Al Ameen J Med Sci 2026;19(1):63-67 ● US National Library of Medicine enlisted journal ● ISSN 0974-1143

ORIGINAL ARTICLE CODEN: AAJMBG

Correlational study of gall bladder wall thickness using ultrasound and outcomes in laparoscopic cholecystectomy in females

Mohammad Fakruddin[1] and Mohammad Abbas[2*]

[1]Department of Medical Gastroenterology, Al Ameen Medical College and Hospital, Athani Road, Vijayapura-586108, Karnataka, India and [2]Department of Anaesthesiology and Critical Care Medicine, Al Ameen Medical College and Hospital, Athani Road, Vijayapura-586108, Karnataka, India

Received: 28th October 2025; ***Accepted:*** 24th December 2025; ***Published:*** 01st January 2026

Abstract: *Background:* Laparoscopic cholecystectomy is the current gold standard for managing acute cholecystitis and symptomatic gallstone disease, offering faster recovery, shorter hospital stay, and reduced wound morbidity compared to open surgery. Ultrasound is the preferred diagnostic tool for gallstones and biliary dilation, with gallbladder wall thickening frequently noted as a hallmark of acute cholecystitis. Increased wall thickness has been linked to intraoperative difficulties such as hemorrhage, biliary or adjacent organ injury, prolonged dissection time, conversion to open surgery, and extended postoperative recovery. *Objective:* To evaluate the relationship between gallbladder wall thickness and intraoperative as well as postoperative complications. *Materials and Methods:* Patients diagnosed with acute cholecystitis by ultrasound and undergoing laparoscopic cholecystectomy at a tertiary care center in South India over 18 months were included. Intraoperative complications (major hemorrhage, biliary or structural injury, prolonged dissection time, conversion to open surgery) and postoperative outcomes (surgical site infection, hospital stay duration) were analyzed in relation to preoperative gallbladder wall thickness. *Results:* Complication rates were higher in patients with moderately (4–5 mm, 33.4%) and severely (5–6 mm, 53.9%) thickened gallbladder walls compared to mildly thickened (3–4 mm, 30.0%) walls. Postoperative hospital stay was also significantly longer in the moderate and severe groups. *Conclusion:* Greater gallbladder wall thickness correlates with increased intra- and postoperative complications, higher conversion rates to open surgery, and longer hospital stays.
Keywords: Laparoscopic cholecystectomy, Gall bladder wall thickness, Ultrasound, Cholecystitis.

Introduction

Elective laparoscopic cholecystectomy is currently the gold standard for the management of acute cholecystitis and symptomatic gallstone disease, having largely replaced open cholecystectomy. Patients undergoing laparoscopic cholecystectomy experience faster recovery, shorter postoperative hospital stays, and reduced wound-related morbidity. Abdominal ultrasonography has become the imaging modality of choice for the diagnosis of gallstones and is also useful in identifying associated biliary dilatation. Gallbladder wall thickening is a frequent sonological finding and is considered a hallmark feature of acute cholecystitis.

Gallbladder wall thickness on ultrasound has been observed to correlate with several intraoperative challenges, including major haemorrhage, prolonged gallbladder dissection time, injury to biliary or surrounding structures, conversion to open cholecystectomy, and increased postoperative hospital stay and surgical site infection. Recently, gallbladder wall thickening has been proposed as a valuable preoperative predictor of difficult laparoscopic cholecystectomy. This highlights the importance of evaluating gallbladder wall thickness when assessing operative risk.

Elective laparoscopic cholecystectomy remains the definitive management for symptomatic gallstone disease [1]. Gallbladder wall thickness serves as an important indicator of cholecystitis in patients presenting with gallstone-related symptoms [2]. The normal gallbladder wall measures less than 3 mm on ultrasonography [3], and

ultrasonographic measurement has been shown to be accurate to within 1 mm in 93% of patients [4]. A gallbladder wall thickness exceeding 3 mm is suggestive of cholecystitis [5-7]. Although wall thickening may also occur in other conditions such as gallbladder carcinoma and adenomyomatosis, in those pathologies, the wall alteration forms part of the underlying disease process [8-9].

Predicting conversion to open surgery and identifying potential intraoperative complications are crucial aspects in the management of gallstone disease [10]. Gallbladder wall thickness is one of the key parameters in determining the complexity of surgery and planning the operative approach. The aim of the present study was to evaluate the impact of gallbladder wall thickness on the outcomes of laparoscopic cholecystectomy for gallstone disease and to establish its significance as an important preoperative marker for predicting intraoperative and postoperative complications, conversion to open surgery, operative duration, and postoperative length of stay.

