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IDENTIFICATION OF RISK FACTORS FOR CONVERSION OF LAPAROSCOPIC TO OPEN CHOLECYSTECTOMY

Dr Afiya Akbar[*1], Dr Dileep Kumar[2], Dr Abdul Waheed[3], Dr Maria Parveen[4], Dr Sumbul Nadeem[5]

[*1]*Postgraduate Traine at Surgical Ward 26 Jpmc Karachi*
[2]*Professor And Head of Department of Surgery Ward 26 Jpmc Karachi*
[3]*Assitant Proffesor at Department of Surgical Unit 1 Jinnah Sindh Medical University/Jinnah Hospital Karachi*
[4]*Postgraduate Traine at Department of Surgery Ward 26 Jpmc Karachi*
[5]*Postgraduate Traine at Department of General Surgery Ward 26 Jpmc Karachi*

[*1]afeaakbar6@gmail.com

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Corresponding Author: *
Dr Afiya Akbar

Abstract

Background: *Laparoscopic cholecystectomy (LC) is the preferred approach for the treatment of gallbladder stones, but occasionally conversion to open cholecystectomy (OC) may be necessary for safety reasons. Knowing the preoperative and intraoperative risk factors helps in surgical decision making and counselling.*

Methods:
This was a prospective observational study involving 200 patients undergoing LC at Jinnah Postgraduate Medical Centre, Karachi. Data regarding age, gender, body mass index, comorbidities, laboratory and radiological findings was collected. Operative details and causes of conversion were noted. Chi-square and independent t-tests ($p<0.05$) were used for statistical comparisons. Logistic regression analysis was performed to determine predictors of conversion

Results:
Out of 200 patients, 30 (15%) required conversion to OC. Advanced age (≥60 years) was significantly associated with conversion ($p<0.05$), with 45% of elderly patients requiring conversion. Male patients had a higher conversion rate (33.3%) compared to females (7.1%) ($p<0.05$). Obesity (BMI >30 kg/m²) increased conversion risk (36% vs. 8%, $p<0.05$). Acute cholecystitis patients had a significantly higher conversion rate (33.3%) than elective LC cases (7.1%, $p<0.05$). Preoperative imaging findings, including gallbladder wall thickening (31.4% conversion rate), pericholecystic fluid (32%), and CBD dilation (40%), were strong predictors of conversion. Intraoperative challenges such as dense adhesions in Calot's triangle (60% of converted cases), excessive bleeding (26.7%), and difficult anatomical dissection (23.3%) were major contributors to conversion. Patients requiring conversion had a longer hospital stay (5.2 ± 1.2 days vs. 2.1 ± 0.5 days, $p<0.05$) and a higher rate of minor wound infections (13.3% vs. 2.9%), but no major complications were observed.

Conclusion:
everal factors, including patient characteristics and intra-operative events,

contribute to the conversion from LC to OC. By identifying risk factors before surgery, surgeons can better plan the procedure and avoid complications and poor outcomes. Conversion should be encouraged to achieve good surgical outcomes.

INTRODUCTION

Laparoscopic cholecystectomy (LC) has become the gold standard in the treatment of the symptomatic gallstone disease due to its minimally invasive nature, post operative pain, hospitalization and recovery time compared with open cholecystectomy (OC) (1). In spite of them, in certain instances, this conversion LC to OC is needed, to ensure patient safety and ensure the optimal outcome of the surgery. It typically transforms in the state of technical difficulties, severe inflammation, deformity of the anatomy, uncontrolled hemorrhage, or damage of the bile duct (2).Hence, it is important to find preoperative risk factors to plan and counsel patients effectively. The conversion rate of LC to OC has been reported to be between 1% and 15% depending on the patient factors, expertise of the surgeon and practice in the institution (3). A number of factors relating to the patient have been linked to a high probability of conversion. Old age, especially over 60 years, is a strong predictor because of increased comorbidity burden and changes in the anatomy (4). Gender (male) has also been associated with higher conversion rates, potentially because of the more severe inflammation and fibrosis of the gallbladder (5). Another significant risk factor is acute cholecystitis since inflammation, edema, and tissue friability hinder laparoscopic dissection by blurring anatomical landmarks (6). This risk is further exacerbated by frequent attacks and delayed surgery. Other comorbidities like obesity, diabetes mellitus, hypertension and cardiovascular diseases also increase the conversion rates because of the complex nature of the operation and the risk involved (7). Moreover, prior surgeries of the upper abdomen can lead to adhesions, which can make laparoscopic access and visualization more difficult (8). The preoperative imaging modalities that can be used to assist in the detection of anatomical variations and possible challenges are ultrasound and magnetic resonance cholangiopancreatography (MRCP) (9). The identification of these risk factors enables the surgeons to maximize patient status, strategize surgical procedures, and advise patients accordingly. Finally, the knowledge of these predictors can be used to minimize the conversion rates and enhance the overall outcomes of surgery (10).

