DOI Number: 10.37506/v14/i1/2020/ijfmt/193086

Comparison of Preoperative Ultrasound Report with Intraoperative Findings of Laparoscopic Cholecystectomy in Gallstone Disease in Al-Diwaniyah Teaching Hospital

Adel Shakir Al-Timimi[1], Anwar Majeed Hussein[1]

[1]College of Medicine/ Al-Qadisiyah University, Iraq

Abstract

Background: Gallstones constitute a significant health problem in developed societies, affecting 10% to 15% of the adult population, meaning 20 to 25 million Americans have (or will have) gallstones. The resultant direct and indirect cost of gallbladder disease represents a consumption of ~$6.2 billion annually in the U.S., constituting a major health burden that has increased more than 20% over the last 3 decades. The best diagnostic tool is ultrasound; however, several authosr have raised the issue of inconsistency between preoperative ultrasound evaluation and laparoscopic operative findings.

Aim of the study: To compare preoperative ultrasound findings with operative findings in patients undergoing laparoscopic cholecystectomy in order to evaluate the accuracy of ultrasound in detecting gallbladder pathology.

Patients and Method: In this hospital based study, in order to evaluate the concordance and discrepancy between preoperative ultrasound findings and operative findings in patients subjected to laparoscopic cholecystectomy. At the end of study we were able to include 100 cases. The study started on January the 2nd 2019 and ended at June the 15th 2019. The study was carried out at laparoscopic unit in Al-Diwaniyah teaching hospital. Ultrasound findings were retrieved from available reports that are already kept with the case file sheet of each patient. Operative findings were obtained the surgery team and by the use of a special device which provide information about size of stone and gallbladder wall thickness.

Results: Regarding number of stones and for purpose of unification both ultrasound sound findings and operative findings were contrasted as single stone versus multiple stones, as shown in table 2. Indeed, there was almost complete agreement between ultrasound and operative findings since 22 patients were diagnosed as having single stone by both methods and 76 were diagnosed as having multiple stones by both methods. According to MeNemar test, there was no significant difference in distribution of patients into having single versus multiple stones (P = 1.000), a finding that was further supported by Kappa agreement statistic of 0.944 (P < 0.001), table 4.3.

Key word: *Gallbladder Disease,Ultrasound,Gallstone, Laparoscopic Cholecystectomy.*

Introduction

Gallstones constitute a significant health problem in developed societies, affecting 10% to 15% of the adult population, meaning 20 to 25 million Americans have (or will have) gallstones [1]. The resultant direct and indirect cost of gallbladder disease represents a consumption of ~$6.2 billion annually in the U.S., constituting a major health burden that has increased more than 20% over the last 3 decades [2]. With an estimated 1.8 million ambulatory care visits each year, gallstone disease is a leading cause for hospital admissions related to gastrointestinal problems. These numbers are likely an underestimate because laparoscopic cholecystectomy is often performed as a day procedure and thus not captured by hospital statistics that require overnight admission. Although the mortality rate for gallstones disease is relatively low at 0.6%, the high burden of disease imposes

troubling mortality figures, such as an estimated 1,092 gallstone-related deaths for 2004 in the U.S. Fortunately, case fatality rates have steadily diminished from over 5,000 deaths in 1950, falling >50% between the years 1979 and 2004. This decline represents the greatest decrease for any digestive disease [2]. Gallstone disease per se also carries inherent risks. Prospective population-based surveys have revealed an increased overall mortality, particularly from cardiovascular disease and cancer, as seen in Americans and Pima Indians with cholelithiasis. Further, as the incidence of gallstone disease escalates, there is a concomitant increase in complications like gallstone-related pancreatitis [3]. The best diagnostic test to confirm gallbladder disease is the abdominal ultrasound. It is noninvasive and is 90% to 95% accurate in detecting gallstones. Pericholic fluid and thickened gallbladder walls can also be identified as in acute cholecystitis. Gallbladder sludge and occasionally common bile duct stones can also be seen with abdominal ultrasounds. The gallbladder ultrasound may also be useful in detecting possible gallbladder neoplasms. The EUS or endoscopic ultrasound is not a first-line test for diagnosing gallbladder disease. There is no place for it as a diagnostic tool for cholecystitis. It is useful when evaluating and staging tumors of the gallbladder, pancreas, and bile ducts. Biopsies can also be done for tissue diagnosis [4]. Ultrasound scanning has been the modality of choice for the clinical diagnosis of gallstone disease for the last 25 years. It is accepted to possess a higher sensitivity than oral cholecystography or computed tomography [5].

