

## THE IMPACT OF THE GALLBLADDER WALL THICKNESS ASSESSED BY SONOGRAPHY ON THE OUTCOME OF LAPAROSCOPIC CHOLECYSTECTOMY, A PROSPECTIVE STUDY.

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### Abstract

Laparoscopic cholecystectomy first became popular during the late 1980s and now the procedure is considered the standard approach for symptomatic cholecystolithiasis.

This study aimed to assess the value of sonography in predicting intraoperative difficulties for patients undergoing laparoscopic cholecystectomy and in identifying indicators for conversion to open cholecystectomy.

This prospective clinical trial conducted in the Department of Surgery of Al-Sadir Teaching Hospital, Al-Mousawi private Hospital and Ibn Al-Baitar private Hospital in Basrah, Iraq, between January 2006 and October 2007. Abdominal sonography performed in 100 consecutive patients before laparoscopic cholecystectomy. The surgeon re-verified sonographic findings in the operating room.

Out of 100 patients with cholecystolithiasis on sonography, we encountered straightforward laparoscopic cholecystectomy in 72 patients (72%), difficult laparoscopic cholecystectomy in 20 (20%) and the procedure was converted to open cholecystectomy in 8 patients (8%). Forty two patients had sonography revealing gallbladder wall thickness (>4 mm). The accuracy of sonography for cholecystolithiasis was 99%.

In conclusion, an accurate preoperative diagnostic sonography is mandatory for planned laparoscopic gallbladder surgery to provide information for the selection of the most appropriate approach and to avoid intraoperative difficulties and surprises. On sonography, gallbladder wall thickening is the most sensitive indicator of technical difficulties during laparoscopic cholecystectomy, such difficulties may require conversion to laparotomy.

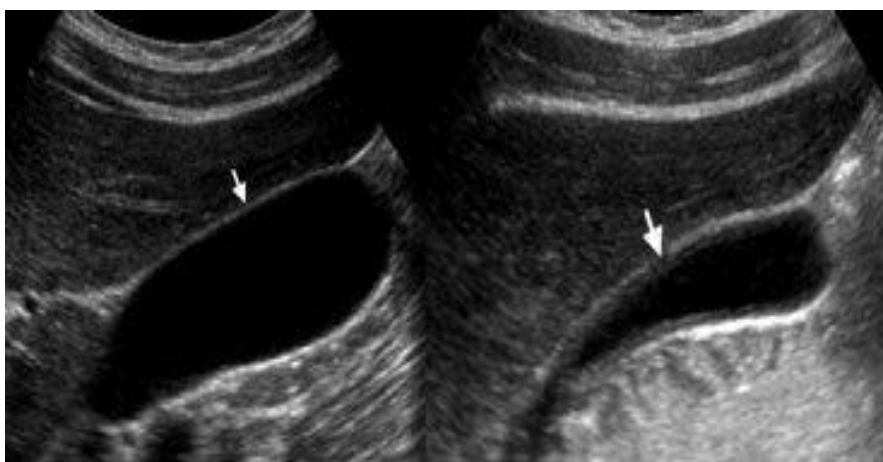
### Introduction

The first documented laparoscopic cholecystectomy was performed by Erich Mühe in Germany in September 1985<sup>1</sup>. Laparoscopic cholecystectomy first became popular during the late 1980s and now the procedure is considered the standard approach for symptomatic cholecystolithiasis. Conventional open cholecystectomy is still performed, albeit very infrequently in patients who are not amenable to minimally invasive surgery. Certain conditions preclude laparoscopic cholecystectomy and may lead surgeons to perform conventional open cholecystectomy, including pericholecystic adhesions and adhesions between the

common bile duct, the cystic duct, and the cystic artery. These conditions may significantly prolong laparoscopic time and may cause bleeding or gallbladder rupture. Frequently, conversion to Laparotomy occurs after complications arise during laparoscopic cholecystectomy such as injury to liver with profuse bleeding, stomach, small and large bowel or inadvertent injury to a bile duct that may occur after the incomplete surgical exposure of Calot's triangle. Surgical time and cost increases considerably in patients who must undergo open cholecystectomy. Therefore, candidates for open cholecyst-

ectomy should be identified before they go to the laparoscopic surgery. Gallbladder wall thickening is an indicator of cholecystitis in patients presenting with symptoms of gallstone disease<sup>2,3</sup>. The aim of the study is to evaluate the impact of gallbladder wall thickness, assessed by sonography preoperatively, on the outcome of laparoscopic cholecystectomy and to evaluate any intra or postoperative complications in relation to them.