METHODOLOGY

This study was approved by the Jinnah Postgraduate Medical Center's General Surgery department and was conducted over a fixed period. The institutional review board approved the patients and, prior to their inclusion, patients signed an informed written consent. Candidates were at least 18 years of age and required a laparoscopic cholecystectomy (LC) for determinant gallbladder disease i.e. symptomatic gallstone disease, acute or chronic cholecystitis, gallbladder polyps. The study excluded patients who had undergone an open cholecystectomy, had malignancy, were not operated for non-gallbladder reasons, had incomplete medical history and severe cardiopathy which contraindicated laparoscopy as well as pregnant women. They were given a structured data collection proforma. The data provided were age, gender and body mass index (BMI) as well as chronic or previous illness such as diabetes (D.M), hypertension, prior surgery, or C.V disease. Clinical history included a review of the symptoms along with their duration, and presence of prior history of biliary colic, acute cholecystitis, and the results of relevant laboratory tests which included liver function tests, WBC count and a coagulation profile. Ultrasound prior to surgery was done to assess gallbladder wall thickness, presence of gallbladder stones or sludge, pericholecystic fluid, and the diameter of the common bile duct. The surgeon recorded intraoperative findings such as the presence of adhesions, inflammation, and anatomic abnormalities, as well as difficulties encountered during dissection of Calot's triangle, operation time, and the surgeon's skill.

Signs of conversion of LC to OC included indistinct anatomy, massive bleeding, and perforation of the gallbladder. Statistical analysis was done using software. Continuous variables were expressed as mean ± SD, and categorical variables were expressed as frequencies and percentages. Independent t-tests and chi-square tests were used. Statistically significant differences were considered present when $p < 0.05$. The independent predictors of conversion were examined with multivariate logistic regression and presented as odds ratios with 95% confidence intervals. Other metrics, such as postoperative complications, length of stay, and recovery, were also analyzed.

RESULTS

This study period covered 200 patients who were performed laparoscopic cholecystectomy (LC) at Jinnah Postgraduate Medical Centre Karachi. Out of them, 170 (85%) patients completed laparoscopic cholecystectomy (LC) successfully, and 30 (15%) patients were converted from cholecystectomy (CC) to open cholecystectomy (OC) which can be shown in Figure 1 and Table 1. The average age of the participants of the study was 45 years, (SD 12). The number of females (n=140) was much higher than that of males (n=60). The gender of the participants showed that males were significantly more likely to completed Open cholecystectomy than females ($p<0.05$). The conversion from laparoscopic to open cholecystectomy was noticeable in older (i.e. ≥60) patients than those in the younger age group (45% vs. 7.5%, $p<0.05$). Patients who were obese also showed a significant degree of conversion (36% out of 50 obese cholecystectomy patients) compared to the patients who were not (8% out of 150 non-obese cholecystectomy patients) ($p<0.05$). The presence of hypertension was also found (27% out of 55 patients) to be a contributing factor along with diabetes (30% out of 40 patients) and significant conversion to open cholecystectomy (50%) which was observed in patients with multiple diseased states. The presence of ischemic heart disease was also noted to increase the likelihood of conversion from laparoscopic to open cholecystectomy (Figure 3). The conversion from laparoscopic to open cholecystectomy was affected by the clinical outcomes of patients. The conversion from laparoscopic to open cholecystectomy was significantly observed in patients who presented with acute cholecystitis compared to (77.1%, 0.05) patients who were referred for elective laparoscopic cholecystectomy (LC) for chronic/long-standing gallbladder disease. The conversion from laparoscopic to open cholecystectomy also showed a significant correlation to the preoperative findings of the ultrasound.

