Original Research Article

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Factors resulting in conversion of laparoscopic cholecystectomy to open cholecystectomy-institution based study

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ABSTRACT

Background: Laparoscopic surgery has revolutionized the way it is performed for an increasing number of patients. In this study, we determined the various reasons for conversion of laparoscopic cholecystectomy in our setup. **Methods:** This was a descriptive study, conducted at Government Medical College Srinagar, Frommay 2015 to June 2017. The study included 450patients with symptomatic cholelithiasis, who underwent laparoscopic cholecystectomy. All patients were operated by experienced laparoscopic surgeons with experience of more than 300 Laparoscopic cholecystectomies. Cases that required conversion from laparoscopic to open surgery were analyzed and the factors possible for such conversion were studied.

Results: The mean age of patients was 45.6 years and male to female ratio 1:3.8. The mean operating time was 49 minutes and average hospital stay was 2 days. Out of 450 patients, 26(5.8%) required open conversion. Factors responsible for open conversion were dense adhesions in 12(2.7%), obscure anatomy at clot's triangle in 6, (1.3%), significant intra-operative bleeding 5 (1.1), CBD injury 1(0.2%), visceral injury 1 (0.2%), and instrument failure in 1(0.2%) conversions.

Conclusions: Open conversion rate of laparoscopic cholecystectomy in this study was 5.8%. The commonest cause of conversion was dense adhesions around the gall-bladder. Preventable factors like instrument failure or power breakdown can be addressed by a reliable back up.

Keywords: Laparoscopic cholecystectomy, Open conversion, Risk factors

INTRODUCTION

Gallstone disease is a global health problem. Most patients are asymptomatic, and gallstones are generally detected with ultrasonography during the evaluation of unrelated medical conditions. Over the past two decades, laparoscopic cholecystectomy (LC) has become the gold standard for the surgical treatment of gallbladder disease. A shorter hospital stays (and, thus, a more rapid return to normal activity and work), less postoperative pain, a

faster recovery, better cosmesis, and good cost containment are some of the advantages of LC over open surgery. Laparoscopic cholecystectomy has now replaced open cholecystectomy as the first-choice of treatment for gallstones and inflammation of the gallbladder unless there are contraindications to the laparoscopic approach. This is because open surgery leaves the patient more prone to infection. Sometimes, a laparoscopic cholecystectomy will be converted to an open cholecystectomy for technical reasons or safety.

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Laparoscopic cholecystectomy is considered the standard operation for patients with gallstone disease owing to its perceived efficacy with both cosmosis and rapid recovery.4 Conversion to open cholecystectomy may be required if the anatomy cannot be defined, if the operation progresses poorly or if complications arise. However, conversion of laparoscopic to open surgery should not be regarded as a complication but as an attempt to prevent complications. As expected, an intraoperative finding of a chronically inflamed contracted gallbladder with a thickened wall during laparoscopic cholecystectomy (LC) is associated with an increased conversion rate. In these cases, the dense adhesions signified chronic inflammation and were certainly due to the repeated attacks of acute cholecystitis. Rosen et al.5 reported that conversion from laparoscopic to open cholecystectomy was required in 5.3% of their patients. The main indication for conversion in their series was severe inflammation, preventing accurate delineation of ductal anatomy. Kuldip and Ashish reported that the overall conversion rate was 0.4% of the total LCs performed and 1.7% of the difficult cases.⁶ They reported that dense adhesions in the region of the Calot's triangle was the leading cause for conversion to open surgery in 16.7% of their cases. Takegami et al, reported a conversion rate of 13% in LC performed by general surgeons and 2% in LC performed by specialized surgeons, suggesting that the skill of the operator has a large influence on the conversion rate.⁷ A conversion rate of 11% in their cases, the most common cause of conversion being difficult anatomy.8,9 Conversion from LC to cholecystectomy was required in 5% in another study by Wagih et al.10

Several complications related to anesthesia, peritoneal access, pneumoperitoneum, surgical exploration, and thermocoagulation have been reported during LC, and these complications and several other factors can necessitate the conversion from LC to open cholecystectomy (OC). Although there are several studies reporting various rates of the causes of this worldwide medical problem, every institution must have a thorough understanding of the rate and causes of conversion to open surgery based on culture and geography, in addition to an understanding of conversion within the institution.¹¹

Objectives of the study were to determine the frequency of conversion of laparoscopic cholecystectomy to open cholecystectomy in a tertiary care teaching hospital. To determine the factors responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy.

