

## Original Research Article

# Determinants of conversion during laparoscopic cholecystectomy among a sample of Iraqi patients

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### ABSTRACT

**Background:** Laparoscopic cholecystectomy has become a standard technique for gall bladder surgery of symptomatic cholelithiasis. However, conversion to open cholecystectomy is sometimes necessary. The aim of the present study was to assess the predictive factors that increase the possibility of conversion of laparoscopic cholecystectomy to open cholecystectomy.

**Methods:** A total of 621 laparoscopic cholecystectomies were attempted at AL-Mawanee General Hospital and AL-Sader Teaching Hospital in Basrah, IRAQ from June 2012 till June 2016. Of these, 43 had to be converted to open cholecystectomies. Patients assessed according to different factors, including age, sex, acute cholecystitis, adhesions of gallbladder and Calot's triangle, obesity, previous abdominal surgery, anatomical variation of gallbladder and Calot's triangle and intraoperative complications (bleeding, bile duct injury, visceral injury).

**Results:** Conversion to open cholecystectomy was performed in 43 patients (6.92%). The significant factors for conversions were adhesions of gallbladder and Calot's triangle (39.53%) followed by acute cholecystitis (34.88%). Rate of conversion in other factors are as the following i.e., isolated male gender (0%), age (0%), previous abdominal surgery (9.3%), obesity (2.33%), anatomical variations of gall bladder and Calot's triangle (2.33%), intra operative complications including bleeding (4.65%), bile duct injury (4.65%), visceral injury (2.33%) were insignificant factors for conversion.

**Conclusions:** Adhesions of gallbladder and Calot's triangle is the most common predictive factor and cause for conversion from laparoscopic cholecystectomy to open cholecystectomy. Acute cholecystitis found to be the strongest factor for conversion despite its incidence is lower than adhesions of gall bladder and Calot's triangle. Male gender and age more than fifty years are not direct predictive factors for conversions.

**Keywords:** Conversion, Determinants, Iraq, Laparoscopic cholecystectomy, Open

### INTRODUCTION

Cholecystectomy is one of the commonest elective surgical procedures performed today with over 500 000 operations being performed annually in the United States alone. It is considered the treatment of choice for a lot of gall bladder diseases, on the top of which is the symptomatic gall stones and biliary colic.<sup>1</sup>

In 1987, Philip-Mouret performed the 1<sup>st</sup> human laparoscopic cholecystectomy. Since that time, laparoscopic cholecystectomy has become the standard treatment for symptomatic gall stone.<sup>2</sup> It is not only supplanted open cholecystectomy, but also more or less ended the attempts for non-invasive management of gall stones, such as extracorporeal shockwave and bile salt therapy. Evidence is accumulating that the cholecystectomy rate has risen markedly following the

introduction of laparoscopic cholecystectomy. This unexplained increase in rate may reflect surgical enthusiasm for new procedure with consequent alteration of operative indication rather than a true increase in the incidence of symptomatic gall stone.<sup>3</sup>

Laparoscopic cholecystectomy, as any other laparoscopic procedure, offers the cure with minimally invasive procedure, minimal pain, less scarring and early return to full daily activity. However, the picture is not always glamorous like that. Each advanced technology has its own drawbacks and obstacles. Cholecystectomy still has many factors that contraindicate and complicate the laparoscopic approach as well as difficulties that prevent the completion of the laparoscopic approach and obligate a conversion to open one.<sup>4</sup>

Converting a laparoscopic cholecystectomy to an open approach is sometimes perceived as "failure" by many laparoscopic surgeons as they, unfortunately, think that laparoscopic approach is a procedure rather than an approach and so, Enthusiasts strive to keep the conversion rate as low as possible.<sup>5</sup> Conversion rate ranges from 5-20% depending on general surgical practice.<sup>6,7</sup> While it has been suggested that conversion rates may fall with increasing experience, there are plenty of "amazing reports" where surgeons have struggled for many hours to complete an operation laparoscopically. Usually during the laparoscopic cholecystectomy, surgeon has to carry out an initial dissection and, if no progress is being made after reasonable amount of time (20 minutes or so) to define the anatomical structures of calot's triangle or when an intra-operative complication that cannot be managed laparoscopically occurs, the operation should be converted to open.<sup>7</sup> A lot of Attempts have been made to predict a difficult cholecystectomy where there would be a high risk of conversion or at least deciding an open approach from the beginning.<sup>8</sup> Actually, with improvement of the surgeons' skill and the new advances in the laparoscopic instruments, understanding of these high-risk factors and categorization of the contraindications for laparoscopic approach has been widely changed.