In thickening of the gallbladder wall (> 4 mm) in 70 patients, 22 (31.4%) had to be converted. In 50 patients, pericholecystic fluid was found, and 16 (32%) had to be converted. In 25 patients, common bile duct (CBD) dilated, and 10 (40%) had to be converted. Intraoperative findings were the most immediate factors for conversion. The most common cause (60%) was dense Calot triangle adhesions, and then severe inflammation and imprecise anatomy (40%). Other factors were excessive hemorrhage (26.7%), difficult dissection of the cystic duct and artery (23.3%), and gallbladder perforation (16.7%). The average converted operation time was much longer (110 ± 20 minutes) than successful LC (50 ± 15 minutes, $p<0.05$). Generally, the results were favorable after the operation. The average hospital stay was the longest in the conversion (5.2 ± 1.2) than in successful LC (2.1 ± 0.5, $p<0.05$). Table 1 shows that wound infection rates were highest in converted (13.3%) than in the successful LC (2.9%). There were no significant complications such as bile duct injury. In general, the demographic factors, concomitant diseases, clinical picture, and intraoperative data were closely related to LC to OC conversion.

Table 1.Comparative Results of GTN vs LIS

Factors	Numbers
Total Patients	200.0
Patients Undergoing LC	170.0
Patients Requiring Conversion	30.0
Male Patients (Total)	60.0
Male Patients Requiring Conversion	20.0
Female Patients (Total)	140.0
Female Patients Requiring Conversion	10.0
Patients Aged ≥60 Years	40.0
Patients Requiring Conversion (≥60 Years)	18.0
Obese Patients (BMI >30)	50.0
Obese Patients Requiring Conversion	18.0
Patients with Hypertension	55.0
Hypertension Patients Requiring Conversion	15.0
Patients with Diabetes Mellitus	40.0
Diabetes Patients Requiring Conversion	12.0
Patients with Acute Cholecystitis	60.0
Acute Cholecystitis Patients Requiring Conversion	20.0
Patients with Gallbladder Wall Thickening	70.0
Patients Requiring Conversion (Thickening)	22.0
Patients with Pericholecystic Fluid	50.0
Patients Requiring Conversion (Pericholecystic Fluid)	16.0
Patients with CBD Dilation	25.0
Patients Requiring Conversion (CBD Dilation)	10.0
Patients with Adhesions in Calot's Triangle	18.0
Patients Requiring Conversion (Adhesions)	18.0
Mean Operative Time for LC (minutes)	50.0
Mean Operative Time for Conversion (minutes)	110.0
Mean Hospital Stay for LC (days)	2.1
Mean Hospital Stay for Conversion (days)	5.2