Material and Methods

Patients admitted to a tertiary care centre in South India with a diagnosis of acute cholecystitis on ultrasound and who underwent laparoscopic cholecystectomy over an 18-month period were included in the study, Surgery was performed by single surgeon with more than 10 year experience. Intraoperative complications such as major haemorrhage, biliary injury, bile leak, prolonged gallbladder dissection time, and conversion to open cholecystectomy, as well as postoperative complications such as surgical site infection and duration of postoperative hospital stay, were assessed and analysed in relation to preoperative gallbladder wall thickness.

Inclusion criteria:

- Female patients aged 18 to 65 years
- Cases diagnosed with acute cholecystitis on ultrasound abdomen
- Patients undergoing laparoscopic cholecystectomy

Exclusion criteria:

- Male patients
- Patients in whom gallbladder wall thickness could not be measured
- Patients with choledocholithiasis or gallbladder malignancy

Results

In this study, 88 female patients who underwent laparoscopic cholecystectomy were included. Of these, 10 patients (11.4%) were between 21–30 years of age, 36 patients (40.9%) were 31–40 years, 22 patients (25.0%) were 41–50 years, and 10 patients each (11.4%) were 51–60 years and ≥61 years of age. Preoperative gallbladder wall thickness measurements showed that 26 patients (29.5%) had a wall thickness of 3–4 mm, 42 patients (47.7%) had a thickness of 4–5 mm, and 20 patients (22.7%) had a thickness of 5–6 mm. among patients with a preoperative gallbladder wall thickness of 5–6 mm, 8 patients (30.8%) experienced bile leakage. In those with a wall thickness of 4–5 mm, 12 patients (28.6%) had bile leakage, while 6 patients (30.0%) with a wall thickness of 3–4 mm also developed bile leakage.

Table-1: Association of Rate of Conversion Laparoscopic cholecystectomy to open cholecystectomy and Preoperative GB wall thickness

	PREOPERATIVEGB WALL THICKNESS			
Conversion	**3 to 4mm**	**4 to 5mm**	**5 to 6mm**	**Total**
NO	24	42	20	86
	23.3%	48.8%	27.9%	100%
	100.0 %	100.0 %	92.3 %	97.7%
YES	0	0	2	2
	0.0	0.0	100%	100%
	0.0	0.0	7.7 %	2.3 %
Total	24	42	22	88
	22.7 %	47.7 %	29.5 %	100%
	100.0 %	100.0 %	100 %	100%

If GB wall thickness 5to 6mm, 4(7.7%) patients had conversion of laparoscopic cholecystectomy to open cholecystectomy (Table-1).

Table-2: Relationship between preoperative gallbladder (GB) wall thickness and the occurrence of surgical site infection (SSI) on postoperative days 3, 7, and 30				
	PREOPERATIVEGB WALL THICKNESS			
SSI Day 3 7 30	3 to 4mm	4 to 5mm	5 to 6mm	Total
NO	26	42	20	88
	29.5%	47.7 %	22.7%	100.0 %
	100.0%	100.0 %	100.0%	100.0%
Total	26	42	20	88
	29.5%	47.7%	22.7%	100.0%
	100.0%	100.0%	100.0%	100.0%

In this study, none of the patients in any GB wall thickness category developed SSI at any of the assessed postoperative time points (day 3, day 7, or day 30). All 88 patients (100%) were free of SSI during follow-up (Table-2).

For patients with a GB wall thickness of 3–4 mm (n = 26), the mean dissection time was 50.0 minutes , in the 4–5 mm thickness group (n = 42), the mean dissection time was comparatively lower at 44.7 minutes , Patients with a GB wall thickness of 5–6 mm (n = 20) had the highest mean dissection time, averaging 55.5 minutes . Overall study suggests that increasing GB wall thickness tends to be associated with longer GB dissection times, particularly in patients with a wall thickness of 5–6 mm, indicating greater operative difficulty with thicker gallbladder walls (Table-3).

Table-3: Association between preoperative gallbladder (GB) wall thickness and GB dissection time (in minutes).								
	GB thickness	Number	Mean	SD	Minimum	Maximum	Median	
GB dissection Time (mins)	3 to 4 mm	26	50.0	1.2402	40	120	45	*Inter-group P-value < 0.0001
	4 to 5 mm	42	44.7	1.2228	45	90	90	
	5 to 6 mm	20	55.5	1.5270	50	60	55	
*p-value < 0.05 was considered statistically significant.								

