Relationship between gallbladder wall thickness and the conversion rate to open cholecystectomy

Abstract:

Background: The gold standard procedure for cholecystitis is laparoscopic cholecystectomy. The presence of a thickened GB wall has been recognized as a risk factor in the conversion of LC to OC. The goal of this study is to see if there is a link between gallbladder wall thickness and the rate of conversion to open cholecystectomy. **Patients and methods:** In this prospective study, we looked at (140) patients who had a laparoscopic cholecystectomy at Al-Kadhimiya teaching hospital in the last three years (January 2019 to January 2020) and noted the reasons for conversion to OC. The results of the statistical analysis were then used to identify parameters that were associated with a higher chance of conversion. Our unit's practice on timing for cholecystectomy is general practices interval cholecystectomy for most of our patients. Patients who underwent emergency cholecystectomy were excluded from this study. **Results:** In the current study 18 patients out of 140 patients with cholecystitis who underwent laparoscopic cholecystectomies were converted to open cholecystectomy which equals (13%), as well as The failure to identify the anatomy of the Calot's triangle, a common bile duct injury with bile leak and possibly haemorrhage, or equipment failure were all reasons for the conversion (lack of Co2 gas and poor light source). In the current study, the conversion rate was equal to 13% of the total number of our patients, which constitute 18 patients out of 140, also the highest rate of conversion was within those patients whose age group was more than 50 years old (the total number was 11 patients, 4 patients out of them underwent conversion to OC, which constitutes 36.4 %). Patients aged 20-50 years were in total 124, 14 out of them underwent conversion, which equals 11.3%, while those under 20 years passed smoothly without conversion.so, By ultrasonography, 77.8% of converted cases had gallbladder wall thickness greater than 4mm, while the remaining 22.2 percent of converted cases had wall thickness less than or equal to 4mm.. **Conclusion:** The significant risk factor for conversion to OC was gall bladder wall thickness >4 mm.

keywords: Gallbladder wall thickness; conversion rate; open cholecystectomy

Introduction:

The decision to convert an LC to an open surgery appears to be multifaceted, influenced by factors such as the patient, the pathophysiology of the gallbladder, and the surgeon [(1).] On a national scale, a conversion rate of 5 percent to 10% has been reported [(2).] A conversion can be classified as either elective or enforced, depending on the circumstances. Elective conversions are defined as the surgeon's decision to resort to a laparotomy (due to obscure anatomy or lack of progress with the laparoscopic procedure) before being forced to do so due to a major intraoperative complication, while enforced conversions are defined as when an intraoperative emergency such as uncontrollable bleeding or bile duct injury occurs [(3).]

The gallbladder-related disease is currently one of the most common causes for elective and emergency surgery, with a smooth weakly enhancing thin inner layer consistent with inflamed or sloughed mucosa and a non-enhancing thick outer layer compatible with an oedematous loose connective tissue layer [(4).] In the mid-1980s, laparoscopic cholecystectomy (LC) was developed in Europe as an alternative to open cholecystectomy, a technique that had been used for over a century and is now the treatment of choice for gall bladder pathology [(5).]

The CT attenuation ratio of arterial phase (ARAP) was derived by Maehira et al. to indicate the degree of transitory localized enhancement of the liver next to the gallbladder. They discovered that a higher ARAP1.5 level is a predictor of poor LC and conversion [(6)]

Patients and methods:

In this prospective study, we looked at (140) patients who had a laparoscopic cholecystectomy at Al-Kadhimiya teaching hospital in the previous three years

(January 2019 to January 2020). and recorded reasons for conversion to OC.

Gall bladder wall thickness is an important predictor for conversion we depend on ultrasonic measurement for the wall thickness of each case. we found that if the wall thickness exceeds normal thickness(2_3)mm .risk of conversion increase

After that, a statistical study was carried out to discover factors that were associated with a higher likelihood of conversion. After that, a statistical study was carried out to discover factors that were associated with a higher likelihood of conversion.. Our unit's practice on timing for cholecystectomy is general practices interval cholecystectomy for most of our patients. Diagnostic criteria include clinical signs and symptoms, Ultrasonic findings of cholecystitis. Patients who underwent emergency cholecystectomy were excluded from this study. We include patients with chronic cholecystitis, whilst Patients with acute cholecystitis were excluded, All patients with gall bladder stones without choledocholithiasis

Operative technique:

L.C. is the method of choice for the majority of gall bladder disease patients; the key, as with open surgery, is the identification and self-dissection of calot's triangle.