Recently the only considered absolute contraindications for laparoscopic cholecystectomy are: Uncontrolled coagulopathy and End stage liver disease.<sup>4</sup> Conditions formerly believed to be relative contraindications such as acute cholecystitis, gangrene or empyema of the gall bladder, biliary enteric fistula, obesity, pregnancy and previous upper abdominal surgery are now considered independent factors for a potentially difficult laparoscopic cholecystectomy that might mandate the conversion to an open approach.<sup>6</sup> In acute cholecystitis, wall thickness of gall bladder which interfere with its manipulation and obscured anatomy of Calot's triangle caused by acute inflammatory process making many surgeons prefer to delay the operation in order to avoid the difficult procedure and avoid the risk of biliary injury. Despite all of that, many clinical studies showed that

early laparoscopic cholecystectomy is safe and feasible, providing the surgery is performed within 72 h from the onset of symptoms, but with higher rate of conversion.<sup>9</sup> So, there are a lot of factors that might be a cause for conversion, and therefore A difficult laparoscopic cholecystectomy which might need conversion may be related to difficult access, disturbed anatomy, disease state of gall bladder and bile ducts or to operative technique.<sup>7</sup>

## METHODS

This is an observational prospective study, done in Al-Mawanee General Hospital and Al-Sadr teaching Hospital from June 2012 to June 2016. In this study, 621 patients underwent laparoscopic cholecystectomy.

### *Parameters of the study included*

Age, sex, acute cholecystitis, adhesions of gall bladder and calot's triangle, obesity " BMI >35, previous abdominal surgery, anatomical variation of Gall bladder and calot's triangle, and Intra-operative complications (bleeding, major bile ducts injury and visceral injury).

All patients who underwent laparoscopic cholecystectomy were operated on nearly by same team of surgeons to eliminate the effect of difference in surgical skill on the study. Informed consent had been taken from all patients.

All patients received prophylactic dose of one-gram ceftriaxone intravenously on induction under general anesthesia and endotracheal tube, while pneumoperitoneum was induced by closed method.

Authors used the technique of critical view of safety (releasing lateral peritoneal attachment of gall bladder for better dissection of calot's triangle. Then dissection was continued from the posterior aspect of Calot's triangle to identify the cystic artery and cystic duct. Clipping and division of cystic artery then duct was achieved. Gall bladder was dissected off its bed in the liver with monopolar cauterization of any bleeding points.

If no progress in the dissection of calot's triangle after 30 minutes or if there were any intra-operative complications (bleeding, biliary duct injury or visceral injury) which cannot be managed laparoscopically, the approach was terminated and converted to open. The open approach was either by the right subcostal incision or upper right paramedian incision.

All the patient received post-operative antibiotic in form of I.V cefatriaxone twice daily. Most patient with laparoscopic cholecystectomy started oral intake in the 1<sup>st</sup> postoperative day, few cases with difficult laparoscopic cholecystectomy started oral intake in the 2<sup>nd</sup> postoperative period. Patients who were converted to open cholecystectomy, started oral intake when positive

bowel sound started, usually on 2nd-3rd postoperative day. All the data and parameters in these studies were analyzed using the SPSS software.

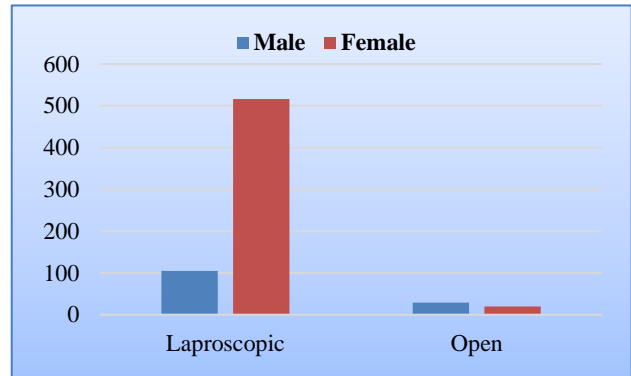
**RESULTS**

There were 43 patients out of 621 of the patients underwent laparoscopic cholecystectomy had undergone conversion to open cholecystectomy with a rate of conversion of 6.92%.

As shown below in Table 1, males underwent laparoscopic cholecystectomy are much lower than do the females (105 males 16.91% vs. 516 females 83.09%) with a male to female ratio of (1:4.9). However, the conversion to open cholecystectomy found to be more in males (23 male patients out of 43 patients "53.4%" vs.

