

SONOLOGICAL FACTORS PREDICTING CONVERSION OF LAPAROSCOPIC CHOLECYSTECTOMY FOR ACUTE CHOLECYSTITIS

Shaista Shoukat, Kausar Lashari, Tariq Mahmood

Department of Radiology, Jinnah Postgraduate Medical Centre (JPMC), Karachi, Pakistan.

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ABSTRACT

OBJECTIVE: To determine the frequency of conversion of laparoscopic cholecystectomy for acute cholecystitis in patients with thickened wall gall bladder, multiple stones and liver fibrosis. **MATERIALS AND METHODS:** This was a cross sectional study conducted at Radiology department Jinnah Post Graduate Medical Center (JPMC), Karachi. A total of 127 patients from Radiology department with symptomatic cholelithiasis referred for abdominal ultrasound and were meeting with inclusion criteria of the study. Informed consent was taken for ultrasound. The ultrasound abdomen was performed by the resident radiology (researcher) and the findings were confirmed by consultant radiologist having >10 years of post-fellowship experience. The data were entered and analysed into SPSS (version 21). Descriptive statistics were calculated for the characteristics of age of the patients and splitting age with gender distribution in term of Mean \pm SD respectively. Whereas frequency with percentage was calculated for the comparison of LC & OC with their Liver fibrosis, multiple gallstone & Gall Bladder Wall Thickness. **RESULTS:** Mean (\pm SD) age was 51.6 (\pm 11.9) years. 46 (36.2%) were males and 81 (63.8%) were females (M: F = 1:1.8). Out of 127 cases, conversion was required in 19 (15%) cases. The most frequent cause of conversion was multiple gallstones seen in 10 (52.6%) (among converted), followed by liver fibrosis 5 (26.3%) cases and Gall Bladder Wall Thickness (GBWT) 3 mm in 3 (15.8%) cases. **CONCLUSION:** Clinical and ultrasonographic findings may help predict a difficult LC. This information may be useful to both the patient and the treating surgeon. Conversion of Laparoscopic to open procedure may be life saving in difficult situations. Conversion rate can be reduced by addressing the preventable factors.

Key Words: Gallstone, Liver fibrosis, laparoscopic cholecystectomy (LC), Cholecystitis, Cholelithiasis

Introduction

Abdominal ultrasonography has become a reliable, quick and noninvasive tool to diagnose gall stone diseases.¹ It is not only an important modality to establish the diagnosis, it may also be an indicator of the degree of difficulty involved in the Laparoscopic Cholecystectomy (LC) which is now the treatment of choice for symptomatic gall diseases. One of the important findings is maximal gall bladder wall thickness of > 4.0mm which indicates a contracted

fibrotic gall bladder which is difficult to grasp.²

The ultrasound criterion for a normal gallbladder wall is less than or equal to 3 mm. Increased thickness of the gallbladder wall is frequently described as a sign of acute inflammatory involvement of the gallbladder. Several non-biliary conditions can lead to a similar sonographic appearance. The preoperative parameters that significantly predicted difficult LC were based on the presence of local signs of cholecystitis in addition to the ultrasound criteria of liver fibrosis, large stones and thick wall gall bladder exceeding 3 mm.³

Correspondence : Dr. Shaista Shoukat
Department of Radiology,
Jinnah Postgraduate Medical Centre (JPMC),
Karachi, Pakistan.
Email: shaistadr@hotmail.com

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Since two decades, laparoscopic cholecystectomy has become widely accepted as the procedure of choice for symptomatic gall bladder disease especially gall stones.⁴ However, technical difficulties can make the conversion of LC to Open Cholecystectomy (OC) unavoidable which may minimize all advantages of the laparoscopic procedure in terms of patient safety, cost and effectiveness. It is important to realize that the need for conversion to laparotomy is not a failure or complication but it is actually an attempt to avoid complications and ensure patient safety.⁵

In one of the international studies, conversion was required in 6 of 20 (30%) patients noted to have sonographic evidence of wall thickness compared with 2 of 16 (12.5%) patients without increased wall thickness ($p=0.257$). pericholecystic fluid was observed on ultrasound in 10 patients, only one (10%) of whom required conversion.⁶ Conversion to laparotomy was found significant in cases of liver fibrosis as out of 4 cases, 2 (50%) were required conversion.⁶

In one study, gall bladder wall thickness > 3 mm, conversion rate of LC to OC was 47.9% and multiple gall stones lead to conversion of LC to OC in 89.7% cases.⁷

Preoperative factors revealed in ultrasonography could assist the surgeon in recognizing those patients at risk for conversion and assist in making the decision to convert the procedure from laparoscopic approach to laparotomy.

