

CLINICAL IMPLICATIONS OF GALLBLADDER WALL THICKNESS IN
CHOLECYSTECTOMY PROCEDURES EXPLORED

Surgery

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ABSTRACT

Background- Pathological issues of GB often manifest through changes in wall thickness, with ultrasonography revealing healthy thickness below 3 mm. gallbladder wall thickness assessment has become pivotal in diagnostic imaging, guiding surgical planning. **Methods-** This prospective longitudinal study spanned 16 months, from September 1, 2022, to December 31, 2023. After applying the inclusion and exclusion criteria, 136 patients were included in the study. Haematological and radiological assessments were conducted, followed by cholecystectomy procedures. Both intraoperative and postoperative complications were documented in an Excel spreadsheet, and statistical analyses were carried out using SPSS version 2.0. **Results & Discussion-** A study involving 152 patients revealed that 136 were eligible after applying inclusion and exclusion criteria, with a predominant age group of 20-40 years. Among the patients, 65% were female. Intraoperative complications associated with thickened gallbladder walls, particularly bleeding, were observed, with complication risk escalating with increased wall thickness. Inflamed gallbladder walls are more prone to bleeding due to friability and enlarged blood vessels, leading to poor visualization and orientation during surgery. Moreover, thicker gallbladder walls correlated with prolonged intraoperative duration and increased likelihood of difficulties during cholecystectomy, including bleeding, bile leakage, frozen Calot's triangle, conversion to open surgery, and drain placement, particularly when the wall thickness exceeded 3mm on ultrasound. **Conclusion-** The study aimed to evaluate the influence of gallbladder wall thickness on cholecystectomy outcomes. Findings indicated that thicker gallbladder walls correlated with heightened complication risks and prolonged hospital stays post-surgery. This underscores the significance of gallbladder wall thickness as a preoperative indicator for surgical challenges, facilitating informed patient counselling and potential need for open cholecystectomy.

KEYWORDS

BACKGROUND

Gallbladder-related illnesses have become increasingly prevalent, leading to a rise in both planned and urgent surgical interventions. Laparoscopic cholecystectomy, a procedure frequently conducted by general surgeons, has consequently become one of the most commonly performed surgeries globally. (1) The gallbladder, an essential component within the biliary system, plays a vital role in storing and concentrating bile to facilitate fat digestion. Its wall consists of mucosa, muscular layers, peri muscular subserosal connective tissue, and serosa, differing from other gastrointestinal structures by lacking muscularis mucosae and submucosa. Pathological issues affecting the gallbladder, such as inflammation, neoplasms, and structural anomalies, frequently present with alterations in wall thickness. In ultrasonography (USG), the typical thickness of a healthy gallbladder wall is usually less than 3 mm. A thickness exceeding 3 mm suggests the possibility of cholecystitis, although early stages of gallbladder carcinoma may exhibit thin walls and remain asymptomatic. Thickening of the gallbladder wall can occur due to both benign and malignant causes. The thickness of the gallbladder wall plays a crucial role in determining the appropriate surgical intervention for gallbladder conditions. A prevalent occurrence of conversion rates ranging from 3.6% to 13.9% has been noted, with several studies indicating a positive correlation between gallbladder wall thickness exceeding 3mm on pre-operative ultrasound. (2,3) Dinkel and colleagues discovered that thickening of the gallbladder wall is the most sensitive indicator of technical challenges during laparoscopic cholecystectomy. (4) Consequently, assessing gallbladder wall thickness has become a significant aspect of diagnostic imaging, offering valuable guidance for surgical planning. (5) This study embarks on a profound exploration of the preoperative assessment of gallbladder wall thickness through radiological means, particularly utilizing ultrasonography (USG), while also delving into the intricacies of its management during both intraoperative and postoperative stages. (6-8)