Patients and Method

In this hospital based study, in order to evaluate the concordance and discrepancy between preoperative ultrasound findings and operative findings in patients subjected to laparoscopic cholecystectomy. At the end of study we were able to include 100 cases. The study started on January the 2019 and ended at June the 2019. The study was carried out at laparoscopic unit in Al-Diwaniyah teaching hospital. The study was approved by the institutional ethical approval committee and formal agreement was obtained from the directorate of Health in Al-Diwaniyah province, the formal representative of Iraqi Ministry of health. Verbal consent was obtained from each patient after full illustration of the aim and procedures related to the current study.

Results

Patient's demographics

The present comparative study included 100 patients who recently underwent laparoscopic cholecystectomy. The age range of those patients was form 14 to 85 years and the mean was 44.32± 14.53 years. With respect to gender, there was 19 male patients accounting for (19.0 %) and 81 female patients accounting for (81.0 %); therefore the male to female ratio was 1:4.26. Mean body mass index (BMI) was 29.28 ± 7.83 kg/m^2 and the range was from 24-33 kg/m^2 as shown in table 1.

Table 1: Patients demographics

Characteristic	Value
Age (years)	
Mean ±SD	44.32± 14.53
Range	14-85
Gender	
Male, n (%)	19 (19.0 %)
Female, n (%)	81
BMI (kg/m2)	
Mean ±SD	29.28 ± 7.83
Range	24-33

n: number of cases; SD: standard deviation

The degree of agreement between ultrasound findings and operative findings

The thickness of gall bladder wall

It is obvious that approximately more than half of cases that have been labeled as normal thickness had actually operative measures that are comparable to that regarded as thin by ultrasound examination. On the other hand, most of cases that have been thick wall, according to ultrasound examination, had indeed operative measures that are the same as those considered normal by ultrasound examination. Added to that, the value of R^2 was 0.206 which in terms of accuracy means that the accuracy of ultrasound in comparison with operative findings is only 20.6 %, as shown in figure 1. Therefore, one can conclude that ultrasound examination is very undependable in estimation of gallbladder wall thickness.

The mean thickness of gall bladder wall according to operative notes was 2.95 ±2.08 mm with a range of 0.8 to 15 mm. There was almost complete agreement between ultrasound and operative findings since 22 patients were diagnosed as having single stone by both methods and 76 were diagnosed as having multiple stones by both methods, table 2. The mean size of largest gall stone according to ultrasound was 10.02 ±5.94 mm and that according to operative findings was 9.93 ±6.56 mm; the difference was statistically insignificant (P = 0.770). On the other hand the range of sizes of gall stone was 2 -27 mm according to ultrasound and 2 -26 according to operative findings; therefore, there was fair agreement between ultrasound and operative findings regarding stone size, as shown in table 3. In 71 patients there was agreement between ultrasound and operative findings in the absence of peri-cholecystic fluid. In 13 patients there was also agreement between ultrasound and operative findings in the presence of peri-cholecystic fluid. However, disagreement was seen in 16 cases; but McNemar test showed no significant difference (P = 1.000) and Kappa statistic indicated fair agreement of 0.518 (P < 0.001), as shown in table 4. There was complete agreement between ultrasound and operative findings with respect to presence or absence of stone impaction, as shown in table 5, in which stone impaction was seen in 5 patients according to both ultrasound and operative notes. The level of agreement was supported by lack of significant variation according to MeNemar test (P = 1.000) and a kappa statistic of (1.000) with high significant level of (P <0.001), as shown in table 5.

