

Factors Necessitating Conversion of Laparoscopic Cholecystectomy to Open Cholecystectomy**Ramachandran K¹, Arunbabu C², Muruganandham R³, Princess Beulah D⁴**¹Assistant Professor, Department of general Surgery, Government Medical College, Thiruvallur²Associate Professor, Department of General Surgery, Government Stanley medical College³Senior Assistant Professor, Department of Community Medicine, Government Stanley Medical College, Chennai⁴Associate Professor, Department of General Surgery, Government Medical College, Thiruvallur

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Abstract:

Gallbladder stones continue to be the leading cause of abdominal morbidity and affect a large portion of the population in many different countries across the world. The goal of this study was to determine the conversion rate and identify the factors responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy. Hence, these findings will allow us to improve patient safety by reducing time to conversion, better operating room scheduling and efficiency, and more relevant and accurate preoperative counseling, it is necessary to determine a patient's risk for conversion based on preoperative information. A hospital based cross sectional study was conducted in general surgery department, in Government Thanjavur medical College and Hospital. A total of 75 Patients presenting with symptomatic gall stone disease without choledocholithiasis between December 2017 and October 2019 were included in the study. The present study of 75 patients has shown that gallstone diseases were more common in females than to males with a ratio of 2: (68 % females and 32% males). The most common age of presentation of gallstone diseases is 41-50 years (28% of the patients presented in this group). Most of the patients had right hypochondrium pain followed by vomiting (71%) and jaundice (4%) as the chief complaint. Ultrasonography is the most economical, simplest, easiest and an initial tool for the evaluation of gallstone diseases. Patients with thickened gallbladder wall had a higher rate of conversion i.e, 5 out of 13. This was one of the important parameter. Patients who presented on admission with acute cholecystitis had a higher conversion rate to open procedure as compared to those who presented with only cholelithiasis. The main cause for conversion from laparoscopic cholecystectomy to open procedure was difficulty in identifying the anatomy of the Calot's triangle as a result of dense omental adhesion (83.3%) followed by common bile duct injury (16.7%). Laparoscopic cholecystectomy is a safe and reliable surgery. With growing experience by the surgeons in laparoscopic technique, complications and conversion rate can be brought down to a minimum.

Keywords: Laparoscopic cholecystectomy, Open cholecystectomy & Cholelithiasis.

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Introduction

Gallbladder stones continue to be the leading cause of abdominal morbidity and affect a large portion of the population in many different countries across the world. In the general population, gallstone disease is a prevalent gastrointestinal ailment that often necessitates hospitalization.

The prevalence is around 11% to 36%. The treatment of choice for patients with symptomatic cholelithiasis is laparoscopic cholecystectomy [1]. Previously Open cholecystectomy was frequently performed but that has given way to a laparoscopic approach.

The advantages of laparoscopic cholecystectomy are the avoidance of large incision, shortened hos-

pital stay and earlier recovery. The patient's condition, the surgeon is level of experience, and technical factors can play a major role in the decision for conversion. Inability to define the anatomy and difficult dissection are the leading cause for conversion followed by other complications like bleeding [2]. The conversion rate for elective laparoscopic cholecystectomy is around 5%, whereas the conversion rate in the setting of complications like acute cholecystitis is around 30% [3]. The goal of this study was to determine the conversion rate and identify the factors responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy. Hence, these findings will allow us to improve patient safety by reducing time to conver-

sion, better operating room scheduling and efficiency, and more relevant and accurate preoperative counseling, it is necessary to determine a patient's risk for conversion based on preoperative information.

Aim and Objectives

1. To identify the risk factors predictive of conversion of laparoscopic cholecystectomy to open surgery.
2. To determine the rate of conversion of laparoscopic cholecystectomy to open surgery.

Material and Methods

A hospital based cross sectional study was conducted in general surgery department, in Government Thanjavur medical College and Hospital. A total of 75 Patients presenting with symptomatic gall stone disease without choledocholithiasis between December 2017 and October 2019 were included in the study. The following evaluations were performed on each patient who was a part of the study and were thought to be risk factors for laparoscopic cholecystectomy: characteristics of the patient. Complaints, radiological investigations, clinical examinations, laboratory results, and operational findings.

