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Prevalence and reasons for conversion to open surgery in patients undergoing elective laparoscopic cholecystectomy in a tertiary care centre

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Abstract

Background: Despite the advances in technology and improvement in surgical techniques, open conversion is still needed in a small proportion during laparoscopic cholecystectomy. The study intends to look at the prevalence of conversion to open surgery during elective laparoscopic cholecystectomy and elucidate the reasons for the same.

Methods: This retrospective single centre study from a tertiary care centre in South India (Government Medical College, Trivandrum) included 204 consecutive laparoscopic cholecystectomy patients. The primary goal was to Calculate the prevalence of conversion to open surgery and secondarily also to describe the reasons for conversion.

Results: 21 patients out to 204 (10.29%) required conversion to open surgery for safe completion of cholecystectomy. The reasons for conversion were frozen Calot's triangle (71.4%), Mirizzi syndrome (9.5%), cholecysto-enteric fistula (9.5%), dilated CBD (4.8%), cirrhosis – liver (4.8%).

Conclusion: The prevalence of conversion to open surgery during elective cholecystectomy in our tertiary care centre remained acceptable as per literature, the majority of which were due to frozen Calot's triangle due to inflammation.

Keywords: cholecystectomy, laparoscopic, conversion to open surgery

Introduction

Laparoscopic cholecystectomy (LC) came into vogue after Erich Mühe introduced it in 1985 [1] and in the current era, it is the standard of care for symptomatic benign gallbladder disease, *viz*. stone disease and polyps. Conversion to open surgery in laparoscopic cholecystectomy is needed in about 4.2% to 6.2% with some series reporting as high as 15% [2, 3]. With the improvements in laparoscopic techniques and accumulating surgical experience, increasing number of even difficult cholecystectomies are being completed laparoscopically without compromising safety. The host of factors contributary to the conversion to open surgery can be patient specific, disease specific, surgeon specific and technical factors. The present study intends to study the prevalence of conversion to open surgery in elective cholecystectomy in a tertiary care centre and to elucidate the reasons governing the same.

Materials and Methods

Patients and Study Design

This was a retrospective single centre study from a tertiary care centre in South India (Government Medical College, Trivandrum). A total of 218 elective cholecystectomies conducted during the study period (January 2017 to December 2019) out of which 14 were elective open cholecystectomies. 204 consecutive patients who were planned for laparoscopic cholecystectomy in the Department of Surgical Gastroenterology, Government Medical College, Trivandrum were included in the study. The surgeries were performed by experienced laparoscopic surgeons as well as trainee surgical gastroenterologists under the supervision of senior faculties. All the data were collected from the prospectively held hepatopancreaticobiliary surgery operative database held in the department. The primary objective was to estimate the prevalence of conversion to open surgery. The secondary objective was to study the reasons for conversion in the above cases. All patients provided their informed written consent before surgery according to the institutional protocol. This study was performed in accordance with the declaration of Helsinki and was approved by the ethics review committee of Government Medical College, Thiruvananthapuram [HEC No: 08/05/2021/MCT]

Surgical Principles and Procedures

Standard 4 port approach was followed for all cases. Initial umbilical access was done using the Hasson's open technique [4]. A major proportion of patients had Calot's triangle dissection first followed by demonstration of the "critical view of safety" as described by Strasberg *et al* [5]. This was followed by clipping of the cystic duct and artery – 2 clips on the patient side and 1 clip on the gallbladder side with subsequent gallbladder fossa dissection. Some "difficult cholecystectomies" were done "fundus first" with a few needing stapled transection of the wide/thickened cystic duct using an endo-stapler. Cases that required conversion were opened using a right subcostal or upper midline laparotomy incision depending on ease of access.