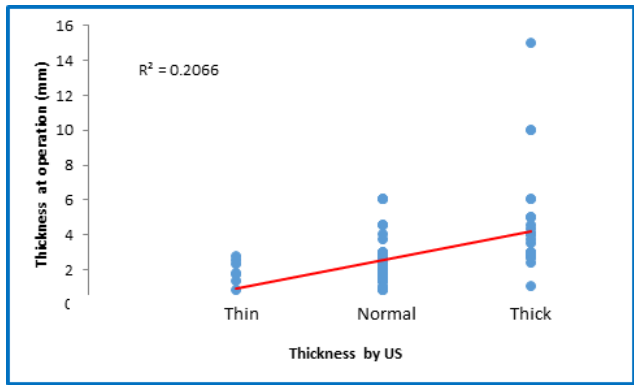

Figure 1: Correlation between gall bladder thickness according to ultrasound and gall bladder thickness at operation

Table 2: Comparison of gall stone number according to ultrasound with that found during operation

	Number of stones according to operative findings			**Mc Nemar test**	**Agreement**	
Number of stones according to US	Single	Multiple	Total	P	Kappa	P
Single	22	1	23	1.000 NS	0.944	<0.001 HS
Multiple	1	76	77			
Total	23	77	100			

NS: not significant at P ≤ 0.05; HS: Highly significant at P ≤ 0.05

Table 3: Comparison of gall stone size according to ultrasound with that found during operation

Size of stone (mm)	Ultrasound	Operation	P
Mean± SD	10.02 ±5.94	9.93 ±6.56	0.770 NS
Range	2 -27	2 -26	

NS: not significant at P ≤ 0.05; HS: Highly significant at P ≤ 0.05

Table 4: The presence of peri-cholecystic fluid according to ultrasound and operative notes

	Pericholecystic fluid OP			Mc Nemar test	Agreement	
Pericholecystic fluid US	Absent	Present	Total			
Absent	71	8	79	P	Kappa	P
Present	8	13	21	1.000 NS	0.518	<0.001 HS
Total	79	21	100			

NS: not significant at P ≤ 0.05; HS: Highly significant at P ≤ 0.05

Table 5: Gall stone impaction according to ultrasound and operative findings

	GS impaction in OP			McNemar test	Agreement	
GS impaction in US	Absent	Present	Total	P	Kappa	P
Absent	95	0	95	1.000 NS	1.000	<0.001 HS
Present	0	5	5			
Total	95	5	100			

NS: not significant at P ≤ 0.05; HS: Highly significant at P ≤ 0.05

Discussion

In the current study the degree of accuracy provided by US in measuring gallbladder wall thickness was extremely low (20.6 %). Therefore, one can conclude that ultrasound examination is very undependable in estimation of gallbladder wall thickness. Actually, as most patients are examined in the emergency setting, it has sometimes been questioned if the younger radiologists would perform as well as experienced radiologists, who are not always available at the time of examination[7]. prospectively evaluated the interobserver agreement in US examination of the gallbladder and the biliary tract performed by an experienced and a novice radiologist: they report that the novice radiologist's expertise in the primary diagnosis of uncomplicated gallstone disease was as good as the one provided by the experienced colleague and the significant interobserver difference in the measurements of the thickness of the gallbladder wall and the common bile duct diameter might indicate that assessment of these parameters requires extensive practice. In the current study, there was almost complete agreement between ultrasound and operative findings since 22 patients were diagnosed as having single stone by both methods and 76 were diagnosed as having multiple stones by both methods and the Kappa agreement statistic highly significant 0.944 (P < 0.001). So the level of agreement in our