In our study (although some surgeons perform open subumblical we performed a closed method using a Verre's needle to establish pneumoperitoneum prior to placing the initial trocar) we cut down with direct visualisation of the peritoneum to implant the initial port which will operate as a camera port), and we complete the procedure with a four-port technique for all the patients included in our study.

When the conversion was indicated, we used classical open cholecystectomy using the right Kocher incision for completion of cholecystectomy. It has been challenging to identify a subset of individuals who are at an elevated (risk) of converting from laparoscopic (LC) to open cholecystectomy (OC). We have tried to look at the various factors and conditions that would help a surgeon to predict a difficult L.C., which are essentially the same as those that increase the complexity of

conventional open cholecystectomy.

Statistical analysis:

In the current study To see the effect of hypothesised factors on conversion, researchers employed the Chi-square test, P-value, and simple charts and figures. SPSS (Statistical Package for the Social Sciences) version was used to obtain the p-value [(17).] *p-value* being significant if below 0.05 (significant relationship).

Results:

Conversion to open cholecystectomy:

In the current study, 18 patients out of 140 patients with cholecystitis who underwent laparoscopic cholecystectomies were converted to open cholecystectomy which equals (13%), as shown in Figure 1.

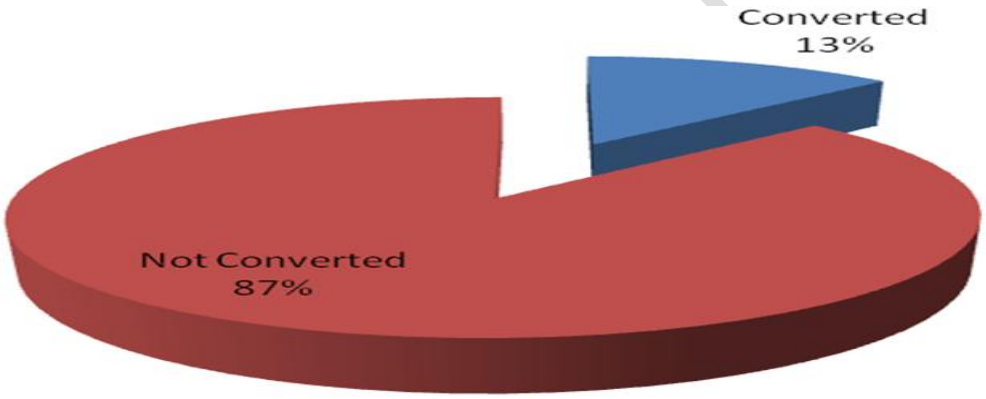


Figure (1): Conversion rate

Conversion to open cholecystectomy was necessary for the following reasons:

The conversion was either owing to a failure to recognise the Calot's triangle anatomy, a frequent bile duct injury with bile leak and/or bleeding, or equipment failure (lack of Co2 gas and poor light source).). In the current study, the conversion rate was equal to 13% of the total number of our patients, which constitute 18 patients out of 140, and this rate was classified as shown in table 1.

