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Original Research Article

Factors Influencing Conversion of Laparoscopic Cholecystectomy to Open Cholecystectomy

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Abstract: ***Introduction:*** The conversion from laparoscopic cholecystectomy to open cholecystectomy results in a significant change in out-come for the patient because of the higher rate of postoperative complications and the longer hospital stay in addition to the effect and the long-term sequel of the cause of conversion itself as in bile duct injury. ***Material and Methods:*** A prospective study was carried out in Department of Surgery, N.C Medical College and Hospital over a period of 1 year patients undergoing laparoscopic cholecystectomy. Full details of patients were recorded in the proforma. Out of 240 laparoscopic cholecystectomy performed during this duration 16 needed conversions. ***Result:*** Adhesions (85.7% versus 31.2%, $P<0.001$), bleeding (28.5% versus 8.7%, $P<0.01$), and stone spillage (28.5% versus 7.9%, p=0.04) were significantly more frequent in the conversion group. However, unclear anatomy, thick gall bladder wall, and bile spillage had no significant relationship with conversion of laparoscopic to open cholecystectomy. ***Conclusion:*** We found that a thickened gallbladder wall and a contracted gallbladder on ultrasound, male gender, age above 40, and acute cholecystitis were risk factors for conversion of laparoscopic cholecystectomy to open surgery.

Keywords: Conversion, Gall bladder, Laparoscopic cholecystectomy, Risk factor.

INTRODUCTION

Laparoscopic cholecystectomy (LC) represents the "gold-standard" for the treatment of symptomatic gallstones disease, being the most common intra-abdominal operation performed in Western nations [1]. A conversion rate 5% to 10% has been reported on a nationwide basis [2]. Depending on specific circumstances, a conversion can be characterized as either elective, which is defined as the surgeon's decision to resort a laparotomy (because of obscure anatomy or lack of progress of the laparoscopic procedure) before being forced to do so as a result of a major intraoperative complication or as enforced, when an intraoperative emergency such as uncontrollable bleeding or bile duct injury, occurs [3].

The most recognizable causes for conversion are: obscure biliary anatomy, presence of dense pericholecystic adhesions, intraoperative bleeding, and failure of the progression and suspicion of choledocholithiasis [4].

Several factors such as male gender, age greater than 65 years, diabetes mellitus, obesity, acute cholecystitis, gallbladder's wall thickness, previous abdominal surgery, cirrhosis, etc. have been studied as predisposing for conversion, but contradictionary results have been published. Predictive scoring systems based on these factors [5], although did not gain worldwide acceptance, have been proposed as useful in selection of cases for residents training [6].

The conversion from laparoscopic cholecystectomy to open cholecystectomy results in a significant change in out-come for the patient because of the higher rate of postoperative complications and the longer hospital stay in addition to the effect and the long-term sequel of the cause of conversion itself as in bile duct injury. [7] Conversion to open cholecystectomy is occasionally necessary to avoid or repair injury, delineate confusing anatomic relationships, or treat associated conditions [8]. This study was planned to identify the circumstances and the risk factors influencing the conversion of laparoscopic cholecystectomy to open procedure. The aim and

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objectives of the study was to identify Patient related and Disease related variables that determine the conversion of laparoscopic to open cholecystectomy. To find out the Factors influencing conversion of Laparoscopic Cholecystectomy to Open Cholecystectomy.

MATERIAL AND METHODS

A prospective study was carried out in Department of Surgery, N.C Medical College and Hospital over a period of 1 year patients undergoing laparoscopic cholecystectomy. Full details of patients were recorded in the proforma. Out of 240 laparoscopic cholecystectomy performed during this duration 16 needed conversions.

Inclusion criterion

All patients attending surgery OPD irrespective of age and sex with gall stone diseases with or without chronic cholecystitis. Gall bladder polyp was also included in the study.

Exclusion criterion

Patients with jaundice, abnormal liver function test, acute pancreatitis, any contraindication to laparoscopic surgery, carcinoma of gall bladder, cholangitis, biliary enteric fistula, portal hypertension, pregnancy, peritonitis, morbid obesity and major bleeding disorder.

A detailed history was taken with special reference to duration of right upper quadrant pain or epigastria pain, its periodicity, its aggravation by fatty meals and relief by oral or parental analgesics, fever, jaundice or any previous attacks of cholecystitis. A relevant general physical examination along with body mass index, abdominal and systemic examination was done. Routine laboratory investigation: haemoglobin, leucocyte count, liver function test.