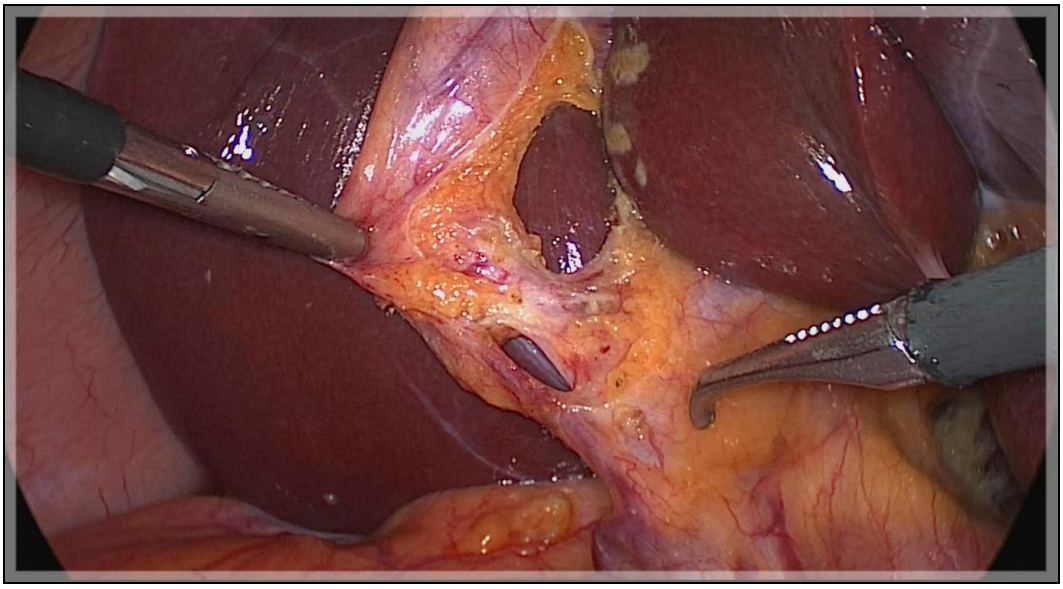

Fig 1: Critical view of Safety of Strasberg during laparoscopic cholecystectomy

Statistical Analysis

Descriptive statistics are reported in mean and standard deviation or median and interquartile range for continuous variable and in absolute numbers and percentages for categorical variables. Proportion of conversion to open surgery was reported in percentages with 95% confidence interval. All statistical analysis were done in R statistical software.

Results

Patient Characteristics

The patient demographics are shown in Table.1, comprising of 72 males (35.3%) and 132 females (64.7%) with a median age of 48 years (ranging from 14 to 75 years). Predominant indication was stone disease (94.6%) whereas polyp was present in 4.4% and stone along with polyp in 0.98%. Majority (94%) of the patients had pain as the predominant symptom while the remaining 5.8% had pain and jaundice. 19.6% of the patients were diabetic while only 1.47% had previous upper abdominal surgeries. 11.76% had previous ERCP and stenting while previous acute pancreatitis and cholecystitis were present in 3.92% and 23.5% respectively. Raised total leucocyte count was present in 7.8% and raised alkaline phosphatase in 11.27%. Preoperative imaging features of GB wall thickening (>3mm) or common bile duct dilatation was present in 25.49%.

Table 1: Patient Characteristics

	Total Number	Percentage
Age [Years; Median, Range]	48 [14-75]	
Sex		
Male	72	35.3
Female	132	64.7
Symptom		
Pain	192	94.1
Pain + Jaundice	12	5.8
Diabetes Mellitus	40	19.61
Previous upper abdominal surgery	3	1.47
ERCP + Stenting	24	11.76
Previous Acute Pancreatitis	8	3.92
Previous Acute Cholecystitis	48	23.5
Aetiology		

Stone	193	94.6
Polyp	9	4.4
Stone + Polyp	2	0.98
Total Leucocyte Count – Elevated	16	7.8
Raised Alkaline Phosphatase	23	11.27
Imaging features suggestive of GB wall thickening or CBD dilatation	52	25.49
ERCP: Endoscopic retrograde cholangiopancreatography; CBD: Common bile duct GB: Gall Bladder		

Proportion and rationale for conversion to open surgery during laparoscopic cholecystectomy

As shown in Table.2, out of the 204 patients who were planned for elective laparoscopic cholecystectomy, 183 (89.7%) were successfully completed laparoscopically. 21 patients (10.29%) required conversion to open surgery for safe completion of cholecystectomy. The principal reason for conversion was frozen calot's triangle (71.4%) which impeded the safe delineation of cystic artery and duct due to inflammation. Few of the patients (9.5%) had Mirizzi syndrome [6] with the large stone in the Hartmann's pouch compressing the common bile duct (CBD) and producing upstream dilatation. An equal proportion also had a cholecysto-enteric fistula. A small proportion (4.76%) had a dilated CBD on laparoscopic visualization requiring CBD exploration. A few (4.76%) were found to be grossly cirrhotic precluding the safe laparoscopic dissection of GB fossa requiring conversion to open surgery.