Table 1: frequency of causes of conversion

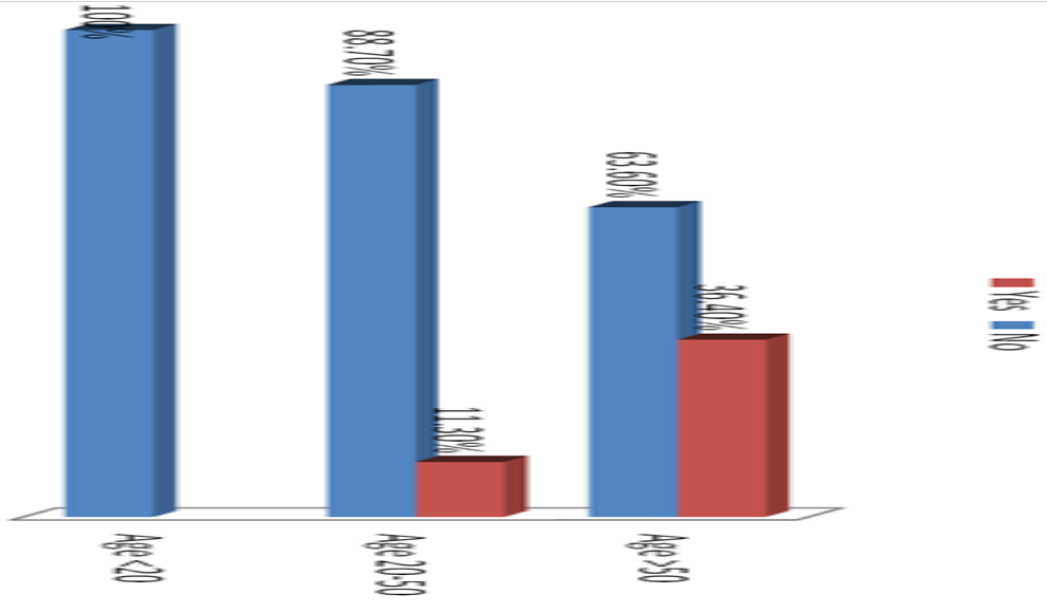
causes of conversion	No.	%
Obscure Anatomy	7	39
Bile duct injury	3	17
Instrument Faliure	2	11
Gall Bladder Empyema	2	11
Uncontrolled Bleeding	2	11
Others (e.g., injury to other organs like stomach, Duodenum)	2	11

Age and conversion to open cholecystectomy

Results in Table 2 and Figure (2&3) shows the conversion rate in different age groups, in our study the highest rate of conversion were within those patients whose age group was more than 50 years old (the total number was 11 patients, 4 patients out of them underwent conversion to OC, which constitutes 36.4 %). Patients aged 20-50 years were in total 124, 14 out of them underwent conversion, which equals 11.3%, while those under 20 years passed smoothly without conversion.

Table 2: The percentage and frequency for each age group with respect to conversion.

Conversion		Age groups (years)		
		<20	20-50	>50
No conversion	Number of patients	5	110	7
Yes (converted)	Number of patients	0	14	4
Percentage of converted cases according to Age group(%)		0	11.3	36.4
Total	Number of patients	5	124	11



***p* value = 0.040**

Figure (2): rate of conversion in different age groups.

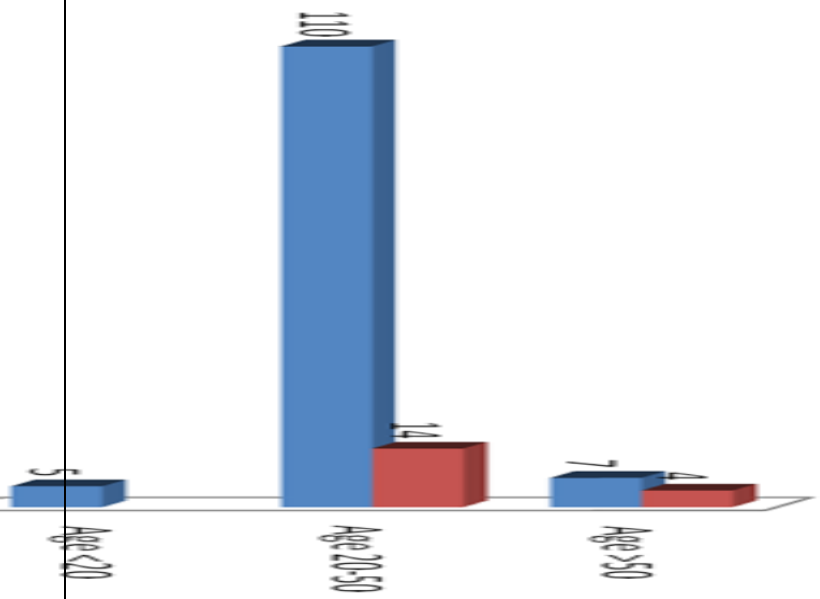


Figure (3): frequency of conversion in different age groups.