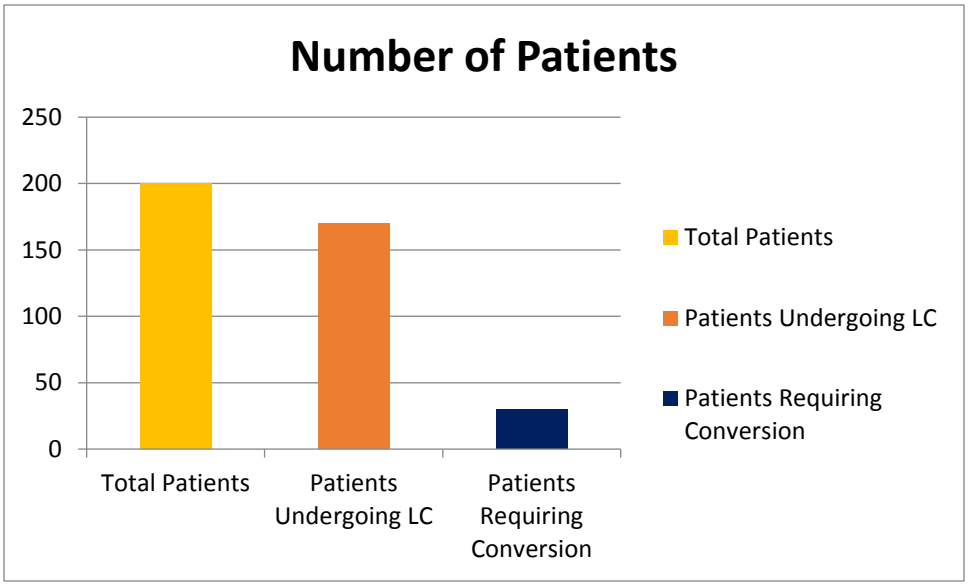

Figure 1.Statistic of Outcome

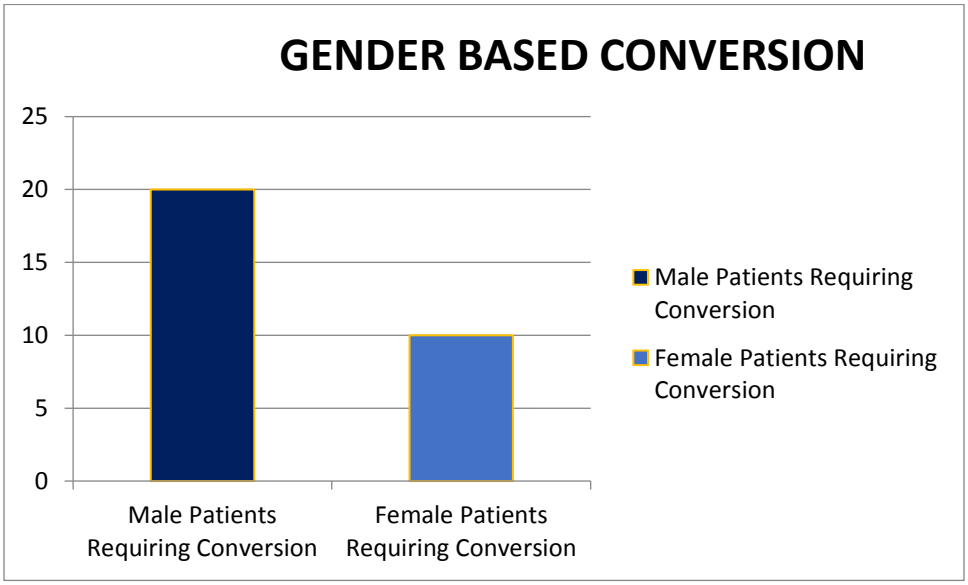

Figure 2.Statistic of Gender Based Conversion

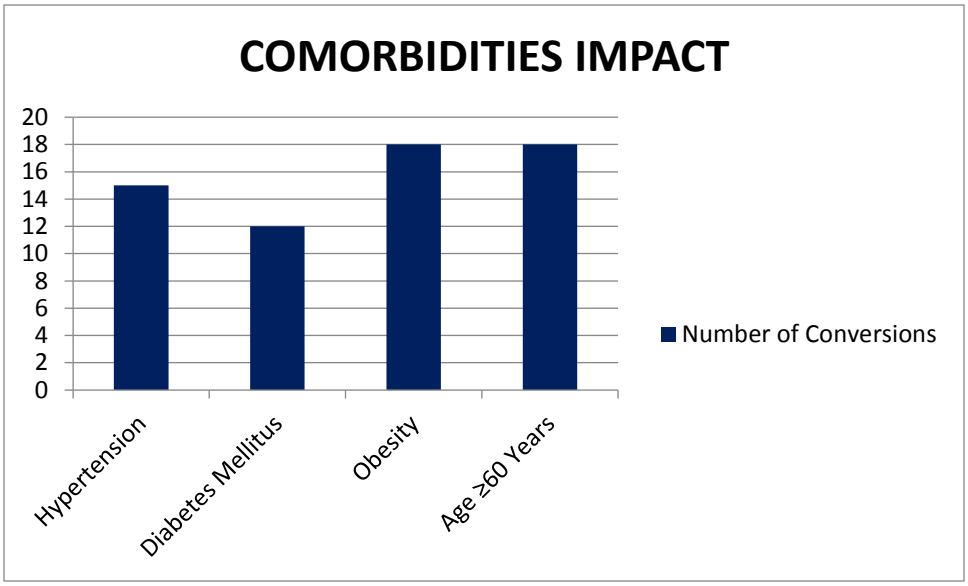

Figure 3.Statistic Of Comorbidities Impact

DISCUSSION

The results of this study suggest that conversion of laparoscopic cholecystectomy (LC) to open cholecystectomy (OC) constitutes a defensible progressive intraoperative decision to ensure safety of the patient. A conversion rate of 15% is comparable to the previously reported rates of 1-15% (1,3). Despite recent advancements in laparoscopic techniques, conversion is inevitable in certain patient subsets due to anatomical and pathological challenges. The incidence of conversion is also higher in patients aged 60 and older, which is expected because older patients have greater susceptibility to and presence of comorbid conditions/syndromes which result in chronic and acute tissue inflammation (2), and generally make laparoscopic dissection more challenging (4). Furthermore, the incidence of conversion from the laparoscopic to the open technique was also reported to be greater in patients who were males as opposed to patients who were females, which is also consistent with the literature. It was found that males were more likely to develop inflammation and fibrosis in their tissues (5). Furthermore, the presence of other comorbid conditions such as diabetes and hypertension as well as obesity results in increased rates of conversion. In the case of obesity, patients have greater abdominal adiposity, which also makes it challenging to achieve a clear visualization of the intraabdominal structures during laparoscopic surgery.

Both diabetes and heart disease hamper the body's natural concerted efforts in the healing process after surgery. This makes performing surgery on such patients much difficult. To minimize surgery-related complications, it is indeed important to prepare such patients for surgery as much as possible (6). The patient's health status also plays a significant role as it is noted that patients suffered from acute cholecystitis. The risk of the need to convert their surgery was greatly increased. High levels of inflammation, swelling, and necrosis characteristically lead to cholecystitis when tissue damage occurs. This high degree of inflammation destroys the delicate tissue in the triangle of Calot of the hepatic pedicle, which in turn is known to increase the risk of damage to the bile duct. Therefore, the risk of damage to the bile duct increases the need for surgery to be converted. For surgery related to acute cholecystitis, the general guideline is to perform surgery as soon as possible. This minimizes the risk of damage to the patient and related bile duct abscess formation. Some authors provide excellent predictive models related to the need to convert surgery (7,9). These authors note that in the ultra-sound findings of the gallbladder, it is predictive if there is

