Correlation of gallbladder wall thickness with conversion rate to open cholecystectomy

Abstract:

Background: Laparoscopic cholecystectomy is the gold standard procedure for cholecystitis. Thickened GB wall was identified as a risk factor in LC to OC conversion. The purpose of current study is to study the correlated of gallbladder wall thickness with conversion rate to open cholecystectomy. **Patients and methods:** In this prospective study, we reviewed (140) patients undergoing laparoscopic cholecystectomy during the last three years (January - 2019 to January - 2020) at Al-Kadhimiya teaching hospital and recorded reasons for conversion to OC. Statistical analysis was then performed to identify factors predictive of increased risk for 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 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 conversion was either due to failure of identification of anatomy of the Calot's triangle, common bile duct injury with bile leak and or bleeding or equipment failure (lack of Co2 gas and poor light source). In current study the conversion rate was equal to 13% of the total number of our patients, which constitute 18 patients out of 140.~~,~~ ~~also t~~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, 77.8% of converted cases were with gallbladder wall thickness more than 4mm by ultrasound and the remaining percent of the converted cases (22.2%) were with wall thickness less than or equal to 4mm. **Conclusion:** The significant risk factors for conversion to OC was gall bladder wall thickness >4 mm.

keywords: Gallbladder wall thickness; conversion rate; open cholecystectomy

Comment [A1]: Unnecessary repetition of first statement in the Results section

Introduction:

The conversion of a LC to an open procedure seems to be

multifactorial. It could, be affected by factors related to the patient, the gallbladder's pathology and the surgeon [(1)]. A conversion rate 5% to 10% has been reported on a nationwide basis [(2)]. Depending on specific circumstances, a conversion can be characterized as either elective, which is defined as the surgeon's decision to resort to a laparotomy (because of obscure anatomy or lack of progress of the laparoscopic procedure) before being forced to do so as a result of a major intraoperative complication or as enforced, when an intraoperative emergency such as uncontrollable bleeding or bile duct injury occurs [(3).]

A thickened wall is defined as 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)], Gallbladder-related disease is now one of the commonest indications for elective and emergency surgery. Laparoscopic cholecystectomy (LC) was first developed in Europe in the mid-1980s as an alternative to open cholecystectomy, a procedure that had been performed for more than a century and is now the treatment of choice for gall bladder pathology [(5)].

Maehira *et al.*, determined the CT attenuation ratio of arterial phase (ARAP) to represent the degree of transient focal enhancement of the liver adjacent to the gallbladder. They found that an increased ARAP≥1.5 is a predictive factor for difficult LC and conversion [(6)]

Patients and methods:

In this prospective study, we reviewed (140) patients undergoing laparoscopic cholecystectomy during the last three years (January - 2019 to January - 2020) at Al-Kadhimiya teaching hospital and recorded reasons for conversion to OC. Statistical analysis was then performed to identify factors predictive of increased risk for conversion. Our unit's

Comment [A2]: Is this a retrospective or prospective study?

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.

Operative technique:

L.C. is the procedure of choice for majority of patients with gall bladder disease, the key, as in open surgery, is identification and self-dissection of calot`s triangle. In our study (although some surgeons perform open subumblical cut down with direct visualization of peritoneum to place the initial port which will function as camera port) we used closed technique using a Verre`s needle to establish pneumoperitoneum prior to placing the initial trocar, and we complete the procedure with a four-port technique for all the patients included in our study.

When conversion was indicated, we used classical open cholecystectomy using the right kocher incision for completion of cholycystectomy. Identification of group of patients who are at increased (risk) for conversion from laparoscopic (LC) to open cholecystectomy (OC) has proven to be difficult. We have tried to look 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 current study used the Chi-square test; P value and Simple charts & figures were initiated to see the effect of proposed factors on conversion. *p* value calculated by SPSS (Statistical Package for the Social Sciences) version (17). *p* value being significant if below 0.05 (significant relationship).

Results:

Conversion to open cholecystectomy:

In 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.

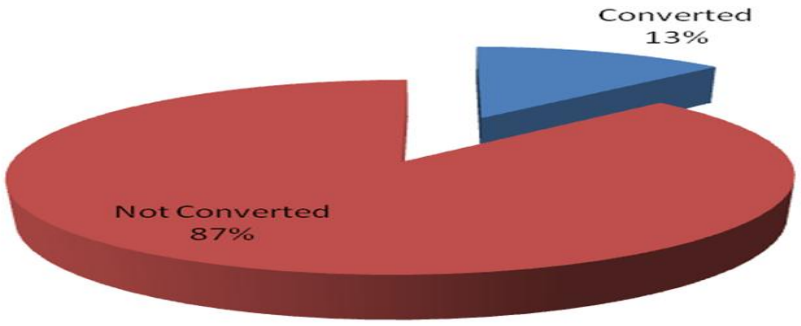


Figure (1): Conversion rate

Reason for conversion to open cholecystectomy:

The conversion was either due to failure of identification of anatomy of the Calot's triangle, common bile duct injury with bile leak and or bleeding or equipment failure (lack of Co2 gas and poor light source). In 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 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

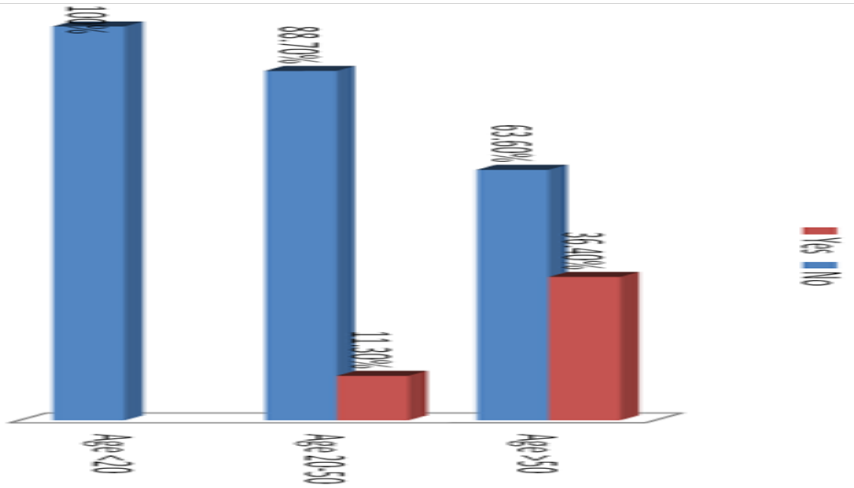
Age and conversion to open cholecystectomy

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 frequency and percentage for each age group with respect to conversion.

Comment [A3]: Table 2, Fig 2 and Fig 3 could be summarized with a single chart.

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.

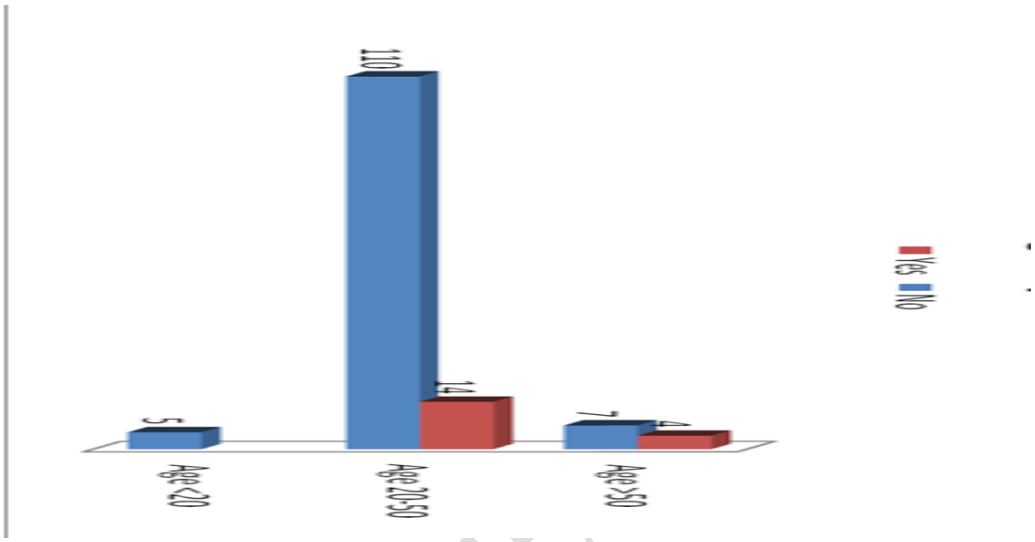


Figure (3): frequency of conversion in different age groups.

Gallbladder wall thickness and conversion to open cholecystectomy.

About 77.8% of converted cases were with gallbladder wall thickness more than 4mm by ultrasound and the remaining percent of the converted cases (22.2%) were with wall thickness less than or equal to 4mm. Table 3 and Figure (4&5) show the percentage and frequency for each group of gallbladder wall thickness and conversion rate for each.