Gallbladder wall thickness and conversion to open cholecystectomy.

By ultrasound, almost 77.8% of converted cases had gallbladder wall thickness greater than 4mm, while the remaining 22.2 percent of converted cases had wall thickness less than or equal to 4mm. The percentage and frequency of each group of gallbladder wall thickness, as well as the conversion rate for each, are shown in Table 3 and Figures 4 &5.

Table 3: The frequency and percentage of conversion in relation to the

gall bladder wall thickness.

Conversion			Thickness	
			>4 mm	**<4 mm**
No. conversion	No conversion	Number of patients	100	22
	Yes (converted)	Number of patients	4	14
		Percentage of converted cases according to time of study(%)	3.8	38.9%
Total			104	36

***p* value = 0.01**

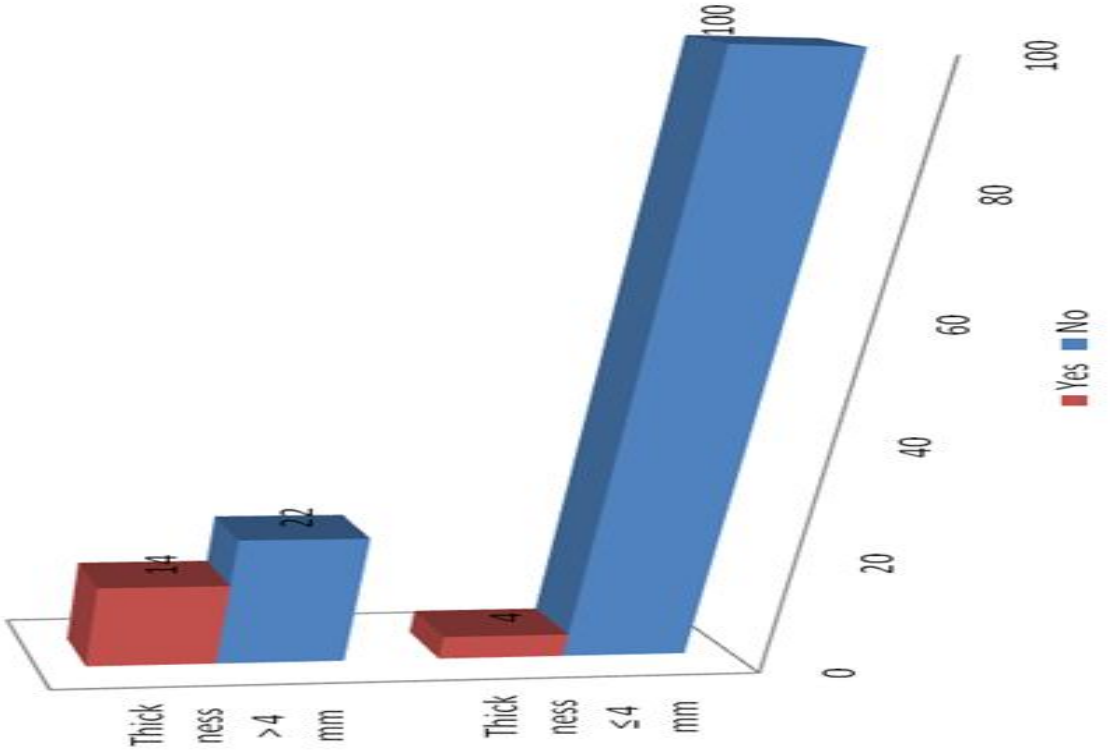


Figure (4): The frequency of conversion With relation to the thickness of the gall bladder wall.