Patients with a high-predicted risk of conversion could be operated on either by or under the supervision of a more experienced surgeon. Moreover, taking an early decision to convert LC to OC may shorten the surgery duration, hence ensures patient safety and decrease the associated morbidity. This cross sectional study will determine the frequency of conversion of laparoscopic cholecystectomy for acute cholecystitis in patients with thickened wall, multiple stones and liver fibrosis.

Materials & Methods

This cross sectional study was performed in Radiology Department Jinnah Post Graduate Medical Center (JPMC), Karachi. Non-Probability purposive sampling

technique was applied where every patient meeting the inclusion criteria were included in the study. 127 patients with symptomatic cholelithiasis referred for abdomen ultrasound meeting the inclusion criteria were included in the study. The purpose and procedure performed was briefed to the patient before inclusion and confidentiality was maintained. The ultrasound abdomen was performed by the radiology researcher and the findings were confirmed by consultant. Wall thickness of the gall bladder found to be > 3 mm was labeled as thickened wall gallbladder. Presence of more than one gall stones found on ultrasound was noted as multiple gall stones. Liver fibrosis was labeled if the liver appeared coarse on ultrasound. Patients operative notes were seen and preoperative findings like conversion from LC to OC were noted. The findings on sonological factors leading to conversion (LC to OC), which include gall bladder wall thickness ≥ 3 mm and multiple gall stones were entered in the study. The data was entered and analysis in to SPSS (version 21). Descriptive statistics were calculated for the characteristics of age of the patients & splitting age with gender distribution in term of Mean \pm SD respectively. Whereas frequency with percentage was calculated for the comparison of LC & OC with their Liver fibrosis, multiple gallstone & Gall Bladder Wall Thickness.

Inclusion Criteria: Referred Patients from surgical department of any age and either sex, with symptomatic cholelithiasis presenting with pain in right upper quadrant, fever ($>100^{\circ}\text{F}$) and vomiting irrespective of duration, diagnosed on the basis of abdominal ultrasound for thickened wall, multiple stones and liver fibrosis undergoing laparoscopic cholecystectomy.

Exclusion criteria: We excluded patients who were pregnant, with a gall bladder mass evident on ultrasound with acute pancreatitis (Serum amylase level > 3 time normal) or who had previously had undergone upper abdominal operations. In addition patients with co-morbid like diabetes mellitus, hypertension and cardiovascular diseases were also excluded.

Result

The data were entered and analysis in to SPSS (version 21). Descriptive statistics were calculated for the characteristics of age of the patients & splitting age with gender distribution in term of Mean \pm SD respectively. Whereas frequency with percentage was calculated for the comparison of LC & OC with their liver fibrosis, multiple gallstone & Gall Bladder Wall Thickness GBWT. Different age group distribution was also calculated. Percentage of gender distribution with male: female ratio was also calculated. Confounder was addressed through stratification according age, gender so that the effect of these variables on the sonological factors leading to conversion of LC to OC evaluated.

In this study, we analyzed 127 patients who were operated laparoscopically for acute cholecystitis. There were 19 patients (15%) who required conversion to open surgery. Conversion rates in the literature range from 6.5% to 35%. In our series conversion rate is favorable when compared with the figures quoted from the literature.

A total of 127 Patients met the inclusion criteria will be recruited in the study. Laparoscopic cholecystectomy was attempted during the period starting from 25-9-2009 to 24-3-2010. The mean age of the patients in a given study population was 51.6 ± 11.9 with range starting & end (25-84). In contrast the mean age between gender distribution were found in male patients was 52.5 ± 12.7 & in female was 51.1 ± 11.5 (Fig. 1). According to preoperative sonoographical factors out of 127 patients cases, GBWT > 3mm