Ultrasound examination with 2-5MHz curvilinear array transducer with an aim to assess: (a) diagnosis of cholelithiasis, (b) number of calculus and size of calculus, (c) thickness of gall bladder wall thickness <4 mm was considered as normal and >4 mm was considered as abnormal, (d) nature of gall bladder wall whether distended or contracted and fibrosed, (e) stone impaction at the neck of gall bladder, (f) any CBD calculi or dilatation of CBD, (g) any other intra-abdominal pathology, (h) any free fluid due to other cause and (i) preoperative evaluation was done.

A nasogastric tube placed for gastric decompression to prevent trocar injury. All patients received prophylactic preoperative antibiotics. General anaesthesia was given with inhalational or intravenous agent and endotracheal intubation done. The patients were operated by senior surgeon either by laparoscopic or by open method.

Operative technique

Laparoscopic cholecystectomy was done using the standard four puncture technique described by Reddick. The intraabdominal pressure was maintained at 10-14 mm of Hg and CO2 insufflation rate was kept at 6 L/min.

Inoperative assessment

The difficulties in operation encountered were mentioned. A note was made regarding all cases which had difficulties in the laparoscopic cholecystectomy and conversion to open procedure and reasons for conversion.

Statistical Analysis

Chi-square test of significance was used for comparison and p value <0.05 was considered as significant and p value <0.01 was considered as highly significant.

RESULTS

A total of 244 patients who underwent cholecystectomy during the study period. Four patients were excluded because cholecystectomy was planned as an open procedure. The remaining 240 patients who underwent laparoscopic cholecystectomy, were mostly obese women. Approximately 40% of patients were older than 40 years, and 16% were admitted for emergency cholecystectomy.

Table-1: Comparison of demographic, clinical, ultrasound, and biochemical variables between the laparoscopic and conversion groups

Variable	LC (n = 240)	CTO (n = 7)	P
Sex, n (%) Male	100(41.6%)	5 (71.1%)	<0.001
Age, yr (n (%)≥40	120(50.0%)	6 (85.7%)	0.014
Obese	135(56.2%)	2 (28.5%)	0.04
Type of admission, n (%) Emergency	101(42.0%)	2 (28.5%)	0.27
Diabetes mellitus, n (%)	81 (33.7%)	5 (71.4%)	<0.001
Previous admissions for Gallstones for, n (%)	23 (9.5%)	2 (28.5%)	0.03
Previous upper abdominal surgery for, n (%)	19(7.91%)	1 (14.2%)	0.4
Previous lower abdominal surgery, n (%)	71 (29.5%)	0 (0%)	-
Days from admission to surgery	1.7±0.8	4.6±0.8	0.02
Days from surgery to discharge	1.6± 0.4	10.1±2.3	<0.001

Variable	LC (n = 240)	CTO (n = 7)	P
Total hospital stay, days	3.3±0.6	10.2±2.1	<0.001
Operation time, min	85.3±9.2	132±11.4	<0.001
Maximum body temperature, 8C	36(15.0%)	37.0±0.3	0.21
WBC	7.0±2.6	8.3±3.7	0.3
Direct bilirubin	6.8±23.9	45.6±4.7	<0.001
Total bilirubin	13.7±3.9	55.5±5.3	<0.001
Alkaline phosphatase	106.5±11.3	210.3±22.5	<0.001
Ultrasound findings, Pericholecystic fluid n%	26(10.8%)	1 (14.2%)	0.24
Sonographic Murphy's sign	5(2.8%)	0 (0%)	-
CBD diameter, mm	4.4±0.7	3.9±0.4	0.83

Of the 240 patients, 7 (2.9%) required conversion to open cholecystectomy. Demographics, ultrasound, and biochemical and clinical variables are shown in Table 2. Subjects in the conversion group were mostly men (71.1% versus 41.6%; P, 0.001), and they were significantly older than those in the laparoscopic group (85.7% versus 50.0% older than 40 years; P 0.014). Fewer patients in the conversion group were obese patients (BMI. 30) compared with those in the laparoscopic group (28.5% versus 56.2%, P =0.05), but this was not statistically significant. The operative time was longer for subjects in the conversion group (132.0 ± 11.4 versus 85.3 ± 9.2 minutes; P<0.001). In addition, the number of days between admission and surgery (4.6 ± 0.8 versus 1.7 ± 0.8; P=0.02), number of days between operation and discharge (10.1 ± 2.3 versus 1.6 ± 0.4; P<0.001), and the overall total Hospital stay (10.2 ± 2.1 versus 3.3 ± 0.6; P<0.001) were significantly higher for the conversion group. There was no significant relationship between the possibility of conversion in terms of the following factors: previous upper or lower abdominal surgery, white blood cell count, maximum body temperature , or common bile duct diameter on ultrasound. However, previous admissions for gallstones, total bilirubin, direct bilirubin, and alkaline phosphatase were significant factors. Patients in the conversion group were more likely to have a history of admission for gallstones (28.5% versus 9.5%; P=0.03). Total bilirubin (55.5 ± 5.3 versus 13.7 ± 3.9; P<0.001), direct bilirubin (45.6 ± 4.7 versus 6.8 ± 23.9; P<0.001), and alkaline phosphates (210.3 ± 22.5 versus 106.5 ± 11.3; P<0.001) levels were significantly higher in patients who required conversion. Diabetes mellitus was more common in the conversion group (71.4% versus 33.7%; P, 0.001).