20 female patients out of 43 patients 46.6%). The conversion rate between males was 21.90% (23 patient

out of 105) VS. 3.87% between the females (20 patient of 516), (Figure1).



**Figure 1: Sex distribution among patients underwent laparoscopic cholecystectomy and patients underwent conversion to open cholecystectomy (n=621).**

**Table 1: The predictive factors among patient underwent laparoscopic.**

Predictive factor	LC/PR n(%)	OC n (%)	p value
Gender(Male)	12 (5.35)	0 (0)	-
Age (≥50 years)	15 (6.69)	0 (0)	-
Previous abdominal surgery	36 (16.07)	4 (9.3)	0.365
Acute Cholecystitis	37 (16.51)	15 (34.88)	0.010
Adhesion to gall bladder and calot's	92 (41.07)	17 (39.53)	0.032
Obesity (BMI ≥35)	5 (2.23)	1 (2.33)	-
Anatomical variation	8 (3.57)	1 (2.33)	-
Intraoperative bleeding	15 (6.69)	2 (4.65)	0.712
Intraoperative biliary duct injury	3 (1.33)	2 (4.65)	
Intraoperative visceral injury	1 (0.44)	1 (2.33)	
Total	224	43	

LC= Laparoscopic Cholecystectomy, PR= predicted group, OC= Converted to open cholecystectomy

**Table 2: Interaction of the male gender and other predictive factors for high risk group patient who underwent laparoscopic cholecystectomy and conversion.**

Male gender	Isolated	Age	AC*	Adhesion	Obesity	Previous surgery	Anat. variation	Intraoperative complication	Total
LC n (%)	12 (11.5)	9 (8.6)	15 (14.3)	54 (51.4)	2 (1.9)	6 (5.7)	2 (1.9)	5 (4.7)	5 (4.7)
OC n (%)	0 (0)	0 (0)	5 (21.8)	14 (60.9)	0 (0)	1 (4.3)	1 (4.3)	2 (8.7)	23

\*AC = Acute Cholecystitis

Below is the number of patients underwent laparoscopic cholecystectomy and number of patients underwent conversion to open cholecystectomy in regard to each predictive factor separately.

As shown in the table 1, the highest predictive factor found to be the adhesions of gall bladder and calot's triangle (represents 41,07% of high- risk group; 92 patients) followed by Acute cholecystitis (16.51%; 37 patients). Number of patients with previous abdominal surgery is about the same as acute cholecystitis (16.07%;

36 patients). The least was with the intra-operative complications - visceral injury (0.44%; 1 patient), (Table 1).

The interaction between the gender and other predictive factors in patients underwent both laparoscopic cholecystectomy and conversion to open is shown below. These results showed that the adhesions of gall bladder and calot's triangle is the commonest predictive factor associated with Male gender (54 patients, 51.4%) followed by acute cholecystitis (15 patients 14.3%) in

patients underwent laparoscopic cholecystectomy. Conversion also seen more in male patients with

adhesions (14 patients 60.9%) and male patients with acute cholecystitis (5 patients 21.8%), (Table 2).

**Table 3: Interaction between the age >50 years and other predictive factors for high risk group patient who underwent laparoscopic cholecystectomy and conversion.**

> 50 age	Isolated	Age	AC*	Adhesion	Obesity	Previous surgery	Anat. variation	Intraoperative complication	total
LC n (%)	15 (33.3)	9 (20.0)	6 (13.3)	6 (13.3)	1 (2.4)	4 (8.9)	2 (4.4)	2 (4.4)	45
OC n (%)	0 (0)	0 (0)	2 (28.55)	2 (28.55)	1 (14.3)	1 (14.3)	0 (0)	1 (14.3)	23

\*AC = Acute Cholecystitis

In regard to the interaction between the Age over 50 years and other predictive factors, the highest association is with the Male gender (9 patients 20%), followed by adhesions and Acute cholecystitis (6 patients with each 13.3%). However, the conversion is seen more with adhesions and acute cholecystitis (Table 3).

## DISCUSSION

Laparoscopic approach or "Minimally invasive approach" considered nowadays as a "Revolution" in the world of surgery. However, and even with the increasing experience in this field, still there are many limitations that might be considered as "Obstacles" against completion of a laparoscopic approach and convert it into open approach.