study was 98 % and this is higher than that reported by [11]. who stated that the degree of agreement between preoperative US assessment of number of gallstones in comparison with operative findings was 82.7 %. In another study, the degree of accuracy of preoperative ultrasound in estimating number of gallstones was 74 % [12] which is much lower than that of the current study. In the current study, ultrasound was able to agree with operative findings in 84 % of cases; however, false results were seen in 16 % of cases; therefore the degree of agreement was faire. Despite thorough search in available published articles, we failed to find an article that compares the accuracy of pre-operative ultrasound in the detection of pericholycystic fluid with that of operative findings as most of published articles have assessed gallbladder wall thickness and stone characteristic, compare ultrasound with other imaging modalities or evaluate the accuracy of pericholecystic fluid in predicting conversion to open surgery or difficult operation or in association with accurate detection of acute cholecystitis [13,14,15,16,17,18,]. Therefore, this study may be regarded as the first one to raise the issue of ultrasound accuracy in detecting perichoecystic fluid in comparison with operative findings. In the current study, there was complete agreement between ultrasound and operative findings with respect to presence or absence of stone impaction and stone impaction was observed in 5% of cases. Despite thorough search in available published articles, we failed to find an article that compares the accuracy of pre-operative ultrasound in the detection of gallstone impaction with that of operative findings as most of published articles have assessed gallbladder wall thickness and stone characteristic, compare ultrasound with other imaging modalities or evaluate the accuracy of pericholecystic fluid in predicting conversion to open surgery or difficult operation or in association with accurate detection of acute cholecystitis [13,14,15,16,17,18,]. Therefore, this study may be regarded as the first one to raise the issue of ultrasound accuracy in detecting impacted gallstone in comparison with operative findings. In the current study, adhesion was seen in 34 (34.0 %) patients and operation was difficult in 12 (12.0 %). Adhesion was significantly correlated to thick gall bladder wall, presence of pericholecystic fluid, dilated gall bladder and stone impaction; whereas, difficult operation was significantly correlated to female gender, biliary tree dilation, presence of pericholecystic fluid and stone impaction. Actually these findings are in agreement with the vast majority of articles dealing with how to predict difficult laparoscopic cholecystectomy and may alter the decision of the surgeon to change into open surgery to avoid unnecessary complications [19,20,21,22,23,24]

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the College of Medicine/ Al-Qadisiyah University, Iraq and all experiments were carried out in accordance with approved guidelines.

References

1. Tazuma S. Gallstone disease: epidemiology, pathogenesis, and classification of biliary stones (common bile duct and intrahepatic) Best Pract Res Clin Gastroenterol. 2006;20:1075–1083
2. Everhart JE, Ruhl CE. Burden of digestive diseases in the United States part I: overall and upper gastrointestinal diseases. Gastroenterology. 2009;136:376–386
3. Ruhl CE, Everhart JE. Gallstone disease is associated with increased mortality in the United States. Gastroenterology. 2011;140:508–516.
4. Negrão de Figueiredo G, Mueller-Peltzer K, Zengel P, Armbruster M, Rübenthaler J, Clevert DA. Contrast-enhanced ultrasound (CEUS) and gallbladder diseases - a retrospective mono-center analysis of imaging findings with histopathological correlation. Clin. Hemorheol. Microcirc. 2018 Dec 17
5. Shea JA, Berlin J, Escarce J, Clarke J, Kinosian BP, et al. Revised estimates of diagnostic test sensitivity and specificity in suspected biliary tract disease. Arch Intern Med. 1994;154:2573–81.
6. Chong Y. Update on the gallbladder. Ultrasound Annual. 1982; 135–172.
7. Grantcharov TP, Rasti Z, Rossen B, Kristiansen VB, Rosenberg J. Interobserver agreement in ultrasound examination of the biliary tract. Acta Radiol. 2002;5(1):77–79.
8. Matcuk GR, Grant EG, Ralls PW. Ultrasound measurements of the bile ducts and gallbladder: normal ranges and effects of age, sex, cholecystectomy, and pathologic states. Ultrasound Q. 2014;30:41–48.