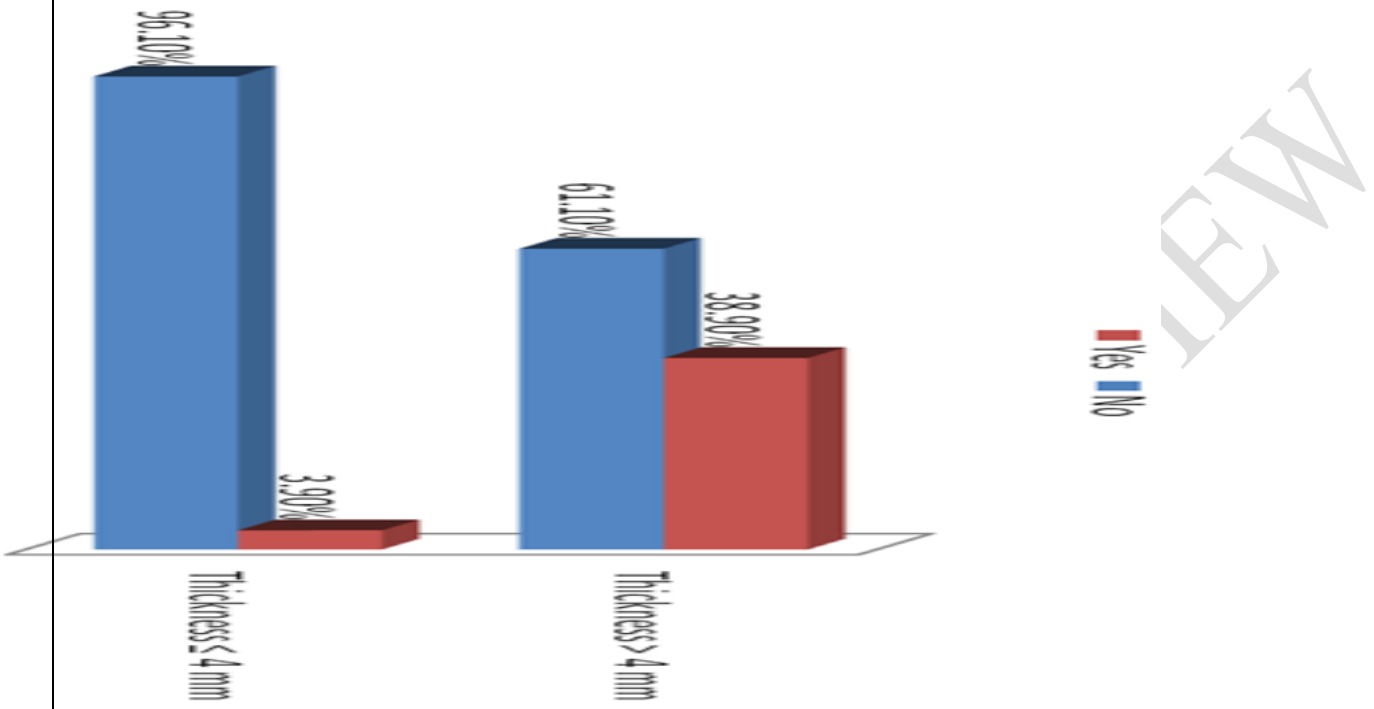


Figure (5): The Rate of conversion with relation to the thickness of the gallbladder wall.

Discussion:

We discovered that increasing age (>50 years) is associated with a higher rate of conversion (the rate of conversion in this age group is more than 25%), which concurs with Jeremy M. Lipman [(7)] (30%) and Ibrahim S (29%) findings[(8)]. This could be due to a long period of gallbladder wall irritation resulting in frequent attacks of cholecystitis and subsequent increase in gallbladder wall thickness, as well as associated co-morbid

medical diseases. The gallbladder walls of the patients had thickened before to surgery. There was no significant link between age, sex, or conversion (P0.05) (P=0.26), although there was a significant difference between emergency surgery and gallbladder wall thickness. (0.05%) [9], The thickness of the gall bladder wall exhibited a direct relationship with the rate of conversion to open surgery [9], Gallbladder wall thickness determined by preoperative ultrasound was also found to be an important predictor of conversion, with around 39% of patients with gall bladder wall thickness >4 mm undergoing conversion to open cholecystectomy. This is the results doesn't agree with Zacks[10](55%), or Ishizaki Y[11] (50%). The likely reason is the smaller number of patients included in our study. In addition, they include a gall bladder that is highly inflamed and has a higher conversion risk, while in our study we excluded acutely inflamed gall bladder.