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**

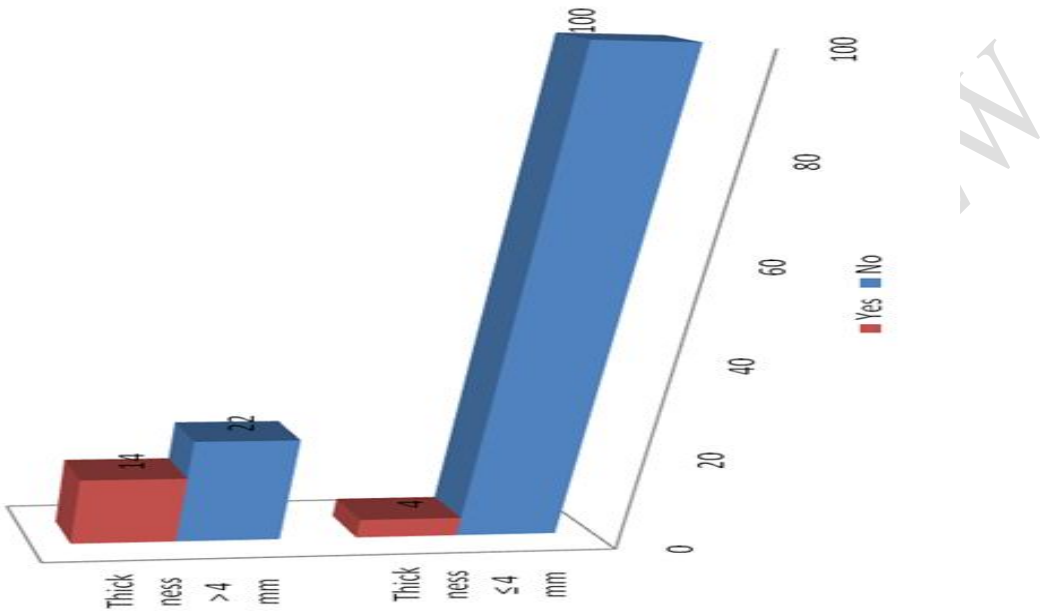


Figure (4): The frequency of conversion in relation to gall bladder wall thickness.

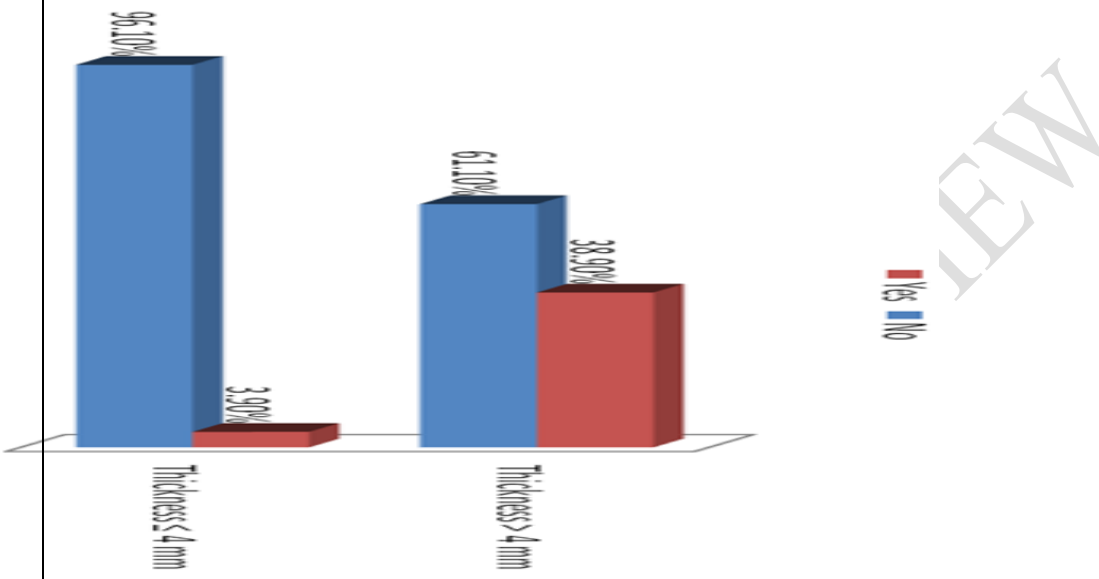


Figure (5): The Rate of conversion in relation to gall bladder wall thickness.

Discussion:

We have found that increasing age (>50 years) is associated with increasing rate of conversion (the rate of conversion in this age group is more than 25%) which agrees with Jeremy M. Lipman [(7)] (30%) and Ibrahim S [(8)] (29%), this may be due to long period of irritation of the gallbladder wall resulting in frequent attacks of cholecystitis with subsequent increase in gallbladder wall thickness and due to associated co-

morbid medical diseases. The patients had a pre-surgical increase in thickness of the gallbladder wall. and there was no significant relationship between age, sex, and conversion (P≥0.05) (P=0.26), but between emergency surgery and gallbladder wall thickness a meaningful difference was found. (P≤0.05) [(9)], as well as the gall bladder wall thickness had a direct relation to conversion rate to open surgery [(9)]

Also found that gallbladder wall thickness measured by preoperative ultrasound is an important predictive factor for conversion, around 39% of patients with gall bladder wall thickness >4 mm underwent conversion to open cholecystectomy. This result 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 the acutely inflamed gall bladder which carries a higher risk of conversion, while in our study we excluded acutely inflamed gall bladder.

The sonography was done by more than one sonographist and this may affect our result, because the ultrasonic picture is operator dependent. Increased thickness of the wall makes it difficult to be grasped by laparoscopic grasper and is usually associated with fibrosis and adhesion with subsequent narrowing of Calot's triangle[(11,12),] the main causes of increased thickness of the wall are previous attacks of cholecystitis[(13,14)] and thus may reflect difficulty in delineation of the anatomy during surgery.

Conclusion:

The significant risk factors for conversion to OC was gall bladder wall thickness >4 mm.

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