**Figure1: The normal gallbladder wall appears as a pencil-thin echogenic line at sonography.**



LEFT: US of a normal gallbladder after an overnight fast shows the wall as a pencil-thin echogenic line (arrow). RIGHT: US in the postprandial state shows pseudothickening of the gallbladder  
RIGHT: US in the postprandial state shows pseudothickening of the gallbladder  
The thickness of the gallbladder wall depends on the degree of gallbladder distention and pseudo-thickening may normally occur in the postprandial state.

### Patients and methods

This is a prospective clinical study that was conducted in the Department of Surgery of Al-Sadir Teaching Hospital, Al-Mousawi private Hospital and Ibn Al-Baitar private Hospital in Basrah, Iraq, between January 2006 and October 2007.

One hundred patients with chronic calculus cholecystitis were included in this prospective study ranging from 23 to 52 years old (mean age 37.5 year), (74 female and 26 males).

The criteria for selection of patient were:

- 1- Sonography done by the same radiologist and within 7 days from surgery.
- 2- All procedures were performed by the same team.
- 3- Only patients who had no previous abdominal surgery were included.
- 4- Patients with comorbid illnesses like Ischemic heart disease, hypertension, diabetes mellitus, sickle cell anaemia, previous hepatitis etc. were excluded.

5- Only patients subjected to elective surgery were included.

The laparoscopic system that we used (STORZ) was the same in all hospitals where the study was conducted.

Abdominal sonography was performed in 100 patients before laparoscopic cholecystectomy. Sonographic findings were re-verified by the surgeon in the operating room see (figure 1).

All patients underwent surgery between 1 day and 7 days after sonography (mean 4 day). An evaluation sheet (questionnaire) on which we recorded sonographic data, history data and a summary of radiological interpretation was sent to the operating room with each patient. The operating surgeon correlates the data on the checklist with intraoperative findings immediately after surgery.

The duration of each procedure was recorded starting just after insertion of the three ports till removal of all ports, i.e.

time of insertion of ports and time of closure of port sites were not recorded.

## Results

One hundred patients had surgically proven gallbladder stones. In all patients, the prospective diagnosis of cholecystolithiasis was correctly made on sonography. Thus sensitivity and specificity of sonography with regard to cholelithiasis were 99%. Forty two patients had ancillary sonographic findings indicating chronic cholecystitis beyond the presence of cholecystolithiasis including gallbladder wall thickening.

Initially, all patients underwent laparoscopy (table1). Out of 100 patients with cholecystolithiasis on sonography, we encountered laparoscopic cholecystectomy in 72 patients (72%) see (figure 2). There were 52 patients (72.2%) with normal gallbladder wall thickness and 20 patients (27.8%) with thick wall gallbladder (figure 3). There were adhesions in 32 patients (44%), as shown in (figure 4) but most of them were easy to separate from the gallbladder. We had no serious complications. Perforation of the gallbladder happened intra-operatively in 8 patients (11.1%) six of which were iatrogenic (with hook/spatula during dissection of the gallbladder from the liver bed) while two perforation occurred during extraction of the gallbladder from the epigastric port and some stones dropped into the abdominal cavity. It took us an additional 8 minutes to extract them all. Six of the perforated gallbladders had normal gallbladder wall thickness and two was thick-walled. No postoperative complications were recorded apart from the usual, mild, abdominal pain mostly at wound sites and occasional postoperative vomiting. We put a subhepatic tube drain in only two patient and it was removed the following day with only a few milliliters of blood. The duration of laparoscopic cholecystectomy ranged from 25-40 minutes (figure 5).

Out of 100 patients with cholecystolithiasis on sonography we encountered difficulties at laparoscopic preparation in 20 (20%) two of whom (10%) had normal gallbladder wall thickness while 18 (90%) had thick-walled gallbladders. Gallstones varied in number in those cases.

We faced adhesions in all those "difficult" procedures (100%) and they were dense and not easy to separate from the gallbladder and nearby structures and therefore required time for safe dissection to free the operative field. Four gallbladders (20%) were perforated intra-operatively Two of which had normal gallbladder wall thickness while the other was thick-walled. No major postoperative complications were recorded apart from mild wound site pain and sometimes vomiting postoperatively. We left a subhepatic tube drain in 6 patients (30%) and all were removed within 24 hours with a few milliliters of blood. The duration of a "difficult" laparoscopic cholecystectomy ranged from 50 to 110 minutes.