Because the ultrasonic picture is operator-dependent, our results may be influenced by the fact that sonography was performed by multiple sonographers. Increased wall thickness makes it difficult to grasp with a laparoscopic grasper and is usually associated with fibrosis and adhesion, resulting in the narrowing of Calot's triangle[11,12]. The main causes of increased wall thickness are previous attacks of cholecystitis[13,14], and thus may reflect the difficulty in delineating the anatomy during surgery.

Conclusion:

Gall bladder wall thickness greater than 4 mm was a major risk factor for conversion to OC.

Ethical Approval:

As per international standard or university standard written ethical

approval has been collected and preserved by the author(s).

Consent

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

References

1- Griniatsos J. Factors predisposing to conversion from laparoscopic to open cholecystectomy. Ann Laparosc Endosc Surg 2018;3:12.

2- Livingston EH, Rege RV. A nationwide study of conversion from laparoscopic to open cholecystectomy. Am J Surg 2004;188:205-11. [Crossref] [PubMed]

3- Tang B, Cuschieri A. Conversions during laparoscopic cholecystectomy: risk factors and effects on patient outcome. J Gastrointest Surg 2006;10:1081-91. [Crossref] [PubMed]

4- Mathur M, Singh J, Singh DP, et al. Imaging evaluation of enhancement patterns of flat gallbladder wall thickening and its correlation with clinical and histopathological findings. J Clin Diag Res 2017;11:7-11.

5- Keulemans YC, Venneman NG, Gouma DJ. New strategies for the treatment of gallstone disease. Scand J Gastroenterol. 2002;236:87-90

6- Maehira H, Kawasaki M, Itoh A, et al. Prediction of difficult laparoscopic cholecystectomy for acute cholecystitis. J Surg Res 2017;216:143-8. [Crossref] [PubMed]

7- Jeremy M. Lipman, MD, Jeffrey A. Claridge, MD, Manjunath Haridas, MBBS, Matthew D. Martin, BS,David C. Yao, BS, Kevin L. Grimes, BS, *and* Mark A. Malangoni, MD, *Cleveland, Ohio*

8- Ibrahim S, Hean TK, Ho LS, Ravintharan T, Chye TN, Chee CH. Risk factors for conversion to open surgery in patients undergoing laparoscopic cholecystectomy. World J Surg. 2006; 30(9):1698-704.

9- Savaddar F, Kachoie A, Bahadorzadeh M, Vahedian M, Noori E, Amirkanian F, Mohmadmehdi Shater, Mohamadi AA. Investigation of the Relationship between Gallstone Wall Thickness before Surgery of Cholecystectomy Laparoscopic and the Rate of Conversion to Open Surgery. Jundishapur Sci Med J 2019; 18(3):225- 231.

10- Zacks SL, Sandler RS, Rutledge R, Brown RS Jr. A Population-Based Cohort Study Comparing Laparoscopic Cholecystectomy and Open Cholecystectomy. Am J Gastroenterol. 2002; 97: 334-40.

11- Ishizaki Y, Miwa K, Yoshimoto J, Sugo H, Kawasaki S. Conversion of elective laparoscopic to open cholecystectomy between 1993 and 2004. Br J Surg. 2006; 93(8): 987- 91.

12- Nachnani J, Supe A. Pre-operative prediction of difficult laparoscopic cholecystectomy using clinical and ultrasonographic parameters. Indian J Gastroenterol. 2005 Jan-Feb; 24(1): 16-8.

13- Daradkeh SS, Suwan Z, Abu-Khalaf M. Preoperative ultrasonography and prediction of technical difficulties during laparoscopic cholecystectomy. World J Surg. 1998; 22: 75-7.

14- Santambrogio R, Montorsi M., Bianci P, Opocher E, Schubert L, Verga M, et al. Technical difficulties and complications during laparoscopic cholecystectomy: predictive use of preoperative ultrasonography. World J Surg. 1996; 20: 978-82.