MATERIALS AND METHODS

This prospective longitudinal study spanned 16 months, from

September 1, 2022, to December 31, 2023, conducted within the surgery department of Darbhanga Medical College and Hospital, Bihar, India. Approval from the institute's committee preceded the commencement of the study, and patients provided informed consent before data collection. The inclusion criteria encompassed adults aged 18 years and above of any gender who underwent cholecystectomy at our institution for various indications, including symptomatic cholelithiasis, mucocele of the gallbladder, gallbladder polyps, empyema of the gallbladder, and biliary pancreatitis. Patients with risk factors known to affect wound healing were excluded. a.) Patients under the age of 18. b.) Patients with suspected coronary artery bypass grafting (CABG). c.) Patients with comorbidities such as diabetes, cardiovascular disease, pulmonary disease, coagulopathies, or end-stage liver disease. A series of assessments were conducted, encompassing both general preoperative evaluations and investigations tailored to specific diseases. Preoperative evaluations involved blood tests including complete blood counts, urine analysis, blood glucose levels, coagulation profiles, liver and kidney function tests, viral marker screenings, electrocardiograms (ECG), and chest X-rays. Disease-specific investigations included whole abdominal ultrasonography, supplemented by contrast-enhanced computed tomography (CECT) or when deemed necessary. The ultrasonography findings were documented, detailing gallbladder distension, the presence, location, and size of stones, gallbladder wall thickness, pericholecystic oedema, and common bile duct (CBD) diameter. Patients were categorized into three groups based on their gallbladder wall thickness.

1. Normal (<3mm)
2. Moderately thickened (3-5mm)
3. Severely thickened (>5mm)

All patients underwent either open or laparoscopic cholecystectomy. Intraoperative complications such as bleeding, biliary spillage, frozen Calot's triangle, operative time, and postoperative complications were documented. Data were collected using a structured form. The statistical analysis was conducted using IBM Statistical Package for the Social Sciences (SPSS) version 2.0 for Windows. Mean values

were computed for continuous variables, while percentages were calculated for categorical variables.

RESULTS

A total of 152 patients of attended the surgery outpatient and emergency department of the institute for elective cholecystectomy during the study period. Of which after applying the inclusion and exclusion criteria, 136 patients were included in the study population. Out of 136 patients, 89 patients were females (65.4%) and 47 patients were male (34.6%). (Fig. 01) The age distribution is as shown in the graph below. Majority of the population lies in the age group of 20-40 years. Majority of the patients were females (65%).

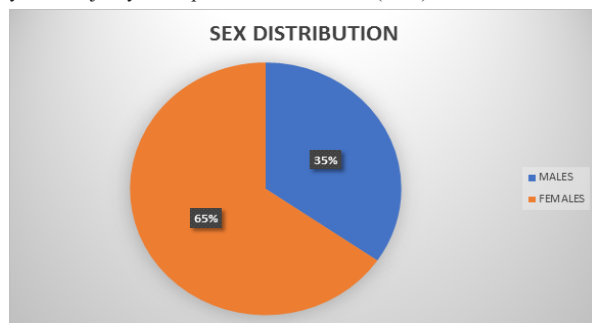


FIG. 01. Sex Distribution Of The Study Population

TABLE 01 : Age Distribution Of The Patients Underwent Cholecystectomy

AGE GROUP (YRS)	NO. OF PATIENTS	PERCENTAGE (%)
0-20	12	8.8
20-40	67	49.3
40-60	43	31.6
>60	14	10.3
TOTAL	136	100

The intraoperative complications seen with thickened gall bladder wall are bleeding. The risk of complication increases with the increase in thickness of gall bladder wall. The inflamed gallbladder wall becomes friable and the enlarged blood vessels are more likely to break and causes intraoperative bleeding that will lead to poor visual exposure and compromises orientation. The other complications seen are bile leak, drain placement, frozen calot and conversion of lap to open cholecystectomy. The incidence of these complications are depicted in table below.

Table 02 : Incidence Of Different Complications Related To Gall Bladder Wall Thickness

GALL BLADDER WALL THICKNESS	BLEEDING (%)	BILE LEAK (%)	DRAIN PLACEMENT (%)	FROZEN CALOT (%)	CONVERSION OF LAP. TO OPEN (%)	TOTAL (%)
NORMAL (<3 MM)	4 (7.7)	4 (7.7)	5 (9.6)	15 (28.8)	8 (15.4)	52 (38.2)
MODERATELY THICKENED (3-5 MM)	11 (26.8)	8 (19.5)	12 (29.3)	11 (26.8)	8 (19.5)	41 (30.2)
SEVERELY THICKENED (>5 MM)	27 (62.8)	32 (74.4)	37 (86)	39 (90.7)	34 (79)	43 (31.6)
TOTAL	42 (30.9)	44 (32.4)	54 (39.7)	65 (47.8)	50 (36.8)	136 (100)

It was observed that with increase in gall bladder wall thickness, the intraoperative time was greater, as depicted in the table below. TABLE 03

Table 03: Mean Operative Time In Relation To Gall Bladder Wall Thickness

GALL BLADDER WALL THICKNESS	MEAN OPERATIVE TIME (MINS)	NO. OF PATIENTS
NORMAL (<3 MM)	27.5	52

MODERATELY THICKENED (3-5 MM)	36	41
SEVERELY THICKENED (>5 MM)	69	43

It was observed that mean hospital stay increases with increase in the gall bladder wall thickness. The mean hospital stay with normal wall thickness was 2 days while it increases greatly with thickness in gall bladder wall that is mean of 7 days with severely thickened gall bladder wall.