Table-2 Comparison of intraoperative factors of the laparoscopic group and conversion group

Variable	LC (n = 240)	CTO (n = 7)	P
Unclear anatomy	19 (7.9%)	1 (14.2%)	0.15
Adhesions	75 (31.2%)	6 (85.7%)	<0.001
Thick gallbladder wall	25 (10.4%)	0 (0%)	0.23
Bleeding	21 (8.7%)	2 (28.5%)	0.01
Stone spillage	19 (7.9%)	2 (28.5%)	0.04
Bile spillage	31 (12.9%)	1 (14.2%)	0.43

In table 3, Adhesions (85.7% versus 31.2%, P<0.001), bleeding (28.5% versus 8.7%, P<0.01), and stone spillage (28.5% versus 7.9%, p=0.04) were significantly more frequent in the conversion group. However, unclear anatomy, thick gall bladder wall, and bile spillage had no significant relationship with conversion of laparoscopic to open cholecystectomy.

DISCUSSION

Laparoscopic cholecystectomy has become the procedure of choice for management of symptomatic gall bladder stone disease [9]. The advantages to the patient and the economic benefits to society have been reported. However, the risk of conversion to open surgery is always present. The actual rates of conversion reported in literatures are quite variable ranging from 0% to 20 % [10]. Conversion from laparoscopic to open cholecystectomy is required when safe completion of the laparoscopic procedure cannot be ensured. It is considered as a sound judgement rather than failure of laparoscopic surgery to avoid complications and reduce morbidity. The identification of parameters predicting conversion helps in preoperative patient counselling, provides for better perioperative planning and avoids laparoscopy associated complications by converting to open procedure as and when appropriate [11]. In our study it has been observed that Patient Related Factors - Age >40yrs, Male gender, Presence of Diabetes Mellitus, Obesity, previous Abdominal surgeries and Disease Related Factors - previous episode of Acute Cholecystitis, presence of Acute Cholecystitis, Gallbladder wall thickness >3mm, presence of Pericholecystic fluid were found to be significant risk factors in conversion of laparoscopic to open cholecystectomy.

Similar to our study, risk factors were analysed by Heng-Hui Lein et al of Taiwan in 2002. They found that male patients had significantly longer (p = 0.03) operating time than females and the conversion rate to open cholecystectomy was also higher in male patients [12]. In 1994, Fried, et al published a study suggesting that the most significant predictors of conversion were increasing age, obesity, thickened gallbladder wall by pre-operative ultrasound and acute cholecystitis. Male sex was also one of them [13]. Neylan CJ, et al. identified male gender and age >40years as being pre-operative factors associated with conversion in acute cholecystitis [14]. Bouassida M, *et al* Similarly, found that age >65 years, obesity, elective laparoscopic cholecystectomy for acute cholecystitis, and a thickened gallbladder wall predicted higher incidence of conversion [15]. El Nakeeb A, *et al* in their study has mentioned previous abdominal surgery as a risk factor predicting difficult laparoscopic cholecystectomy and higher conversion rates [16]. Goh JC, *et al* found in their series that obesity independently predicted conversion to open cholecystectomy in patients with acute cholecystitis [17]. Ashfaq A, *et al* in their study had found diabetes as a predictor of difficult laparoscopic cholecystectomy [18].

This preoperative prediction of risk factors may help surgeon to prepare better for intraoperative technical difficulties expected to be encountered and to make an early decision to convert, if dissection seems to be very difficult and non-progressive, to prevent unwanted biliary tract injuries and complication.

CONCLUSION

In conclusion, Patient Related Factors - Age >40yrs, Male gender, Presence of Diabetes Mellitus, Obesity, previous Abdominal surgeries and Disease Related Factors - previous episode of Acute Cholecystitis, presence of Acute Cholecystitis, Gallbladder wall thickness >4mm, presence of Pericholecystic fluid were found to be significant risk factors in conversion of laparoscopic to open cholecystectomy. None of these risk factors assessed were contraindication to laparoscopic cholecystectomy, but they may help to predict the difficulty of the procedure. This would permit the surgeon to better inform patients about the risk of conversion from laparoscopic to open cholecystectomy. The decision about when to convert to open cholecystectomy is made by the surgeon during the course of the procedure on an individual and often subjective basis.

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