The procedure was converted to open cholecystectomy in 8 patients (8%), four because of difficulty in assessing the anatomy of Calot's triangle and four because of adhesions around the gallbladder that were too dense, consequently hazardous, to be dissected laparoscopically. Gallbladder wall thickness was normal in four of them and thick (above 4 millimeters) 4 in the other four.

Early conversion was performed with the intention to minimize the risk of complications. All of them had intra-abdominal subhepatic tube drain (that eventually produced very little drainage of blood that were removed within 48 hours). The time taken to make the decision to convert from laparoscopic to open cholecystectomy ranged from 20 to 45 minutes.

Gallbladder wall thickness was an important predictor of difficulties during laparoscopic preparation of the operative

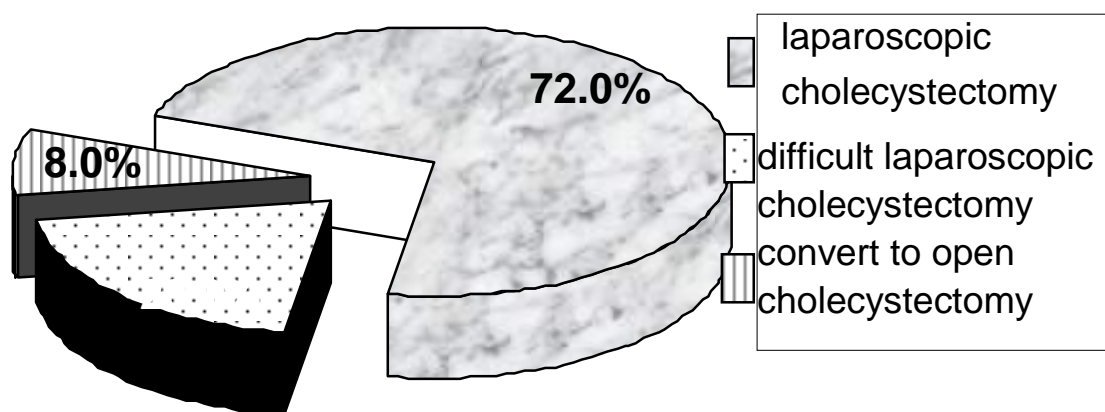
field and difficulty in detaching the gallbladder from the liver bed. We encountered such difficulties in 42 (42%) of 100 patients with gallbladder wall thickness greater than 4 millimeter because of the limits of laparoscopic instruments or visualization of the operative field that lead to conversion in four patients, and comparison between the three group of study (laparoscopic cholecystectomy, difficult laparoscopic

cholecystectomy, and conversion to open cholecystectomy) was statistically significant with p value < 0.05 with difficult laparoscopic cholecystectomy group carry a high percentage of thick wall gallbladder (>4mm) which was (90%).

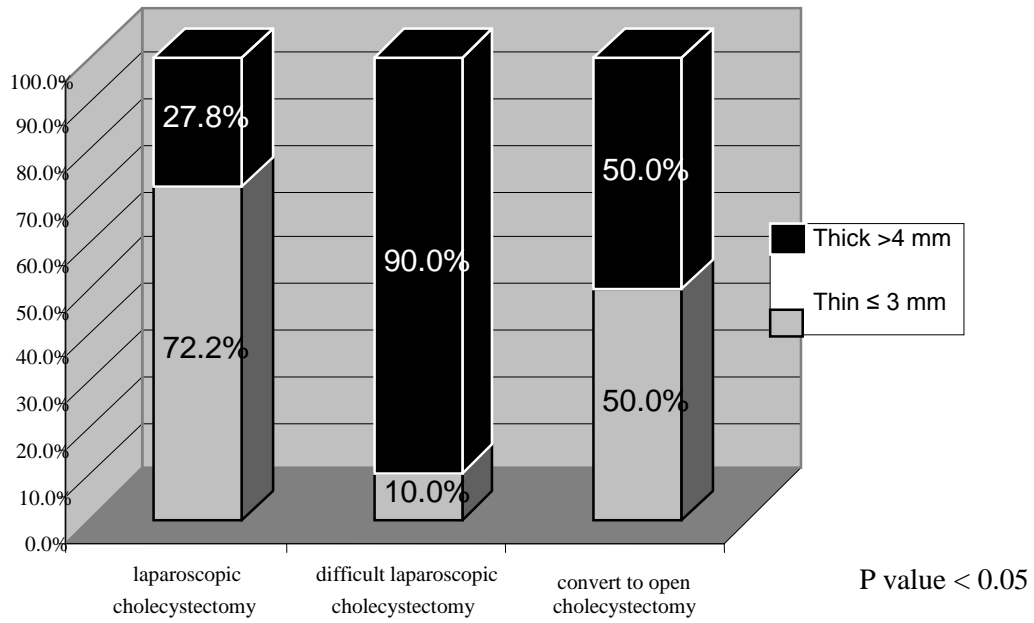
All histopathological examination of the gallbladder revealed chronic inflammation and no malignancy.