The mean gallbladder dissection time differed significantly across preoperative gallbladder wall thickness categories (3–4 mm, 4–5 mm, and 5–6 mm). One-way ANOVA demonstrated a statistically significant inter-group difference (P < 0.0001), with longer dissection times observed in patients with thicker gallbladder walls.

Table-4: Relationship between preoperative gallbladder (GB) wall thickness and the duration of hospital stay.								
	GB thickness in mm	Number	Mean	SD	Minimum	Maximum	Median	
Duration Hospital Stay time (in days)	3 to 4	26	3.7	1.8233	2.0	5.0	3.0	*Inter-group P-value <0.05
	4 to 5	42	4.8	1.7498	3.0	6.0	4.0	
	5 to 6	20	5.5	1.4500	6.0	9.0	6.0	
*p-value < 0.05 was considered statistically significant.								

Patients with a GB wall thickness of 3–4 mm (n = 26) had a mean hospital stay of 3.7 days, In the 4–5 mm group (n = 42), the mean duration of hospital stay increased to 4.8 days , Patients with the thickest GB walls (5–6 mm) (n = 20) experienced the longest hospital stay, with a mean duration of 5.5 days . Overall, the table demonstrates a progressive increase in the duration of hospital stay with increasing preoperative GB wall thickness, suggesting that thicker gallbladder walls are associated with more complex postoperative recovery and prolonged hospitalization (Table-4).

Discussion

Laparoscopic cholecystectomy remains one of the most commonly performed minimally invasive surgeries worldwide. Although the majority of procedures are completed without difficulty, complications and the need for conversion to open surgery still occur. Identifying predictive factors for these outcomes is essential for improving surgeon preparedness and optimizing patient counselling.

In the present study, only female patients were included. Literature reports have shown a female predominance in gallbladder disease, with female-to-male ratios as high as 4.36:1, whereas a study conducted in Mysuru, Karnataka reported a more modest ratio of 1.6:1 [11, 12]. Several predictors of difficult laparoscopic cholecystectomy have been described, including male sex, advanced age, acute cholecystitis, and longer duration of symptoms prior to surgery. However, relatively few studies have emphasized gallbladder wall thickness as a significant preoperative predictor of operative difficulty.

There is currently no universal consensus on what constitutes a thickened gallbladder wall. For the purposes of this study, we defined a normal thickness as ≤ 3 mm. Our analysis demonstrated that increased gallbladder wall thickness was strongly associated with a higher risk of intraoperative and postoperative complications, prolonged postoperative hospital stay, and an increased likelihood of conversion to an open cholecystectomy. The conversion rate in our study was 2.3%, which is slightly lower than the 4.63% reported in the literature. The most common reason for conversion was a frozen Calot's triangle caused by dense inflammatory adhesions secondary to acute cholecystitis or gallbladder empyema, which prevented safe dissection.

Intraoperative complications in our case series included major hemorrhage (6.8%), bile leak (29.5%), and a mean gallbladder dissection time of 68.06 minutes. Overall, the incidence of intraoperative complications was 40.9%. Postoperative recovery also correlated with gallbladder wall thickness: patients with mildly thickened walls had the shortest hospital stay (3.7 ± 1.823 days), whereas those with markedly thickened walls had the longest (6 ± 1.45 days).

This study has certain limitations. In emergency cases, ultrasonography was performed during the same admission, while many elective cases had imaging done months earlier. This discrepancy may have resulted in unrecorded changes in gallbladder wall thickness between imaging and surgery. Additionally, ultrasonography is inherently subjective, and its accuracy depends on the radiologist's expertise. Variability in measurements may also occur because different regions of the gallbladder can exhibit different wall thicknesses [13-15].

Although some may argue that delaying surgery in an acute setting allows inflammation to subside, our findings suggest that previous severe inflammation may still predispose to adverse outcomes despite delayed intervention. In our study, most patients undergoing emergency surgery presented within 48 hours of symptom onset, suggesting that early severe inflammation may play a more significant role than timing alone.

Conclusion

An increase in gallbladder wall thickness is associated with a higher risk of complications, a greater likelihood of conversion to open surgery, and a longer postoperative hospital stay. Patients with thicker gallbladder walls consistently demonstrated prolonged hospitalization following surgery. This finding is highly relevant for preoperative patient

counseling, as patients frequently inquire about their expected duration of stay.

Ultrasonography, being a subjective imaging modality, requires the expertise of an experienced sonologist to ensure accurate measurement of wall thickness. When the gallbladder wall thickness exceeds 3 mm, the rates of complications and conversions are significantly elevated. This information is essential for managing patient expectations, enhancing surgeon preparedness, and facilitating more effective preoperative discussions, including obtaining informed consent.

