International Surgery Journal
Tripathi AD et al. Int Surg J. 2019 Nov;6(11):4017-4023
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20195116

Original Research Article

Factors influencing conversion of laparoscopic cholecystectomy into open cholecystectomy

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Received: 19 August 2019
Revised: 05 October 2019
Accepted: 07 October 2019

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ABSTRACT

Background: Laparoscopic cholecystectomy may be rendered difficult by various problems encountered during surgery, such as difficulty in accessing the peritoneal cavity, creating a pneumoperitonium, dissecting the gall bladder, pericholecystic adhesions and adhesions between the common bile duct the cystic duct and the cystic artery (calot's triangle) or extracting the excised gall bladder, injury to common bile duct, bowel and iliac vessels. These conditions may lead surgeons to perform conventional open cholecystectomy.
Methods: The general biodata was collected. A detailed history was taken with special reference to duration of right upper quadrant pain or epigastric 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 and systemic examination was done and findings recorded, routine laboratory investigation was done. All cases were then subjected to ultrasound examination with 2-5MHz curvilinear array transducer with an aim to assess.
Results: The univariate analysis sex proved to be significantly predictive of conversion in the present study. Execution of ERCP before the intervention proved associated with an increased risk for conversion in our study. Stone position as significant factor for conversion while stone size was not significant. No significant association between fever and conversion our study.
Conclusions: Male gender, GB wall thickness, stone position, stone size, ultrasound signs of pericholecystitis, acute cholecystitis, were significantly associated with conversion.

Keywords: Laparoscopic cholecystectomy, Open cholecystectomy, Conversion

INTRODUCTION

Laparoscopic cholecystectomy, whose development has been so impressive in the last decade, has now become the gold standard for the treatment of gall bladder disease. gall bladder, laparoscopic cholecystectomy, open cholecystectomy, gall bladder stone. Although cholecystectomy was first introduced in 1882 by Carl Johann August Langenbuch, Phillip Mouret, of Lyon from France performed the first human laparoscopic cholecystectomy in March 1987.[1,2]

The first laparoscopic cholecystectomy was done in India by Prof. T. E. Udwadia in 1989 and he presented his work during 10th world conference of G.I. surgery at New Delhi in 1990.[3] Laparoscopic cholecystectomy may be rendered difficult by various problems encountered during surgery, such as difficulty in accessing the peritoneal cavity, creating a pneumoperitonium, dissecting the gall bladder, pericholecystic adhesions and adhesions between the common bile duct the cystic duct and the cystic artery (calot's triangle) or extracting the excised gall bladder, injury to common bile duct, bowel and iliac vessels. These conditions may significantly

prolong laparoscopic surgery time and may cause bleeding from the gall bladder bed or rupture of gall bladder and may lead surgeons to perform conventional open cholecystectomy. The present study is conducted to look for some preoperative predictive factor on clinical and ultrasonographic examination that can give surgeon some idea about the technical difficulty and complication that may be encountered during the course of laparoscopic cholecystectomy.

METHODS

A prospective study was carried out in Department of Surgery, SRN hospital, Allahabad during the period of September, 2018 to August, 2019 patients undergoing laparoscopic cholecystectomy. Full details of patients were recorded in the proforma. Out of 200 laparoscopic cholecystectomy performed during this duration 16 needed conversions.

The general biodata of patient regarding his name, age, sex, religion, occupation, socioeconomic status, address and registration number was collected. A detailed history was taken with special reference to duration of right upper quadrant pain or epigastric 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: hemoglobin, 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 fully explained well informed consent was taken with explanation of risk of conversion to open cholecystectomy. 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. The Karl Storz laparoscopic unit was used.

Laparoscopic cholecystectomy

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 CO_2 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.

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.

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.

RESULTS

Observations and analysis of all parameters studied are as follows: (a) anagraphic variables such as sex of the patients (male or female). Age of patients >60 years and <60 years, (b) medical variable at clinical history such as obesity (non-obese, BMI<30 and obese BMI>30) and co morbid conditions (HTN or DM) is present or absent, (c) surgical variables at clinical history such as previous abdominal surgery and previous endoscopic retrograde cholangiopancreatography (ERCP), (d) variables at hospitalization such as pain, fever, WBC count, (e) ultrasonography (USG) findings such as GB size, GB wall thickness, features of pericholecystitis and cholelithiasis with choledocholithiasis, (f) intra operative variables such as (i) surgical variables (which included dense adhesions, non-visualization of calot triangle, uncontrolled bleeding (from liver bed and from cystic artery), spilage of stone, bile duct injury, gastrointestinal (GIT) injury, concurrent finding (malignancy, biliary-enteric fistula) and Mirizzi syndrome) and (ii) anesthetic variables (which includes intolerance to pneumoperitoneum) and (g) miscellaneous such as equipment failure.

Experience of surgeon on patients who underwent for conversion i.e. 16 patients.

Anagraphic variables (Aage and sex distribution)

Sex

Of the 200 patients in whom laparoscopic cholecystectomy (LC) was attempted there were 45 male (22.5%) and 155 female (77.5%).