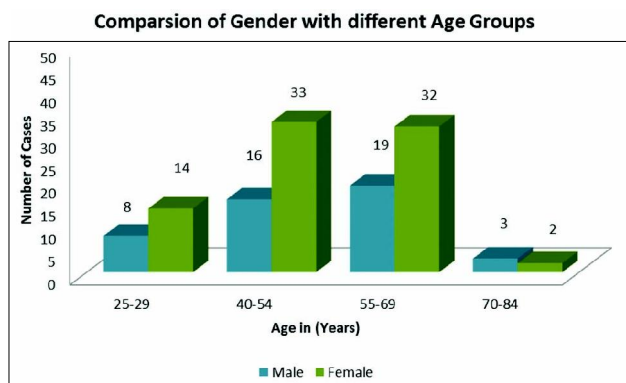


Figure 1: Comparison of gender with different age groups

was seen in 70 (55.1%), multiple gall stones 48 (37.8%) & liver fibrosis was seen in 60 (47.2%) respectively. We found 19 patients out of 127 patients (15%) underwent conversion to open cholecystectomy as shown on (Tab. 1). The distribution of different age groups we have found 40-54 years has the highest

Parameter of the study	n	%
Mean Age in (Years)	51.6 ± 11.9	
Mean Age of Male in (Years)	52.5 ± 12.7	
Mean Age of Female in (Years)	51.1 ± 11.5	
Gender Distribution		
Male	46	36.2%
Female	81	63.8%
Male: Female Ratio	(1:1.8)	
Age Groups		
25-39	22	17.3%
40-54	49	38.6%
55-69	51	40.2%
70-84	5	3.9%
Gall Bladder Wall Thickness		
< 3mm	57	44.9%
\geq 3mm	70	55.1%
Multiple Gall Stone		
Yes	48	37.8%
No	79	62.2%
Presence of Liver Fibrosis		
Yes	60	47.2%
No	67	52.8%
Conversion Required for Laparoscopic cholecystectomy		
Yes	19	15%
No	108	85%

Table 1: Demographics of patients.

patient 49 (38.6%) lie on these age groups respectively. The Male & female ratio was 1: 1.8. According to the gender distribution 46 (36.2%) were male patients & remaining 81 (63.8%) were female patients. Female patient have more predominant as compare to male patients. The most frequent causes cause of conversion was multiple gallstone seen in 10 (52.6%) (Among converted) / followed by liver fibrosis 5 (26.3%).

cases and GBWT > 3 mm in 3 (15.8%) cases as shown on (Tab. 2). Basis on the two groups (LC & OC) compare with Multiple gallstone, 38 (29.9%) underwent on Laparoscopic while in the 10 (7.9%) underwent on conversion groups The difference between the two groups was not statistically significant

Factors conversion cases	Number of conversion	Percentages Among
Multiple Gall Stone	10 (7.9%)	52.6%
Liver Fibrosis	5 (3.9%)	26.3%
GBWT ≥ 3mm	3 (2.4%)	15.8%
Others	1 (0.8%)	5.3%
	Out of 127 Sample size	Out of 19 Sample size

Table 2: Factors associated with conversion

($p > 0.05$) & similarly age groups were found not significantly associated with (LC & OC) groups & age groups were also found insignificantly associated with groups respectively. Now finally found gender, liver fibrosis & GBWT ≥ 3 mm found significantly associated with the comparison of (LC & OC) groups respectively as shown on (Tab. 3).

Parameter of the study group	Groups		Total	P-Value
	Laparoscopic	Conversion		
Gender				
Male	35 (27.6%)	11 (8.7%)	46 (36.2%)	$X^2=4.543$ $P=0.03^*$ Significant
Female	73 (57.5%)	08 (6.3%)	81 (63.8%)	
Age Groups				
25-39	19(15.6%)	3(2.5%)	22(18%)	$X^2=5.343$ $P=0.069$ Not - Significant
40-54	37(30.3%)	12(9.8%)	49(40.2%)	
55-69	47(38.5%)	04(3.3%)	51(41.8%)	
Multiple Gall Stone				
Yes	38(29.9%)	10(7.9%)	48(37.8%)	$X^2=2.093$ $P=0.148$ Not -Significant
NO	70(55.1%)	09(7.1%)	79(62.2%)	
Liver Fibrosis				
Yes	55(43.3%)	05(3.9%)	60(47.2%)	$X^2=3.926$ $P=0.048^*$ Not -Significant
No	53(41.7%)	14(11%)	67(52.8%)	
GBWT ≥ 3mm				
Yes	67(52.8%)	03(2.4%)	70 (55.1%)	$X^2=13.97$ $P=0.000^*$ Significant
No	41(32.3%)	16(12.6%)	57(44.9%)	

Table 3: Factors predicting conversion.