METHODS

The present study was conducted in the Postgraduate Department of General Surgery, Government Medical College, Srinagar. The study was conducted between May 2015 to June 2017. A total of 450 patients planned for laparoscopic cholecystectomy were enrolled.

Inclusion criteria

The patients with signs and symptoms of Cholelithiasis/ cholecystitis and diagnosed by ultrasonography of abdomen.

Exclusion criteria

Patients with CBD calculus, dilated CBD, where CBD exploration is needed. Patients with features of obstructive jaundice Suspected malignant gall bladder disease Patient medically unfit for laparoscopic surgery.

Following evaluation, the patient was subjected to laparoscopic cholecystectomy and following factors were noted:

- Time taken (intraoperative)
- Biliary/stone spillage
- Bleeding during surgery
- Calot's triangle dissection
- Gall bladder bed dissection
- Anatomical variation
- Injury to duct/artery
- Difficult extraction of gall bladder
- Extension of incision;
- Need for conversion.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of SPSS Version 20.0. Continuous variables were summarized as Mean±SD and categorical variables were expressed as frequencies and percentages. Graphically the data was presented by bar and pie diagrams. Chi-square or Fisher's exact test, whichever appropriate, was applied for categorical data. A P-value of less than 0.05 was considered statistically significant.

RESULTS

Majority of our patients were in age group of 30-49 (49.8%). The youngest was 17 years old female and the oldest was 76 years old male. Mean age was 45.6±9.3 years. Out of a total of 450 patients, 357 (79.3%) were females and 93 (20.7%) were males combining a male to female ratio of 1:3.8.

Mean weight of the patients was 65.8±9.32kg. Majority i.e. 201 (44.7%) of our studied patients had a BMI of 18.5-24.9 followed by 25-29.9 in 108 (24%) patients. A very least number 26 (5.8%) out of a total of 450 patients needed conversion from laparoscopic to open cholecystectomy while as 424 (94.2%) laparoscopic cholecystectomy was completed successfully.

Adhesions were the most common cause of conversion to open cholecystectomy in 12 (2.7%) patients. 82 cases in

Present study were having adhesions out of which 70 were managed laparoscopically and 12 cases had to be converted to open cholecystectomy. 16 patients had obscure anatomy at Calot's triangle in Present study out of which 5 had to be converted. Bleeding, visceral injury, instrumental failure and CBD injury were the other causes for converting the patients to open cholecystsectomy.

Table 1: Causes of conversion from laparoscopic cholecystectomy to open cholecystectomy.

Difficult surgery	Total cases	Converted to open	% Age
Adhesions	82	12	2.7
Obscure anatomy at calot triangle	17	6	1.3
Bleeding	16	5	1.1
Visceral injury	1	1	0.2
Instrument failure	1	1	0.2
CBD injury	1	1	0.2
Total difficult	118	26	5.8

Out of a total of 363 patients aged <60 years, 17 (4.7%) needed conversion to open while as out of 87 patients aged >60 years 9 (10.3%) needed conversion to open cholecystectomy. The p value calculated was 0.042 which was statistically significant. There were 93 males in Present study out of which 14 (15.1%) needed conversion to open. In 357 females 12 (3.4%) patients needed conversion to open cholecystectomy. This association was found statistically significant with p value <0.001. Out of 346 patients with <30 Body Mass index, 15 (4.3%) were converted to open while as out of 104 patients with >30 Body Mass index, 11 (10.6%) needed conversion to open cholecystectomy. Patients with Body Mass index ≥30 were found to have increased rate of conversion from laparoscopic cholecystectomy to open cholecystectomy in comparison to patient with Body Mass index <30. This association was found to be statistically significant with a p value of 0.017. Out of a total of 450 patient's gallbladder wall thickness was <3cm thick in 413 patients and out of these 21(5.1%) were converted to open cholecystectomy. 5 (13.5%) patients out of 37 with >3cm gallbladder thickness needed conversion to open cholecystectomy. The p value was 0.035 which was statistically significant. Out of 450 patients 103 patients had stone impacted at the neck of gallbladder. Conversion was needed in 17 (4.9%) cases out of 347 patients with no impaction of stone at neck while as 09 (8.7%) of 103 patients with stone impaction were converted to open cholecystectomy. The p value of 0.143 was statistically insignificant.