Out of 16 patients converted from laparoscopic cholecystectomy to open cholecystectomy: 9 were male while 7 patients were female. (p values 0.0023; significant) (Table 1). 14 were non obese while 2 were obese, with p value 0.6906 (not significant) (Table 2). 3 had previous abdominal surgery while 13 patients were without any surgery. P value 0.0594 (not significant) (Table 3). 4 (22.3%) out of 18 underwent ERCP and 12 (6.6%) out of 182 ERCP was not done. P value 0.0422 (significant) (Table 4). 7 had normal gall bladder while 9 patients had contracted gall bladder, p value 0.0006 (significant). Conversion 7 had USG wall thickness <4 mm while 9 patients had USG wall thickness >4 mm, p value 0.0013 (significant) (Table 5). 5 had stone impacted at neck while 11 patients had stone in the lumen. p value 0.0196 (significant). 2 had stone size >10 mm while 14 patients had stone size <10 mm, p value 0.7417 (not significant) (Table 6). 6 had signs of pericholecystitis while 10 patients had no pericholecystitis. p value is 0.0258 (significant) (Table 7). 6 had acute presentation while 10 patients had chronic presentation. P- value is 0.0034 (significant) Table 8. Non- experienced surgeons are 6 (14.2%) out of 48 and among experienced surgeons 10 (7.6%) out of 132. P value 0.373 (not significant) (Table 10).

Table 1: Sex.

Sex	No. of patients	No. of completed (%)	No. of conversion (%)	P value
Male	45	36 (80)	9 (20)	0.0023 significant
Female	155	148 (95.5)	7 (4.5)	

Table 2: BMI comorbidity.

BMI (>30 kg/m^2)	No. of patients	No. of completed (%)	No. of conversion (%)	P value
Non obese	178	164 (92.2)	14 (7.8)	0.6906
Obese	22	20 (90.9)	2 (9.1)	not significant

Table 3: Previous abdominal surgeries.

Previous abdominal surgery	No. of patients	No. of completed (%)	No. of conversion (%)	P value
Present	12	9 (75)	3 (25)	0.0594
Absent	188	175 (93.1)	13 (6.9)	not significant

Table 4: Previous ERCP.

Previous ERCP	No. of patients	No. of completed (%)	No. of conversion (%)	P value
Present	18	14 (77.7)	4 (22.3)	0.0422
Absent	182	170 (93.4)	12 (6.6)	Significant

Table 5: USG parameters.

GB volume	No. of patients	No. of completed (%)	No. of conversion (%)	P value
Normal GB	162	155 (95.5)	7 (4.5)	0.0006
Contracted GB	38	29 (76.4)	9 (23.6)	Significant
GB wall thickness	**No. of patients**	**No. of completed (%)**	**No. of conversion (%)**	**P value**
<4 mm	158	151 (55.7)	7 (44.3)	0.0013 significant
>4 mm	42	33 (78.6)	9 (21.9)	

Table 6: Stone position and stone size.

Stone position	No. of patients	No. of completed	No. of conversion	P value
Impacted at neck	22	17 (77.3)	5 (22.7)	0.0196
In the lumen	178	167 (38.3)	11 (61.7)	Significant
Stone size	No. of patients	No. of completed	No. of conversion	P value
>10 mm	36	34 (94.4)	2 (5.6)	0.7417
<10 mm	164	150 (93.7)	14 (6.3)	not significant

Table 7: Signs of pericholecystitis.

Pericholecystitis	No. of patients	No. of completed (%)	No. of conversion (%)	P value
Present	32	26 (61.5)	6 (38.5)	0.0258
Absent	168	158 (94.1)	10 (5.5)	Significant

Table 8: Current severity.

Severity	No. of patients	No. of completed (%)	No. of conversion (%)	P value
Acute	22	16 (72.3)	6 (27.7)	0.0034
Chronic	178	168 (94.4)	10 (5.6)	Significant

Table 9: Intra operative variables.

Intra operative variables	N	%
Dense adhesions	7	43.75
Uncontrolled bleeding, from cystic artery, from liver bed	5	31.25
	3	18.75
	2	12.5
Non–visualization of Calot's triangle	3	18.75
Spillage of stone	1	6.25
Bile duct injury	0	
GIT injury	0	
Concurrent findings (malignancy or biliary-enteric fistula)	0	
Total	16	100

Table 10: Experience of surgeon.

No. of laparoscopic cholecystectomy (experience)	No. of patients	No. of completed (%)	No. of conversion (%)	P value
<50	48	42 (85.8)	6 (14.2)	0.373
>50	132	122 (92.4)	10 (7.6)	not significant

DISCUSSION

The rate of conversion quoted in various studies have found to range from 1.5-19%.[4-10]

The reasons for conversion in order of frequency were dense adhesions (7 cases, 43.75%), uncontrolled bleeding (5 cases, 31.25%), non-visualization of calot's triangle (3 cases, 18.75%) and spillage of stone (1 case, 6.25%).