Inclusion Criteria:

- Patients above the age of 18-70 years
- Adults with Symptomatic Cholelithiasis
- Adults with calculous Cholecystitis

Exclusion Criteria:

- Age < 18 years
- Gall Bladder Malignancy
- Adults with choledocholithiasis
- Perforated Gallbladder
- Patients unfit for General anesthesia

A general bio-data of the patients regarding their name, age, sex, occupation, religion, socioeconomic status and address were collected. Detailed history was taken with special reference to the duration of right upper quadrant pain or epigastric pain, periodicity, any aggravation by fatty meals and any relief by parenteral or oral analgesics. Any significant past history was also taken into account. A routine general physical, abdominal and systemic examination was performed.

Pre-operative work up included routine lab investigations like complete blood count, renal function

test, liver function tests, hepatitis profile, Chest-X-Ray and ultrasound of abdomen, Ultra sonogram of the abdomen was routinely done on all the patients to confirm the clinical diagnosis of cholelithiasis. The number and size of the calculus, as well as size of the gallbladder, its wall thickness and CBD calculi or CBD dilatation. A routine pre-anaesthetic checkup was done for all patients. A fully explained well informed consent was taken from all patients undergoing surgery and with explanation of risk of conversion to open cholecystectomy. We also placed nasogastric tube in all patients for gastric decompression to prevent trocar injury. All cases received prophylactic pre-op antibiotics (Inj. Cefotaxime 1gm IV). The procedure was performed by different senior and junior surgeons. Standard four port technique was performed in the operation, using carbon dioxide insufflation. The Veress technique was used to obtain pneumoperitoneum. During surgery the cystic artery and cystic duct were skeletonized and clamped separately with metallic clips. Some cases a suction drain was placed. All patients were started on oral liquids and then solid diet from 3rd day after surgery, provided the patient had no nausea and vomiting.

Statistical Analysis: Data were entered in the excel spread sheet and variables were coded accordingly. The statistical analyses were performed using Graph pad Prism version 5 software. Data were presented as mean with Standard deviation for normal distribution/scale data. Data were presented as frequency with proportion n (%) for categorical data. Fisher's exact test was used to compare the frequencies between the groups. Unpaired „t“ test was used to compare the means between the groups. $p < 0.05$ were considered statistically significant.

Ethical Consideration: Ethical principles such as respect to the patient, beneficence and justice were strictly adhered. Prior to initiating the study, clearance from the ethical committee was obtained.

The Institutional Ethical Committee granted its approval for the current study to be conducted. Prior to the commencement of the study, all participants provided written informed consent. The study participants' confidentiality was respected at all times.

Results

Table 1: Basic characteristics of the study participants

Variables	Number	percentage
Age distribution		
20 to 30 Years	11	14.7 %
> 30 to 40 years	16	21.3 %
> 40 to 50 years	21	28 %
> 50 to 60 years	17	22.7%

> 60 years	10	13.3 %
Gender distribution		
Male	24	32 %
Female	51	68 %
Duration of abdominal pain		
< 1 month	12	16 %
1 to 2 months	45	60 %
> 2 to 3 months	11	14.7%
> 3 months	7	9.3%
Duration of Vomiting		
No Vomiting	21	28 %
< 15 days	16	21.3 %
15 to 30 days	31	41.3%
> 30 days	7	9.4 %
Jaundice as presenting symptom		
Yes	3	4 %
No	72	96 %
Comorbidity		
CAD	1	1.3 %
Diabetes	4	5.3 %
Diabetes with CAD	1	1.3 %
Diabetes with HT	6	8 %
DM/HT/CAD	1	1.3 %
HT only	2	2.8 %
No comorbidity	60	80 %
Total	75	100 %

In 75 cases, 51 were females and 24 were males. The ratio of females to males 2:1.

The data given above shows those gall bladder diseases have a higher in female than male. The age group of the patients in this study ranged from 20 years to 70 years. The highest incidence is seen in the age group of 41-50 years which is 28 %. Around 60 % of the patient had abdominal pain for

1-2 months and 9.3% patient had abdominal pain for more than 3 months.

Among 75 patients, 41.3% of the patients had vomiting for 15 -30 days and 9.4% patients had vomiting for more than 30 days and 28% of the patient doesn't have vomiting. Regarding presenting symptoms, jaundice was seen in 3 patients, which is 3% of the total patients.

