Gall Bladder Wall Thickness: Sonographic Accuracy and Laparoscopic Cholecystectomy Conversion Rate, Evaluated by Histopathology

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Abstract

Background: Preoperative prediction of a difficult laparoscopic cholecystectomy can help the patient as well as the surgeon to prepare better for intraoperative risk and the risk of conversion to open Cholecystectomy.

Aim of study: Evaluation the impact of gall bladder wall thickness, on the outcome of laparoscopic cholecystectomy and conversion rate to open cholecystectomy assessed by sonography preoperative and postoperative measurement of gall bladder wall thickness by histopathology.

Patients and Methods: A prospective study conducted in the surgical unit, Department of surgery, Baghdad Teaching Hospital between November 2010 and November 2011. Abdominal Sonography performed in 110 consecutive patients before laparoscopic cholecystectomy. The surgeon re-verified sonographic finding in operative room, and postoperatively, the gall bladder specimens were sent for histopathological measurement of wall thickness.

Results: Out of 110 patients with cholecystolithiasis on sonography, we encountered easy laparoscopic cholecystectomy in 80 patients (72.7%), difficult laparoscopic cholecystectomy in 24 (21.8%) and the procedure was converted to open cholecystectomy in six patients (5.5%). The difference between Sonographic and histological measurement was within 1 mm in 102 patients (92.7%), and the other 8 patients was with 1.5 mm (7.3%) with sensitivity of (100%), specificity of (83.3%) and accuracy of (97%).

Conclusion: An accurate preoperative diagnostic sonography is mandatory for planned laparoscopic gall bladder surgery to provide information for the selection of the most appropriate approach and avoid intraoperative difficulties and surprises. On sonography gall bladder wall thickening is the most sensitive indicator of technical difficulties during laparoscopic cholecystectomy. Such difficulties may require conversion to laparotomy.

Keywords: *Laparoscopic cholecystectomy, gall bladder wall thickness, sonography, Iraq.*

Introduction

Cholelithiasis has a high prevalence. Although cholelithiasis only becomes symptomatic in about 50% of patients, cholecystectomy is a common surgical procedure [(1)]. Gallstones are one of the major causes of morbidity in Western society. Prevalence of people with gallstones, whether symptomatic or asymptomatic, varies from 5 to 22% [(2)]. In Iraq, operations of gallbladder (GB) represent a considerable fraction of total operations conducted in hospitals. This indicates that the disease is relatively important in Iraq [(3)]. Recently, laparoscopic cholecystectomy (LC) has become the gold standard for treatment of symptomatic gallstones, due to lower morbidity, shorter hospital stay, earlier return to regular daily activities, less postoperative pain and a significant reduction in the incidence of wound complications and postoperative ileus has been documented in patients undergoing LC [(4, 5)]. In addition to numerous advantages, also technical limitations of laparoscopy should be mentioned, which - in the presence of chronic inflammation resulting in

pericystic adhesions and conglutination – increase the risk of undesirable conversion from LC to open surgery [6]. The severity of acute inflammatory change influences the degree of surgical difficulty. GB wall thickening and pericholecystic fluid are indicators of inflammation in patients with acute cholecystitis [7]. The most common risk factors for conversion include a thickened GB wall, past acute cholecystitis, diabetes mellitus, past upper gastrointestinal tract surgeries, age > 65 years and male gender [8, 9]. The selection of the patient who will undergo LC is important, and the most frequently used method other than the clinical evaluation, is radiological examination (ultrasonography) [2]. Preoperative classification of patients into a high risk group would be an objective factor facilitating the surgeon's decision on possible conversion [9]. A preoperative GB ultrasound, which documents a thick GB wall (> or =3 mm) with calculi, is a clinical warning for a difficult LC which may require conversion to an open surgery. In a study, it was found that the rate of conversion was 60% in case of thickened GB wall while 12% in case of normal GB wall [10]. Variable results have been reported in the past about the sensitivity, specificity, positive predictive value, and accuracy of GB wall thickening as an indicator of surgical conversion [7].