Table 04 : Mean Hospital Stay In Relation To Gall Bladder Wall Thickness

GALL BLADDER WALL THICKNESS	MEAN HOSPITAL STAY (DAYS)	NO. OF PATIENTS
NORMAL (<3 MM)	2	52
MODERATELY THICKENED (3-5 MM)	5	41
SEVERELY THICKENED (>5 MM)	7	43

Difficulty during cholecystectomy has been associated with a longer operative time, the use of more anaesthetics, increased overall morbidity, a higher risk of infection, long recovery time, long hospital stay, higher cost and poor patient satisfaction. Gall bladder wall thickness was an important predictor of difficulties during cholecystectomy. We faced such difficulties when gall bladder wall thickness was more than 3mm on usg.

On the part of patients benefit, they can be made aware of the possibility of complications and conversion to open cholecystectomy. The patient can be mentally prepared better and can adjust his or her expectations accordingly. In addition, the surgeon can directly perform the classical open cholecystectomy in the patients with presumed difficult surgery thus saving operating time and the conversion rate.

DISCUSSION

Presently, laparoscopic cholecystectomy stands as the preferred surgical method for treating gallstone disease. However, a small percentage of cases may require conversion to open procedures due to challenges such as limited visibility of surgical anatomy caused by inflammation, dense adhesions, anomalous anatomy, or other factors. Some cases may also experience intra or postoperative complications. Identifying factors that predict conversion and complications could prove advantageous for both surgeons and patients in terms of outcomes.

In terms of demographic characteristics, the male-to-female ratio (M:F) in our study was 1:1.89, mirroring findings from a study conducted in India by Chandra et al., where the sex ratio was 1:1.64 (9). This stands in contrast to observations from Western studies. (10)

According to the findings of this study, a thicker gallbladder wall is associated with a higher likelihood of requiring conversion to an open procedure and an elevated risk of both intraoperative and postoperative complications. Additionally, it prolongs the operative time and extends the total duration of hospital stay.

The total conversion rate to an open procedure was 36.8%, which is higher than the range reported in the literature, typically falling between 5-10% (11), and aligns closely with the findings of a study conducted by Chandra et al. (9). The conversion rate was higher among patients with thicker gallbladder walls, consistent with existing literature. In most instances, dense inflammatory adhesions, often stemming from cholecystitis or empyema of the gallbladder, were the primary reason for conversion, rendering safe dissection unfeasible.

Operative time and postoperative length of stay were additional criteria examined in this study. The group with normal gallbladder wall thickness exhibited the shortest mean operative time at 27.5 minutes. As gallbladder wall thickness increased, the mean operative time also increased, a finding consistent with existing literature (12).

Another parameter considered in this study was the postoperative length of stay, serving as an outcome measure following surgery. The group with normal gallbladder wall thickness exhibited the shortest mean postoperative time, at 2 days, while the severely thickened group showed the highest mean postoperative time, at 7 days. Factors contributing to the prolonged length of stay included postoperative bile leak, postoperative pain, and surgical site infection. The

postoperative length of stay observed in this study is slightly greater than that reported in the literature. (12)

This study had several limitations, one of which pertained to the timing of ultrasonography (USG). In some cases, USG was conducted in an elective setting, while in others, it was performed urgently in response to acute abdominal pain, particularly in cases of cholecystitis. Despite being conducted by a single expert radiologist, ultrasonography is inherently subjective.

CONCLUSION

This study was done to ascertain the impact of wall thickness of gall bladder on surgical management in patients undergoing cholecystectomy. It concluded that an increase in the thickness of the gall bladder wall leads to an increased risk of complications as well as an increased length of hospital stay post operatively, making gall bladder wall thickness an important pre operative indicator for intra operative difficulties faced by surgeons and post operative complications. Increase in gall bladder wall thickness also helps us to plan out the surgery in advance and take consent and appraise the patient of the possible necessity for open cholecystectomy during preoperative patient counselling.

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