Anagraphic variables

In our study, the univariate analysis does not show a significant association between conversion and an age over 60 years, a result contrary observed in several previous studies Ercan et al 2010.[11] Livingston et al 2004, Yetim et al 2010, showed that age is not a risk factor for conversion.[12,13] Sex proved to be significantly predictive of conversion in the present study, similarly to the results by Ercan et al 2010, Harboe et al 2011, Hiroshi Yajima et al 2014, which showed a significant association with the male sex. Chandio et al 2009, showed sex was not significantly associated with conversion.[11,14,15,36]

Medical variables at clinical history

Our study does not show any association between obesity (BMI >30 kg/m^2) and conversion, in line with results of Airan et al 1992, and Tang et al 2006, Ibrahim et al 2006, reported obesity as significantly associated with conversion.[16-18] Hutchinson et al 1994, reported that a BMI>27.2 kg/m^2 represents a significant factor predictive of nearly a three-fold-higher conversion rate.[19]

The presence of co-morbid conditions i.e. hypertension and diabetes was not a risk factor in our study, same as Alponat et al 1997.[37] Livingston et al 2004, showed that hypertension is a risk factor for conversion.[12] France et al 2002, showed that hypertensive patients have less pain.[20] Simopoulos et al 2005, showed in the long-term microvascular complications of can also affect the wall of the gall bladder and can lead to conversion.[21] Telli et al 2006, showed that diabetic neuropathy leads to an increase in the pain thresholds.[22] Ibrahim et al 2006, showed that diabetic patients who had conversion presented a significantly higher glycosylated hemoglobin.[18]

Surgical variables at clinical history

In our study we found no statistically significant correlation between previous abdominal surgery and risk of conversion. Liu et al 1996, Harboe et al 2011, Tang et al 2006, Weibke et al 1996, Schafer et al 2001, showed that previous abdominal interventions in the supra mesocolic space and conversion is significant while that between operation in the submesocolic space and conversion is not.[14,16,23-25]

The execution of ERCP before the intervention proved associated with an increased risk for conversion in our study, in line with the results by Ercan et al 2006.[11] Gouma et al 2006, which show a lack of a significant association.[26]

Clinical variables at hospitalization

Our data showed an association between conversion and echographic signs of acute cholecystitis and stone impacted at neck. Similar to the study of Harboe et al 2011,Chandio et al 2009, Wei-Jie 2008, showed a significantly increased risk of technical difficulties in laparoscopic cholecystectomy.[14,15,35] A wall thickness over 3 mm and the wedging of stones in the biliary tract are significant. Liu et al 1996, showed a significant association between a thickened wall only and conversion.[24]

In our study we found stone position as significant factor for conversion while stone size was not significant. Tayeb et al 2005, does not found stone size as significant factor for conversion.[29] Nachmani et al 2005, found that difficulty in extraction was associated with a calculus size greater than 10 mm.[30]

WBC count

In our study statistical significance was not reached for a level of white cell count over 10000/µl. Rosen et al 2002, showed a significant association between conversion and WBC count >9000/µl.[38] Ercan et al 2010, showed raised white cell count as significant.[11]

Pain and fever

In our study we found no significant association between fever and conversion our study. Rosen et al 2002, reported fever as significantly associated with conversion.[38]

Timing of intervention

Soffer et al 2007, showed that laparoscopic cholecystectomy for acute cholecystitis before or after 72 hours since hospital admission does not influence the conversion rate significantly.[32] Pezzolla et al 2007, studied that if cholecystectomy is performed 48 hours after the start of the symptomatology, the conversion rate is higher.[33]

Intraoperative variables

Laghari et al 2008, Rashid et al 2016, found that the presence of adhesions most common cause for difficult laparoscopic cholecystectomy and conversion.[9,34]

Kama et al 2001, showed that the increase in the experience of the surgeon and the improvement in the surgical apparatus can lead to a reduction of the conversion rate in these patients.[6]

CONCLUSION

The operative parameters taken to assess the difficulty of the laparoscopic cholecystectomy were dense adhesions, non-visualization of calot's triangle (inability to define anatomy), uncontrolled bleeding (from liver bed or cystic artery), spillage of stone, bile duct injury, GIT injury and concurrent finding (malignancy or biliary enteric fistula) miscellaneous parameters were anesthetic complications, equipment failure and experience of surgeon.

In conclusion, our study shows that male gender ultrasonographic parameters, GB wall thickness(>4 mm), stone position (neck of gall bladder) and size more than 10mm in size, ultrasound signs of pericholecystitis, acute cholecystitis, were significantly associated with conversion. These parameters predict the difficulty of the procedure, allow patients to be better informed about possible conversion, and optimize the planning of interventions, particularly by selecting the most experienced surgeons for cases at risk.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Tripathi AD, Qazi I, Tripathi SS. Factors influencing conversion of laparoscopic cholecystectomy into open cholecystectomy. Int Surg J 2019;6:4017-23.