The success of any laparoscopic operation depends on both proper patient selection, and the technical skill and experience of the laparoscopist [11]. The aim of the study was to evaluate the impact of GB wall thickness on the outcome of LC and the conversion rate to open cholecystectomy assessed by preoperative sonography and postoperative measurement of GB wall thickness by histopathology.

Patients and Methods

Study Design and Setting: This was a prospective study that was conducted in the surgical unit, Department of Surgery, Baghdad Teaching Hospital during a period of one year from Nov, 2010 – Nov, 2011.

Study Population and sample size: The study included patients with feature of chronic calculus cholecystitis who were prepared for LC, so the total number was 110. Patients who had previous abdominal surgery and features of acute cholecystitis (clinically and by investigation) were excluded.

Workup: All patients were evaluated by sonography after fasting at least six hours, the wall of GB was carefully evaluated and consider as thick when it is (> 3mm), size and capacity of GB, pericystic fluid collection and biliary system status was evaluated as well as number of GB stones also recorded. Hematological and biochemistry investigation were done. GB wall thickness was measured postoperatively by histopathology; grossly and microscopically as. Initial Procedure of histopathological examination done by.

Measurements:

- GB: length × maximum diameter (cm).
- Cystic duct: length × maximum diameter (cm).
- Lymph node: number and maximum diameter (cm).
- Open longitudinally from the fundus towards the cystic duct with blunt-ended scissors, draining off the bile and noting any contents.
- Photograph if appropriate.
- Paint the external serosal and adventitial aspects if there is any suspicion of tumor.
- Fixation by immersion in 10% formalin for 36 – 48 hours.

The difficulty of procedure was evaluated by: -

1. Clearity of calot's triangle (peritoneal adhesion) length and width of cystic duct.

2. Handling of GB during procedure and ability to perforate it.

3. Dissection of GB from its liver bed and bleeding from it.

4. Extraction of GB to outside.

All patients were undergoing surgery which was done by senior general surgery and resident using closed methods with four ports. Histopathological examination done by senior histopathology. LC considered easy when there is minimal adhesion involving the omentum, only attaches to the fundus and body of GB, and easily separated. Difficult LC when there is sever adhesion involving calot's triangle.

Statistical analysis: The data analyzed using Statistical Package for Social Sciences (SPSS) version 25. The data presented as mean, standard deviation

and ranges. Categorical data presented by frequencies and percentages. Chi–square test was used to assess statistical association between certain variables and GB Wall thickness. A level of p – value less than 0.05 was considered significant.

Results

In this study, mean age of patients was 42.7 ± 8.4 years; and 82.6% were females. By U/S, 64.5% of patients had GB with wall thickness ≤ 3 mm. We noticed that LC was easy in 72.7% of cases, difficult in 21.8%, and converted to open surgery in 5.5% of cases as shown in table (1).

Table 1: Distribution of study patients by certain characteristics

Variable	No. (n=110)	Percentage (%)
Age (Years)		
< 30	24	21.8
30 - 49	64	58.3
≥ 50	22	19.9
Gender		
Male	19	17.4
Female	91	82.6
GB Wall thickness (mm)		
≤ 3	71	64.5
> 3	39	35.5
Type of operation		
Easy LC	80	72.7
Difficult LC	24	21.8
Converted to open surgery	6	5.5

The difference between sonographic and histopathologic measurement was below 0.5 mm in 80 patients (72.5%) and it was between 0.5 and 0.99 mm in 22 patients (20%), so it was within 0 – 1 mm in 102 patients (92.7%), and in other 8 patients the difference was within 1.5 mm from GB wall thickness as shown in table (2)

Table 2: Difference of histopathological and ultrasound measurement of gall bladder wall thickness.