**Table I: Sonographic Predictors & Value Of Findings for Patients Undergoing Laparoscopic Cholecystectomy**

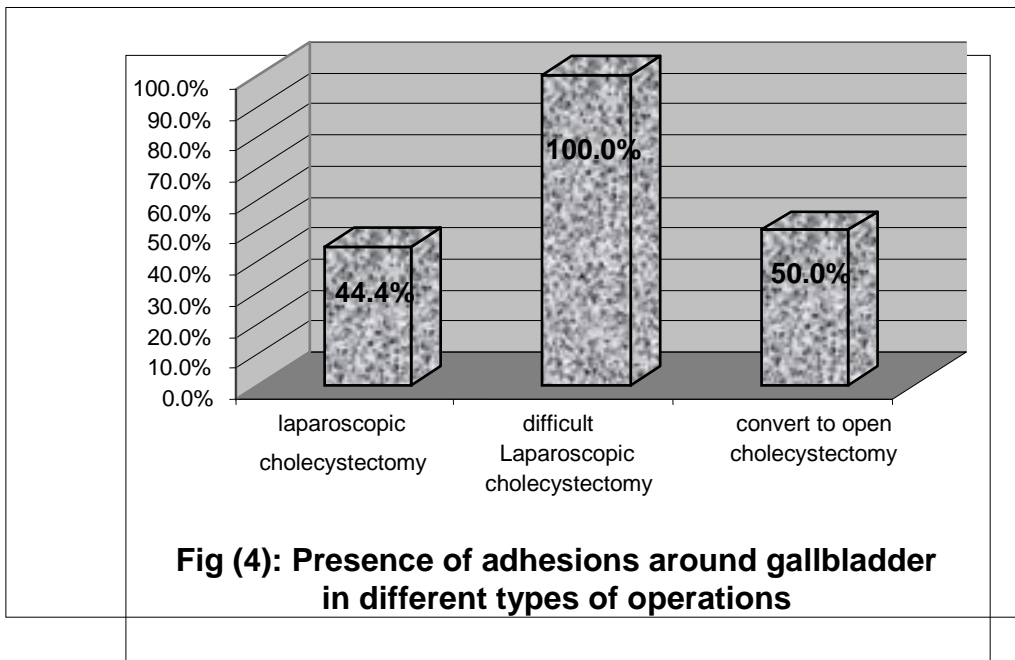
	Number of patients	Thickness of gallbladder wall	Presence of adhesions around gallbladder	Complications		Presence of drain	Duration of procedure
				Intraop.	Postop.		
Laparoscopic cholecystectomy	72 (72%)	52≤3mm(72.2%) 20>4mm(27.8%)	32→there are adhesions(44%)	8 patients there are perforation of gallbladder wall(11.1%)	-(0%)	2 patient (2.77%)	25-40 minutes
Difficult Laparoscopic cholecystectomy	20 (20%)	2≤3mm(10%) 18>4mm (90%)	there are adhesions in all patients(100%)	4 patients there are perforation of gallbladder wall(20%)	-(0%)	6 patient (30%)	50-110 minutes
Convert to open cholecystectomy	8 (8%)	4≤3mm(50%) 4>4mm (50%)	4→there are adhesions(50%)	-(0%)	Wond infection and later develop incisional hernia(25%)	All 8 patients (100%)	20-45 minutes and then convert