Discussion

Acute cholecystitis occurs in up to 10% of patients with gallstones and is more likely if gallstones have previously been symptomatic.⁸ Acute cholecystitis should be differentiated from biliary colic by the presence of constant pain in the right upper quadrant (>12 hours), tenderness in right upper quadrant (usually with a positive murphy's sign and the sometime a palpable mass).⁹ in the presence of these features, diagnosis is usually confirmed by ultrasono-

graphy. The diagnostic characteristics are a thick-walled (> 3mm), often distended gallbladder, gall bladder containing stones and the pericholecystic fluid collections may be present.¹⁰

Laparoscopic cholecystectomy is now one of the most common laparoscopic surgeries performed in a general surgical unit. Due to its efficacy, cost effectiveness and patient compliance, it is considered the standard operation for patients with gallstone disease.¹¹ In the past acute cholecystitis was considered a contraindication to laparoscopic cholecystectomy but now it has become the treatment of choice in these case. This technique demands surgeon expertise because extensive inflammation, increased bleeding and adhesions around the Calot's triangle hide the anatomy and make surgery difficult and hazardous. In these cases conversion may be required and in other cases where the operation progresses poorly or complications arise.¹¹

The conversion rate in studies carried by Chi-leung Liu et al¹² in 1996, incorporating 500 patients, was 9%. Similarly, Rosen et al¹³ in their study of 1347 patients in 2002, had conversion rate of 5.3%. A study by Nachnani et al¹⁴ in India in 2005, including 105 patients, had a conversion rate of 11.4%.

The findings of studies that attempt to define the factors predicting the conversion to open cholecystectomy are contradictory. In our study we evaluate the effect of patients characteristic to conversion such as thick-walled (> 3 mm), distended gallbladder, and gall bladder containing stones. The preoperative parameters that significantly predicted difficult LC were based on the presence of local signs of cholecystitis in addition to the ultrasound criteria of liver fibrosis, large stones and thick wall gall bladder exceeding 3 mm.³

The most frequent cause of conversion was multiple gallstones seen in 52.6% (among Converted), followed by liver fibrosis 26.3% cases and GBWT > 3 mm in 15.8% cases. The results in our study are in agreement with other international study.¹⁵

In other study Conversion was required in 30% patients noted to have sonographic evidence of wall thickness. pericholecystic fluid was observed on ultrasound in 10 patients, only one (10%) of whom required conversion.⁶

Another study noted conversion to laparotomy significant in cases of liver fibrosis as out of 4 cases, 2 (50%) were required conversion.³

In a local study at AKUH, gall bladder wall thickness > 3 mm, conversion rate of LC to OC was 47.9% and multiple gall stones lead to conversion of LC to OC in 89.7% cases.¹⁶

In a study by Rosen et al¹³ they found Male : Female ratio in the converted patients to be 1 : 1.4. Similarly, Liu et al,¹² in their study, found that 10.5% males and 8.1% of females required conversion. In our study, the Male: Female ratio was 1 : 1.8 and Male: Female ratio in converted group was 1.37 : 1. 21.7% of males and 9.9% of females required. It was revealed in other studies also that males are more at risk of conversion probably because male patients usually have more intense inflammation or fibrosis, making surgery difficult due to poorly defined anatomy in Calot's triangle and through the plane between the gall bladder and liver.¹⁷

In the age group of 40 -54 years highest conversion rate 63.2%. Liu et al,¹² in their study, found that age more than 65 years predicted high rate of conversion. Similarly, Kaman et al¹⁸ determined the age of > 60 years a risk factor for conversion.


Studies have shown many disadvantages of conversion from laparoscopic to open cholecystectomy and it includes higher postoperative complications and requires relatively longer hospital stay.¹¹ In addition, it is cost intensive.¹¹ However, conversion of laparoscopic to open surgery should not be regarded as a failure but as an effort to prevent complications.

Conclusion

The evaluation of the criteria for conversion preoperatively showed that conversion is more common in male sex, age group of 40-54 years, multiple gall bladder calculi and gall bladder wall thickness of more than 3 mm. Intra-operative factors for conversion includes inexperienced hands, ambiguous anatomy, excessive inflammation and bleeding. Although conversion of Laparoscopic to open procedure may be life saving but its rate can be reduced by addressing the preventable factors.

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