Difference between measurements (mm)	No. (n=110)	Percentage (%)
No difference	44	40.0
0.1 – 0.49	36	32.5
0.5 – 0.99	22	20.0
1 – 1.5	8	7.5

In table 3, 83.3% of cases who were converted to open surgery had GB wall thickness > 3 mm by U/S with a significant association (P= 0.001) between GB Wall thickness by U/S and type of operation.

Table 3: Association between GB Wall thickness by U/S and type of operation

Type of operation	GB Wall thickness by U/S (mm)		Total (%) n= 110	P - Value
	≤ 3 (%) n= 71	> 3 (%) n= 39		
Easy LC	64 (80.0)	16 (20.0)	80 (72.7)	0.001
Difficult LC	6 (25.0)	18 (75.0)	24 (21.8)	
Converted to open surgery	1 (16.7)	5 (83.3)	6 (5.5)	

In table 4, 90% of cases who complained from GB perforation had GB wall thickness > 3 mm by U/S with a significant association (P= 0.001) between GB Wall thickness by U/S and postoperative complication.

Table 4: Association between GB Wall thickness by U/S and postoperative complication

Postoperative complication	GB Wall thickness by U/S (mm)		Total (%) n= 110	P - Value
	≤ 3 (%) n= 71	> 3 (%) n= 39		
No	68 (72.3)	26 (27.7)	94 (85.5)	0.001
GB Perforation	1 (10.0)	9 (90.0)	10 (9.1)	
Bleeding	2 (33.3)	4 (66.7)	6 (5.5)	

Discussion

Since the Introduction in 1985, LC had been the procedure of choice in treatment of symptomatic gall stone [12]. But some of the planned LC needs conversion due to various factors, it would be useful in advance to know which one would require conversion, so that experienced laparoscopic surgeon could be scheduled to minimize conversion rate. And since the 1970s, ultrasound has become known as a quick, non-invasive and reliable tool to diagnose GB disease [13, 14]. Ultrasound is very sensitive for the diagnosis of gall stones, but few data are available to assess its diagnostic value for the GB wall thickness [15]. We assessed the value of sonography for patients with gall stone disease prior to LC. This study corroborates the well-established high accuracy (97%) of sonography for assessing the thickness of GB wall thickness.

In this study, we found that increase GB wall thickness on preoperative ultrasound which encountered in 39 patients out of 110 patients (35.5%) were associated with increase operative difficulty in 18 patients out of 39 patients, and our conversion rate to open surgery in six patients out of 110 patients (5.5%) was within the range reported by several other studies (1 – 10%) as in Indian one conducted in 2017 with a report of conversion rate of 10% [16], in USA in 2010 were the rate was 9% [17], and a local study in Iraq in 2007 [18] where the rate was 5%. In this study, GB wall thickness significantly determines the difficulty during surgery. We found that increase GB wall thickness (> 3 mm) on preoperative ultrasound which encountered in 39 patients (35.5%) in comparison to those with thin GB wall thickness (≤ 3 mm) 71 patients (64.5%) was associated with increase operative difficulty and this result was in consistent with a result found by Adwan MK et al study in 2015 [3] and with a study conducted by Sharma N et al in 2015 [19] when reported that gall bladder wall thickening can predict difficulty during cholecystectomy, we found that thickened gall bladder wall are the most accurate predictors of potential operative difficulty. GB wall thickening was a sensitive indicator of technical difficulties and the risk of conversion to open cholecystectomy. GB wall thickness is related to the inflammation and fibrosis that follow previous attach of cholecystitis and thus may reflect difficulty in delineation of the anatomy during surgery [20]. In conclusion, LC can be accomplished successfully with low morbidity in most patients with cholecystitis, those patients with increased GB wall thickness on preoperative ultrasonography are at high risk for conversion to open surgery. An accurate preoperative diagnostic tool is mandatory for planned laparoscopic GB surgery to provide information for the selection of the most appropriate approach and to avoid intraoperative difficulties and surprises.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq

Conflict of Interest: Non

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