Out of 450 patients studied, 56 showed contracted (<2cm) gall bladder on USG in which 5 (8.9%) patients needed conversion to open. 357 cases showed normal (2-5cm) gall bladder size on USG, out of which 16 (4.5%) were converted to open cholecystectomy.37 cases were

having distended (>5cm) out of which 5 cases were converted to open cholecystectomy. The p value was found to be 0.045 which was statistically significant. In Present study, 95 patients out of 450 had history of previous abdominal surgery. 23 cases had history of upper abdominal surgery and 72 had lower abdominal surgery. 4 (17.4%) out of 23 cases with previous upper abdominal surgery were converted while 5 (6.9%) out of 72 cases with previous lower abdominal surgery were converted to open cholecystectomy. 355 cases had no history of any surgery in past out of which 17 cases were converted to open cholecystectomy. The p value of 0.039 was found to be statistically significant.

Out of 62 cases having history of more than ten attacks of biliary colic, 8 cases (12.9%) were converted to open cholecystectomy whereas 17 out of 388 cases (4.4%) were converted to open cholecystectomy among those who had less than ten attacks of biliary colic. This factor was found to be statistically significant with p value of 0.012. Out of 326 cases with no history of acute cholecystitis in past 13 (4.0%) were converted to open cholecystectomy whereas 12 (9.7%) out of 124 cases were converted to open cholecystectomy in patients with history of acute cholesystectomy in past. p value of 0.034 was found to be statistically significant.

DISCUSSION

Laparoscopic cholecystectomy has almost replaced open cholecystectomy for the treatment of symptomatic cholelithiasis. It has proved to be an effective and safe procedure both in elective and emergency conditions; however, conversion to open surgery is inevitable in some difficult cases and is required for the safety of the patients. In Present study, we determined the various reasons for conversion of elective laparoscopic cholecystectomy in our set up.

In Present study, we excluded all the patients with history of jaundice, common bile duct dilatation, carcinoma gallbladder, choledocholithiasis, and patients medically unfit for laparoscopic surgery. Memon MR et al, also excluded such patients in their study. 12

Present study was done on 450 patients with the aim to determine the factors responsible for conversion of elective laparoscopic cholecystectomy to open cholecystectomy.

Majority of our patients were in age group of 30-49 (49.8%). The youngest was 17 years old female and the oldest was 76 years old male as shown in table 1. Mean age was 45.6±9.3 years. A mean age of 52.04 years, 45 years, respectively. 11,12

Out of a total of 450 patients, 357 (79.3%) were females and 93 (20.7%) were males combining a male to female ratio of 1:3.8.

Memom MR et al and Abdulhussein BJ et al observed a male to female ratio of 1:4 and 1:3.59 respectively. ^{12,13}

Bulk of the patients 154 (34.2%) patients were weighing 56-65kgs, 102 (22.7%) weighed 45-55 kgs, 88 (19.6%) weighed 66-75kgs, 80 (17.8%) were 76-85 kgs of weight and 26 (5.8%) were 86-95 kgs. Mean weight of the patients was 65.8 ± 9.32 kg. Majority i.e. 201 (44.7%) of our studied patients had a BMI of 18.5-24.9 followed by 25-29.9 in 108 (24%) patients.

Age

Age as a factor for predicting risk of conversion of laparoscopic cholecystectomy to open cholecystectomy was analysed as a dichotomous variable with a cut of at the age of sixty years. There was higher conversion rate associated with patients more than 60 years old. This association was found to be statistically significant. Wiebke EA et al, Kanaan SA et al, Simopoulus C et al, significantly correlated age with an increased conversion rate of laparoscopic cholecystectomy to cholecystectomy. 14-16 Fried GM et al, opined that it was difficult to delineate the anatomy in elderly patients with a long history of gallbladder disease.¹⁷ In such cases gallbladder often becomes thickened, shrunken and contracted. The cystic duct becomes foreshortened and the gallbladder may be densely adherent to the common bile duct.