Table 2: Proportion and rationale for conversion to open surgery during laparoscopic cholecystectomy

	Number	**Percentage**	**CI**
Total Lap Cholecystectomy attempted	204		
Successfully completed	183	89.7	[84.7-93.5]
Conversions	21	10.3	[6.63-15.5]
Rationale for Conversion			
Frozen Calot's Triangle	15	71.4	[47.7-87.8]
Mirizzi Syndrome	2	9.5	[1.7 -31.8]
Cholecysto-enteric fistula	2	9.5	[1.7 -31.8]
Dilated CBD	1	4.8	[0.24-25.9]
Cirrhosis - Liver	1	4.8	[0.24-25.9]

Discussion

The primary finding in our study was that the frequency of conversion to open surgery during elective cholecystectomy was 10.29%. On further elucidation, the most common reason for conversion to open surgery was the frozen Calot's triangle anatomy preventing the safe dissection and delineation of the cystic artery and cystic duct due to inflammation. Other less common reasons included Mirizzi syndrome, cholecysto-enteric fistula, dilated CBD requiring open CBD exploration and cirrhotic liver.

The advantages of minimally invasive approach to cholecystectomy includes lesser post-operative pain, shorter hospital stay, the early return of bowel function, early return to work and cosmesis. These benefits have made laparoscopic cholecystectomy, the standard of care in benign gall bladder diseases including stones and polyps. But the frequency of conversion to open surgery remains high ranging from 4.2% to 15% [2, 3]. The chief reasons for conversion reported in literature are inability to correctly identify the Calot's triangle anatomy, bleeding, choledocholithiasis and bile duct injury [7].

Pericholecystic inflammation produces dense adhesions that make the dissection and delineation of Calot's triangle anatomy unsafe. Proceeding with laparoscopy in such cases may produce biliary or vascular injuries leading to long term complications. Conversion in laparoscopy is never considered a failure and the prompt decision to convert averts intra-operative and post-operative complications.

Mirizzi syndrome makes the Calot's anatomy dissection difficult. As we look at literature, early studies like that by Rust *et al*. [8] suggested that Mirizzi syndrome may be a contraindication to laparoscopic cholecystectomy. Further reviews of laparoscopic treatment report a conversion rate as high as 36.4% (Yeh *et al*.) [9] and complication rates up to 16% with biliary injury as the most common complication [10]. Kumar *et al*. [11] suggested the open approach indicating that the minimally invasive approach is associated with increased incidence of biliovascular injury.

In cirrhotic patients, along with anaesthetic concerns, technical difficulties due to atrophy hypertrophy of the hepatic lobes and bleeding concerns due to portal hypertension, thrombocytopenia and coagulopathy make laparoscopic cholecystectomy difficult with a higher rate of open conversion [12]. Palanivelu *et al*. published a series including 77% laparoscopic subtotal cholecystectomies as an alternative to open conversion in cirrhotic patients [13].

In our study, no patients required conversion to open surgery due to bleeding or bile duct injury. Our centre being a tertiary care referral centre, receives a higher proportion of more complex and chronic cases, which could explain the higher prevalence of conversion (10.29%). The higher prevalence of acute cholecystitis in our study population (23.5%) could also have contributed to the higher rate of conversion. Literature review suggests that conversion rates for teaching institutions continue to be high due to the lower expertise of trainees [14, 15].

The limitations of our study include the referral bias due to our centre being a tertiary care centre, lack of comparison of the time trend in conversion and the wide confidence intervals due to smaller sample size. Further studies with a larger sample size may help us look at predictors of open conversion based on pre-operative patient characteristics.

Conclusion

Prevalence of conversion to open surgery during elective cholecystectomy in our tertiary care centre was 10.29%, the majority (71.4%) of which were due to inability to safely delineate the Calot's triangle anatomy owing to inflammatory reaction.

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