Table 2: Diagnosis and surgery details among study participants

Variables	Number	percentage
Type of diagnosis		
Cholelithiasis	62	82.7 %
Acute calculus cholecystitis	9	12 %
Chronic calculus cholecystitis	4	5.3 %
Gall bladder wall thickness		
Absent	62	82.7%
Present	13	17.3%
Gall bladder with		
Single stone	12	16%
Multiple stones	63	84%
Intra-operative findings		
Bowel adhesion	3	4%
Omental adhesion	11	14.6%
Both bowel and omental adhesion	2	2.7%
Omental adhesion with thickened GB	3	4%
Structures well defined	56	74.6%
Conversion of surgical technique		
No conversion	69	92%
Conversion present	6	8%
Reason for conversion of surgical procedure		

Common bile duct injury	1	16.7%
Omental adhesion	5	83.3%
Total	75	100 %

Out of 75 patients, 62 (82.7%) patients diagnosed as cholelithiasis, 9 (12%) patient diagnosed as acute calculus cholecystitis and 4 (5.3%) patients had chronic calculus cholecystitis.

In Intraoperative findings, 75 % of the patients had well defined structures, 15% had omental adhesion, 4% with thickened gall bladder, 4% of patients had bowel adhesions, 3% of patients had both bowel

and omental adhesion. Out of 75 cases 6 cases converted to open cholecystectomy from laparoscopic cholecystectomy which accounts of about 8%.

The most common cause of conversion was omental adhesion (83.3%) and bile duct injury (16.7%).

Table 3: Comparison of general risk factors with respect to the conversion status

Gender	Conversion present (n=6)		Conversion absent (n=69)		p value
	Number	Percentage	Number	Percentage	
Gender					
Female	2	33.3 %	49	71 %	0.057
Male	4	66.7 %	20	29 %	
Duration of abdominal pain					
<1month	3	50 %	9	13.1 %	0.106
1 – 2 months	2	33.3 %	43	62.3 %	
>2 – 3 months	1	16.7 %	10	14.5 %	
>3 months	0	0	7	10.1 %	
Type of intra-operative findings					
Bowel adhesion	0	0 %	3	4.3 %	0.001
Omental adhesion	2	33.3 %	9	13 %	
Both bowel and omental adhesion	2	33.3 %	0	0 %	
Omental adhesion with thickened GB	2	33.3 %	1	1.4 %	
Structures well defined	0	0 %	56	81.2 %	
Type of diagnosis					
Acute calculus cholecystitis	3	50 %	6	8.7 %	0.001
Cholelithiasis	1	16.7 %	61	88.4 %	
Chronic calculus cholecystitis	2	33.3 %	2	2.9 %	
Mean Duration of surgery in minutes + SD	125 + 25.1		100.00 + 17.4		0.002
Mean Duration of hospital stay(days) + SD	8.67 + 3.1		5.04 + 0.81		0.001
Gall bladder Stonequantity					
Multiple	4	66.7 %	59	85.5 %	0.244
Single	2	33.3 %	10	14.5 %	
Gall bladder wallthickening					
Present	5	83.3 %	8	11.6 %	0.001
Absent	1	16.7 %	61	88.4 %	
Comorbidities					
Present	2	33.3 %	13	18.8 %	0.394
Absent	4	66.7 %	56	81.2 %	
Total	6	100 %	69	100 %	

When comparing gender and conversion status, men had a larger chance of converting than women—66.7% for men and 33.0% for women—but this difference was not statistically significant because the p value was greater than 0.05. There is no significant difference seen between Duration of abdominal pain, Gall bladder Stone quantity and Comorbidities with p value shows more than 0.05. During intraoperative those patients structures well

defined had higher number of non-conversion which is 81.2% when compared to other intra operative findings and the difference is statistically significant with the p value of less than 0.05. Those who had cholecystitis have higher non-conversion status which is 88.4% when compared to acute calculus Cholecystitis and chronic calculus Cholecystitis with the p value shows less than 0.05. The mean duration of surgery among surgery conver-

sion patient was 125 + 25.1 minutes and in non – conversion patients was 100.0 + 17.4 minutes. The mean duration of surgery was significantly higher among conversion group when compared to non-conversion and the difference is statistically significant with the p value of less than 0.05. The mean duration of hospital stay among conversion patient was 8.67 + 3.1 days and in non – conversion patients was 5.04 + 0.81 days. The mean duration of hospital stay was significantly higher among conversion group when compared to non-conversion and the difference is statistically significant with the p value of less than 0.05. Patients those who had gall bladder wall thickening was higher chance of conversion which is 83.3% when compared non gallbladder wall thickening patients and the difference is statistically significant with the p value shows less than 0.05.