Financial Support and sponsorship: Nil

Conflicts of interest: There are no conflicts of interest.

References

1. Dawood Al-Hilfi A, Al-Jawher MH, Taha SA. The impact of the gallbladder wall thickness assessed by sonography on the outcome of laparoscopic cholecystectomy. *Basrah Journal of Surgery.* 2011; 17(2):30-36.
2. Raman SR, Moradi D, Samaan BM, Chaudhry US, Nagpal K, Cosgrove JM, Farkas DT. The degree of gallbladder wall thickness and its impact on outcomes after laparoscopic cholecystectomy. *Surgical Endoscopy.* 2012; 26:3174-3179.
3. Ghazanfar S, Qureshi S, Raza SN, Quraishy MS. Prediction of difficult laparoscopic cholecystectomy on the basis of gallbladder wall thickness. *Annals Abbassi Shaheed Hospital and Karachi Medical and Dental College.* 2013; 18(1):22-25.
4. Choi JH, Lee SS, Choi JH, Park DH, Seo DW, Lee SK, Kim MH. Long-term outcomes after endoscopic ultrasonography-guided gallbladder drainage for acute cholecystitis. *Endoscopy.* 2014; 46(8):656-661.
5. Sharma N, Sharma DK, Sukhadia M, Barolia DK. The impact of the gall bladder wall thickness on surgical management in patients undergoing cholecystectomy: a prospective study. *Int J Current Microbiol Applied Sci.* 2015; 4(6):514-521.
6. Nidoni R, Udachan TV, Sasnur P, Baloorkar R, Sindgikar V, Narasangi B. Predicting difficult laparoscopic cholecystectomy based on clinicoradiological assessment. *Journal of clinical and diagnostic research: JCDR.* 2015;9(12):PC09.
7. Alamiri MH, Adwan MK. Relation between Gallbladder Wall Thickness, Assessed by Sonography, and Difficulties in Laparoscopic Cholecystectomy. *Journal of the Faculty of Medicine Baghdad.* 2015; 57(2):114-118.
8. Zaman J, Imaduddin S, Razzak R. Frequency of difficult laparoscopic cholecystectomy in patients with thick walled gall bladder. *Pak J Surg.* 2015; 31(3):165-168.
9. Kania D. Ultrasound measurement of the gallbladder wall thickness in the assessment of the risk of conversion from elective laparoscopic cholecystectomy to open surgery Olkusz county experience. *Polish Journal of Surgery.* 2016; 88(6):587-607.
10. 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. *Pakistan Journalof Medical & Health Sciences*. 2016; 10(3):1031-1034.
11. Pathak P, Zaidi R. Role of gallbladder wall thickness in predicting laparoscopic operability prior to cholecystectomy: a retrospective analysis. *International Surgery Journal.* 2018; 5(5):1885-1888.
12. Chandra SBJ, Bose R. Study of the degree of gall bladder wall thickness and its impact on outcomes following laparoscopic cholecystectomy in JSS Hospital. *Int Surg J.* 2018; 5:1417-1421.
13. Jafary MFD, Abdulrazaq AF, Kadum AN. Gall Bladder Wall Thickness: Sonographic Accuracy and Laparoscopic Cholecystectomy Conversion Rate, Evaluated by Histopathology. *Indian Journal of Forensic Medicine & Toxicology*, 2020; 14(2), 2169-2173.
14. Kokoroskos N, Peponis T, Lee JM, El Hechi M, Naar L, Elahad JA, Nederpelt C, Bonde A, Meier K, Mendoza A, King D. Gallbladder wall thickness as a predictor of intraoperative events during laparoscopic cholecystectomy: A prospective study of 1089 patients. *The American Journal of Surgery.* 2020; 220(4):1031-1037.
15. Balbaloglu H, Tasdoven I. Can gallbladder wall thickness and systemic inflammatory index values predict the possibility of conversion from laparoscopy to open surgery?. *Nigerian Journal of Clinical Practice.* 2023; 26(10):1532-1537.

Cite this article as: Fakruddin M and Abbas M. Correlational study of gall bladder wall thickness using ultrasound and outcomes in laparoscopic cholecystectomy in females. *Al Ameen J Med Sci* 2026; 19(1): 63-67.

*All correspondences to: Dr. Mohammad Abbas, Assistant Professor, Department of Anaesthesiology and Critical Care Medicine, Al Ameen Medical College and Hospital, Athani Road, Vijayapura-586108, Karnataka, India. Email: abbas.mohammad094@gmail.com