Gender

In literature, it has been reported that the rate of conversion and intra-operative difficulty is more in male patients. Kanaan SA et al, Simopoulos C et al, in their studies found that male sex was significant preoperative factor in predicting a difficulty leading to conversion. ^{15,16} In Present study out of 450 patients, 357(79.3) were females and 93 (20.7) were male. We found that conversion rate was higher among males (15.1%) as compared to females (3.4%).

This association was found to be statistically significant. The reason for higher conversion rate among males remains unexplained but Fried GM et al, has tried to explain the higher risk associated with male patients on the basis of correlation matrix analysis which showed a small but significant correlation between male sex and increased likelihood of acute cholecystitis, older age and increased gallbladder wall thickness. This correlation may explain in part the increased risk of intra-operative difficulty and conversion in men.

Body mass index

Nachnani J et al, and Tayeb M et al, have analysed body habitus as a dichotomous variable (obese with body mass index \geq 30 versus non-obese). In Present study we too have used body mass index \geq 30kg/m² as a cut off for the purpose of analysis. Out of 346 patients with <30 Body

Mass index, 15 (4.3%) were converted to open while as out of 104 patients with >30 Body Mass index, 11 (10.6%) needed conversion to open cholecystectomy. Patients with Body Mass index ≥30 were found to have increased rate of conversion from laparoscopic cholecystectomy to open cholecystectomy in comparison to patient with Body Mass index <30. This association was found to be statistically significant with a p value of 0.017. Fried GM et al, Rosen M et al, and Nachnani J et al, also had similar findings in their studies.^{5,17,18}

Fried GM et al, in their study on 1676 patients observed obesity as a significant factor in predicting intra-operative difficulty including conversion.¹⁷

Gallbladder wall thickness

Majority of the studies have found thickened gallbladder to be an important predictor of intra-operative difficulty leading to conversion. In Present study out of 450 patients gallbladder wall thickness was <3cm thick in 413 patients and out of these 21(5.1%) were converted to open cholecystectomy. 5 (13.5%) patients out of 37 patients with >3cm gallbladder thickness needed conversion to open cholecystectomy. The p value was 0.035 which was statistically significant. This study confirms the findings of Fried GM et al, Rosen M et al who also found thickned gallbladder thickness as a significant predictor of intra-operative difficulty leading to conversion.^{5,17}

Location of calculus

Out of 450 patients 103 patients had stone impacted at the neck of gallbladder. Conversion was needed in 17 (4.9%) cases out of 347 patients with no impaction of stone at neck while as 09 (8.7%) of 103 patients with stone impaction were converted to open cholecystectomy. The p value of 0.143 was statistically insignificant. Singh S et al, in their study of 100 patients did not find impacted stone in Hartman's pouch as a significant predictor of conversion (p =0.794). 20

Gallbladder size

In Present study out of 450 patients studied, 56 showed contracted (<2cm) gall bladder on USG in which 5 (8.9%) patients needed conversion to open. 357 cases showed normal (2-5cm) gall bladder size on USG, out of 16 (4.5%)were converted opencholecystectomy. 37 cases were having distended (>5 cm) out of which 5 cases were converted to open cholecystectomy. The p value was found to be 0.045 which was statistically significant. Steeg Van der HJJ et al, in their study on 346 patients found that conversion was required in 17.2% cases.²¹ Distended gallbladder was found to be a significant predictor of difficult and conversion on both univariate and multivariate analysis.