9. Imhof M, Raunest J, Ohmann C, Röher HD. Acute acalculous cholecystitis complicating trauma: a prospective sonographic study. World J Surg. 1992;5(6):1160–1165.
10. van Breda Vriesman AC, Engelbrecht MR, Smithuis RH, Puylaert JB. Diffuse gallbladder wall thickening: differential diagnosis. Am J Roentgenol. 2007;5:495–501.
11. Kreimer F, Cunha DJ, Ferreira CC, Rodrigues TM, Fulco LG, Godoy ES. Comparative analysis of preoperative ultrasonography reports with intraoperative surgical findings in cholelithiasis. Arq Bras Cir Dig. 2016;29(1):26–29.
12. Brakel K, Laméris JS, Nijs HG, Ginai AZ, Terpstra OT. Accuracy of ultrasound and oral cholecystography in assessing the number and size of gallstones: implications for non-surgical therapy. Br J Radiol. 1992;65(777):779–783.
13. Alshargi AO , Al-sallami SE , Hejazi HAM , Alahdal AIO. Accuracy of ultrasound in diagnosis of cholecystitis. The Egyptian J ournal of Hospital Medicine. 2018; 73 (7): 7146-7152.Brakel et al., 1992)
14. Wertz JR, Lopez JM, Olson D, Thompson WM. Comparing the Diagnostic Accuracy of Ultrasound and CT in Evaluating Acute Cholecystitis. AJR Am J Roentgenol. 2018;211(2):W92–W97.
15. Boruah DK, Sanyal S, Sharma BK, Boruah DR. Comparative Evaluation of Ultrasonography and Cross-sectional Imaging in Determining Gall Bladder Perforation in Accordance to Niemeier's Classification. J Clin Diagn Res. 2016;10(8):TC15–TC18.
16. Qureshi TJ , Khan AU , Ashfaq A , Abid KJ. To Determine the Diagnostic Accuracy of Gallbladder Wall Thickness and Presence of Pericholecystic Fluid in Predicting the need for Conversion of Laparoscopic Cholecystectomy to Open Cholecystectomy in patients with Cholelithiasis. P J M H S. 2016; 10 (3): 1031-1034.
17. Hwang H, Marsh I, Doyle J. Does ultrasonography accurately diagnose acute cholecystitis? Improving diagnostic accuracy based on a review at a regional hospital. Can J Surg. 2014;57(3):162–168.
18. Pinto A, Reginelli A, Cagini L, et al. Accuracy of ultrasonography in the diagnosis of acute calculous cholecystitis: review of the literature. Crit Ultrasound J. 2013;5 Suppl 1(Suppl 1):S11.
19. Carbotta G, Panebianco A, Laforgia R, et al. A new clinical-ultrasound score to predict difficult videolaparocholecystectomies: A prospective study. Ann Med Surg (Lond). 2018;35:59–63.
20. Veerank N, Togale MD. Validation of a scoring system to predict difficult laparoscopic cholecystectomy: a one-year cross-sectional study. J West Afr Coll Surg. 2018;8(1):23–39.
21. Maehira H , Kawasaki M , Itoh A , Ogawa M , Mizumura N , Toyoda S , Okumura S, Kameyama M .Prediction of difficult laparoscopic cholecystectomy for acute cholecystitis. J. Surg. Res. 2017 Aug;216:143–148
22. Bourgouin S, Mancini J, Monchal T, Calvary R, Bordes J, Balandraud P. How to predict difficult laparoscopic cholecystectomy? Proposal for a simple preoperative scoring system. *Am J Surg*. 2016;212(5):873–881.