Present study showed a conversion rate of 6.92%, compared to other studies, we will see variable results. In a study done in the conversion rate found to be 2.76%, while in a study done in Istanbul, the conversion rate found to be 17.59%.<sup>10,11</sup>

In present study the range of conversion rates from laparoscopic to open cholecystectomy is so wide. This is explained by the difference in technical skill of the surgeons, number of patients included in the study and the cause behind the conversion. For example, in the Turkish study, the high conversion rate was attributed to that most of included of cases were acute cholecystitis.<sup>11</sup> The relatively a very low rate in other studies might be due the small Number of patients included in the study which might statically give a false impression in a form of too high or too low rate.<sup>12</sup>

Cholecystectomy (whether laparoscopic or open) is done in females more frequently than in males. Our study showed a male to female ratio of 1:4.9 explained by the higher rate of biliary disease in females, especially gall stone disease. It's not so far from many studies done all over the world showed a relatively same ratio (1:4.2, 1:4.5).<sup>13,14</sup> Actually, many studies investigated to find

whether the male gender is a "Predictive Factor" for conversion or not. In the study done in Taiwan 15, and a study Israel found a significant higher conversion rate in males (21.5% in male vs. 4.5% in female and 17.6% in males vs. 2.9% in females respectively).<sup>15,16</sup>

While in the studies done in England and Italy reported that there was no significant association between the male gender and the high conversion rate (7.45% in male vs 2.5% in females, 2.79% in male vs 2.72% in females respectively).<sup>17,18</sup>

The conclusion could be made is that there are other hidden factors that are associated with male gender rather than be isolated risk factor. Some of them think that the context of symptomatic gall stones, inflammation and fibrosis are more extensive in males than in females.<sup>19</sup>

Others hypothesized that male patients are seeking medical care only after repeated painful episodes later than the females do.<sup>20</sup> In regard to age factor, despite that some literatures stated the age as a predicted factor for difficult laparoscopic cholecystectomy and conversion authors didn't find such results in present study.<sup>21-23</sup> In present study the results are in line with other studies in which investigators didn't find the age as a risk factor for conversion.<sup>24,25</sup>

In present study, only 4 cases were converted from laparoscopic approach to open due to adhesions of previous abdominal surgeries.

The type of surgery done before, site and type of incision are very important parameters in determining the impact on proceeding with laparoscopic approach or conversion to open cholecystectomy. The present study didn't find the previous abdominal surgery statistically a significant risk factor, same as a study done in Turkey, there was no significant correlation between conversion and previous abdominal surgery the reason might be most of cases included in the study were with lower (gynecological) previous surgeries.<sup>26</sup> However, in a study done in India concluded a significant correlation between previous

upper abdominal surgeries and the increase in conversion rate.<sup>27</sup>

Present study findings that acute cholecystitis and its consequences remain the most common reason behind conversion is in line with other studies. 28-30 Nonetheless, there are many patients with acute cholecystitis undergo laparoscopic cholecystectomy electively either as an option.<sup>31</sup>

Present study results are corroborated with other studies which had found the adhesions as the commonest reason behind conversion.<sup>32,33</sup>

Regarding anatomical variations, most of the studies (and our study is one of them) doesn't show any significant increase in conversion rate with anatomical variation, especially if the surgeon is aware about them. Review of literatures show complication rate after laparoscopic cholecystectomy have followed the learning curve of the surgeon and recognition of unusual anatomy comes with thorough laparoscopic knowledge and experience.<sup>34</sup>

As one of the major reason for conversion, bile duct injury could be either active (direct) or passive (indirect). Present study reported lower rate of bile duct injury compared to other studies and some of them passed unnoticed during surhery.<sup>35-37</sup>

Other visceral injury can occur either because of trocar insertion or during the trial of dissection of gall bladder from a dense adhesion involving omentum and transverse colon. In present study authors had only one case of visceral injury out of the 621 patients underwent laparoscopic cholecystectomy (0.001%) which exactly similar to a study done in Japan.<sup>38</sup> Nowadays, with the improvement of laparoscopic skill and advances in instruments, it becomes possible to decrease the risk of trocar insertion injury by either using the open method or using the optical trocars where insertion is under direct camera vision. Also, it becomes possible to deal with many visceral injuries laparoscopically and no more need for conversion. However, the doubt and the confirmation of injury is sometimes difficult to be assured with laparoscopy.

## CONCLUSION

Acute cholecystitis, adhesions of the gall bladder and calot triangle is the most common predictive factor and cause for conversion from laparoscopic to open cholecystectomy. Male gender and age above 50 years are not direct risk factors for conversion from laparoscopic to open cholecystectomy. However, adhesions are found more to be associated with male gender.

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