Previous abdominal surgery

In Present study, 95 patients out of 450 had history of previous abdominal surgery. 23 cases had history of upper abdominal surgery and 72 had lower abdominal surgery. 4 (17.4%) out of 23 cases with previous upper abdominal surgery were converted while 5 (6.9%) out of 72 cases with previous lower abdominal surgery were converted to open cholecystectomy. 355 cases had no history of any surgery in past out of which 17 cases were converted to open cholecystectomy. The p value of 0.039 was found to be statistically significant. The conversion rate was very high 17.4% in patients with previous upper abdominal surgery. Cases with lower abdominal surgery lower segment ceserean section (LSCS), hysterectomy, emergency appendicectomy also had higher conversion rate (6.9%) as compared to case with no history of any abdominal surgery. This is consistent with the finding of Wiebke EA et al.14

History of acute cholecystitis

Out of 326 cases with no history of acute cholecystitis in past 13(4.0%) were converted to open cholecystectomy whereas 12 (9.7%) out of 124 cases were converted to open cholecystectomy in patients with history of acute cholecystectomy in past. p value of 0.034 was found to be statistically significant. This is consistent with the findings of Fried GM et al, Nanchnani J et al, in their studies. Fried GM et al, are of the opinion that the patients who have acute cholecystitis at any time in the past will have an increased likelihood of conversion during laparoscopic cholecystectomy. ^{17,18} It is seen that prior acute cholecystitis results in a scarred and fibroses gallbladder with dense fibrotic adhesions that render laparoscopic dissection difficult.

History of biliary colic

History of repeated attacks of biliary colic has been found to be associated with intra-operative difficulty and laparoscopic cholecystectomy. conversion during Sanabria JR et al defined biliary colic as a severe recurrent abdominal pain of acute onset present in the right upper quadrant or the epigastrium with radiation to back or shoulder, usually occurring after the ingestion of fatty meal.²² They found that the number of biliary colic was statistically significant risk factor for predicting the intra-operative difficulty laparoscopic during cholecystectomy and conversion to open cholecystectomy.

In present study, out of 62 cases having history of more than ten attacks of biliary colic, 8 cases (12.9%) were converted to open cholecystectomy whereas 17 out of 388 cases (4.4%) were converted to open cholecystectomy among those who had less than ten attacks of biliary colic. This factor was found to be statistically significant with p value of 0.012. Our findings are in agreement to those of Sanabria JR et al,

found that the break point of fewer or greater than ten biliary colic in past was a highly significant factor in predicting intra-operative difficulty during laparoscopic cholecystectomy and conversion to open cholecystectomy.

In present study out of 450 cases 26 cases (5.8%) were converted from laparoscopic cholecystectomy to open cholecystectomy which is comparable to the conversion rate of 1.5% to 19% reported in literature.⁵

Significant bleeding from liver bed occurred in 10 (02.22%) cases in present study. This bleeding could be managed in 7 (01.55%) cases by means of cautery, compression with gallbladder, sponge and/or spongiston application. But in 3 (0.66%) cases bleeding from liver bed couldn't be controlled and the procedure had to be converted to open cholecystectomies as had also been done in study conducted by Sanabria JR et al.²² Instrument/Equipment failure could be a cause of conversion as observed in study by Memon MR.¹² In Present study, only 1 case (0.2%) were converted to open operation due to instrument (camera and insufflator) failure.

Author reported one case of common bile duct injury (CBD) during dissection (0.22%) which was recognized immediately and converted to open procedure. Memon MR et al reported common bile duct as a cause of conversion to open cholecystectomy in their studies.¹²

Only 1 patient (0.22%) with CBD injury was converted to open procedure in Present study. Bile duct injury can be prevented by lateral retraction of the infundibulum, precise identification of the cystic duct. junction with the gall bladder or the CBD, dissection of the gall-bladder neck from the liver towards the cystic duct, avoidance of blind use of clips and the use of a bipolar cautery or harmonic scalpel for hemostasis to prevent thermal injuries.

In present study 1 case (0.22%) was converted due to duodenal injury during the procedure. visceral injury as a cause of conversion has been reported in studies by Ercan M et al.²³

CONCLUSION

Laparoscopic cholecystectomy is the gold standard in the management of symptomatic gallstone disease. However, many situations make it inevitable to convert the procedure to open. It is therefore mandatory to explain to the patients about the possibility of conversion to open technique at the time of taking consent for laparoscopic cholecystectomy. In present study most, common cause of conversion was dense adhesion followed by obscure anatomy at calot's triangle. Certain preventable factors like instrumental failure can be addressed by a reliable back up.

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Institutional Ethics Committee

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