscopic cholecystectomy to open surgery. Arch Surg. 1996;131(1):98-101.
29. Ishizaki Y, Miwa K, Yoshimoto J, Sugo H, Kawasaki S. Conversion of elective laparoscopic to open cholecystectomy between 1993 and 2004. Br J Surg. 2006;93(8):987-91.
30. Nidoni R, Udachan TV, Sasnur P, Baloorkar R, Sindgikar V, Narasangi B. Predicting Difficult Laparoscopic Cholecystectomy Based on Clinicoradiological Assessment. J clin diagnostic res. 2015;9(12): PC09.
31. Stanisic V, Milicevic M, Kocev N, Stojanovic M, Vlaovic D, Babic I, Vucetic N. Prediction of difficulties in laparoscopic cholecystectomy on the base of routinely available parameters in a smaller regional hospital. Eur Rev Med Pharmacol Sci. 2014 Apr 1; 18(8): 1204-1.
32. Chindarkar H, Dumbre R, Fernandes A, Phalgune D. Study of correlation between pre-operative ultrasonographic findings and difficult laparoscopic cholecystectomy. Int Surg J. 2018;5(7):2605-11.