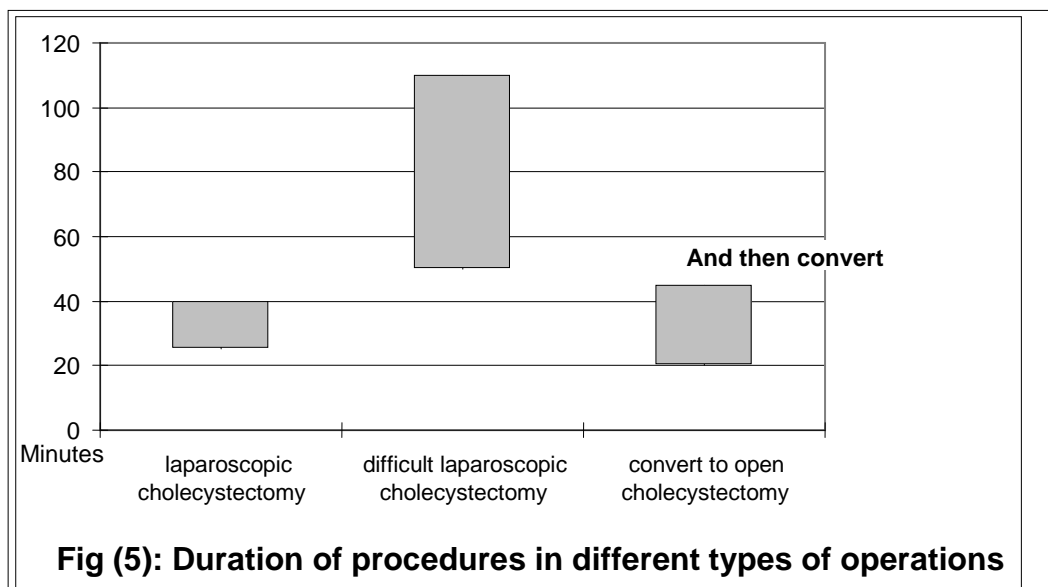


**Fig (2) Percentage of different type of operations**



**Fig (3): percent of gallbladder wall thickness in different operations**





## Discussion

Preoperative diagnostic procedures are designed to support the decision process for the adequate treatment of patients with gallstone disease. We assessed the value of sonography for patients with gallstone disease prior to laparoscopic cholecystectomy. Certain information is required by surgeons to plan the appropriate procedure. Sonography is a valuable tool in detecting gallstones consequently estimating patients' surgical risks and suggesting whether further work-up of the bile duct is required. This study corroborates the well-established high accuracy of sonography for assessing the thickness of gallbladder wall.

An important question is whether it is possible to assess local operability prospectively. In our study, the conversion rate to open surgery (8%) was within the range reported by several other studies (0.9-14 %) <sup>5-7</sup>. A study by Fuchs et al. <sup>8</sup> found that laparoscopy may be advantageous for patients who are difficult to operate on. Although conversion to laparotomy alone does not worsen the patients' outcome, several reasons support the advantage of preoperative assessment of the feasibility of laparoscopy.

It is important to have some idea about the individual patient's risk when obtaining informed consent. Identifying potential difficulties is especially important in a teaching hospital where open cholecystectomy has become a rare procedure <sup>9</sup> and requires the presence of a surgeon who is experienced in this particular approach.

Our findings suggest that patients with excessive gallbladder wall thickening and symptoms of cholecystolithiasis tend to impose technical difficulties during laparoscopic cholecystectomy. In around 87% of the patients with gallbladder wall thickening (>4 millimeter) surgeons encountered surgical difficulties <sup>2,3</sup>. Gallbladder wall thickness can be assessed with a margin of error ranging from 1 to 1.5 millimeter. In healthy patients, 97% of individuals have a gallbladder wall thickness less than 2 millimeter <sup>10</sup>. In our study, gallbladder wall thickness of more than 4 millimeter was significantly associated with a difficult surgical procedure and long operative time. Chronic inflammation may also lead to bleeding that compromises orientation and the visual exposure at surgery forcing surgeons to abandon the laparoscopic access. In

patients with chronic inflammation, pericholecystic adhesions frequently impede the separation of the gallbladder from its bed. In gallstone disease, the histopathologic substrate for sonographic thickening of the gallbladder is chronic pericholecystic inflammation.

Gallbladder wall thickening was a sensitive indicator of technical difficulties and the risk of conversion. However, gallbladder wall thickening may also result from other causes such as hypoalbuminemia, hepatitis, sclerosing cholangitis or AIDS cholangitis, adenomyomatosis, congestive heart failure, portal hypertension, or tumours<sup>10,11</sup>. Therefore, patients with comorbid illnesses like Ischemic heart disease, hypertension, diabetes mellitus,

sickle cell anaemia, etc. were excluded from our research.

In conclusion, an accurate preoperative diagnostic tool is mandatory for planned laparoscopic gallbladder surgery to provide information for the selection of the most appropriate approach and to avoid intraoperative difficulties and surprises. We think that sonography should play a central role in surgical planning for laparoscopic cholecystectomy. In our study, a checklist helped us to systematically record all relevant sonographic information and to convey it to the surgeon. It appears that gallbladder wall thickening is the best predictor for difficulties in laparoscopic cholecystectomy.

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