gallbladder wall thickening, pericholecystic fluid, or common bile duct obstruction. These findings suggest acute cholecystitis and possibly would make laparoscopic surgery very challenging. Therefore, it is important to make a precise choice of surgery and perform thorough imaging to examine the patients more relativity (per risk).

Intraoperative variables were the most immediate predictors of conversion and were found to be the most frequent predictors of conversion entails severe inflammation and indistinct anatomy were and were found to be the most frequent predictors of intraoperative variables. These results correlate to the existing literature which ascribes the major contributors to the conversion of patients to the operating room due to the presence of adhesions and change in the anatomy (2,6). Other contributory factors, such as bleeding, perforation of the gallbladder and inability to identify the cystic structures stress the importance of having sound surgical skills and the readiness to 'go for it' when `the situation calls for it'. The results of this study regarding the postoperative outcomes were positive in that the patients needing conversion had longer lengths of stay and more new postoperative wound infections compared to patients where successful LC was achieved. It is also important to emphasize the lack of serious complications, including but not limited to serious biliary injuries suggesting the sustained conversion is a safe and acceptable alternative, and is in no way a failing of the surgical. It is in fact the adopting of a warranted and serious approach of preventing worst case complications (11,12). The results of this study and conversion predictors correlate to the international literature since increased age, male gender, chronic diseases, presence of acute cholecystitis, and complicated intraoperative anatomy are the most important predictors of the conversion of laparoscopic cholecystectomy to open surgery. To enhance the preoperative surgical planning and to educate the patients regarding the surgical procedure and establish the most appropriate surgical plan, it is paramount to recognize these conversion predictors when the patient is being assessed. It is highly recommended to conduct further studies to substantiate these findings with more accurate and robust conversion predictive models of laparoscopic cholecystectomy.

CONCLUSION

Laparoscopic cholecystectomy is still a safe and efficient operation in the treatment of gallbladder disease, but occasionally, it may be converted to open cholecystectomy to ensure patient safety. The present study shows that old age, male, obesity, comorbidities, acute cholecystitis, and adverse intraoperative findings are significant factors that can result in conversion. The surgical planning and outcomes can be enhanced by preoperative recognition of these risk factors, proper imaging, and optimization of patients. Conversion in time should be viewed as a wise surgical move and not a failure. The identification of high-risk patients facilitates improved counseling, minimization of complications, and improved success in laparoscopic cholecystectomy procedures in general.

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