Discussion

Cholelithiasis is a very common disease entity. Complications of cholelithiasis are frequent and serious and this has made this disease as one of the most important surgically correctable diseases. It is important to keep in mind that conversion from laparoscopic surgery to open surgery is not seen as a complication, but rather a matter of sound surgical judgment as safety of the patient is of foremost importance. Age incidence it is said that gallbladder disease affects all ages, however they were more common in the 3rd, 4th and 5th decades of life as 72% of the cases in our study belonged to these decades. Maximum incidence was seen in the 41-50 years age group i.e, 21 patients (28%) followed by that in 51-60 years i.e, 17 patients (22.7%). All the 75 patients were planned for elective laparoscopic cholecystectomy. 6 out of the 75 patient's i.e., 8 % were converted to open cholecystectomy. Age wise conversion noted in our study is as follows „1 in the age group of 20- 30years,1 in 30-40 years,2 in 40-50years,2 in 50-60 years, with equal incidence of conversion in 40- 50years and50- 60 years attributed to omental adhesion. Similar peak incidence in the 4th and 5th decade has been reported by workers like Thomas B Hugh et al [4]. The main sufferers of gallstone disease in our study were females as compared to males. Out of total 75 cases, 51 (68%) were females and 24 (32%) were males, which are very much similar to the study observed by Frazee et al [5] and U.Berggren et al [6].

In our study, 66.7% males required conversion as compared to 33.3% females; this was similar to Brodsky et al. and also found the male gender as a significant determinant for conversion to open cholecystectomy. The reason for the higher conversion rates in male patients remains unexplained. It has been observed that the male patients have more intense inflammation and fibrosis, resulting in a more difficult dissection of the Calot's triangle and

through the plane between the liver and GB. Out of 75 operated patients, 80% presented with a chief complaint of pain in the right hypochondrium, 20% presented with pain in the epigastrium, 3 patients presented with vomiting and jaundice, In our study of 75 cases of laparoscopic cholecystectomy, conversion from laparoscopic to open cholecystectomy was required in 6 cases out of which one patient had coronary artery disease, one patient had hypertension. In our study comorbidities was not influencing the conversion of laparoscopic cholecystectomy to open cholecystectomy. Ultrasonogram is the best initial, non-invasive, economical and an easily available investigation. In our study, 13 out of 75 patients showed a thickened gall bladder wall on ultrasonography, of which 5 patients were converted. Out of the remaining 62 patients in whom the gall bladder wall was not thickened, one patient were converted due to intra-operative events (common bile duct injury) by which the thickened Gall bladder shows a significant chance of conversion from laparoscopic cholecystectomy to open cholecystectomy. In a study by Pawanlal et al [7], they have found a significant correlation between the gall bladder thickness and conversion from laparoscopic to the open procedure (sensitivity 41.18%) and a positive predictive value of 70. It suggesting that gall bladder thickness is a good predictive factor for conversion to open surgery. Our finding coincides with these studies.

Pre-operative diagnosis

In a study a retrospective analysis by Chahin F [8] over a period of 3 years of 557 patients who have undergone laparoscopic cholecystectomy; 88 of the patients had acute cholecystitis. The author concluded that conversion rates were around 22% in patients with acute cholecystitis when compared to 5.5% of patients with chronic cholecystitis. In our study of 75 patients, 9patients had acute calculus cholecystitis and out of which 3 patients (50%) and chronic calculus cholecystitis (33.3%) were converted. According to Ohri Ashish, Singh Kuldip [9] within 72 hours of the symptoms the tissue planes are inflamed and edematous but are easier to dissect, having no adhesions at all.

After 72 hours, the tissue becomes more friable and becomes more risky to dissect till after 3-4 weeks' time when the inflammation has subsided and fibrosis sets in. In a study by Koo KP (11) et al the author experienced that in acute cholecystitis, laparoscopic cholecystectomy has a high conversion rate if delayed for more than 72 hours. Previous acute cholecystitis results in scarring and fibrosis of the GB, and causes dense fibrotic adhesions that make laparoscopic dissection difficult. Gall bladder wall thickness is related to inflammation and fibrosis that follows previous attacks of acute cholecystitis, and thus it may reflect difficulty in delineating the anatomy during surgery. The average duration

of surgery in our study was 100mins. The average duration of surgery in other studies are as follows-The mean duration of surgery in our study in converted cases was 125 min and successful laparoscopic operated was 100 min. The period from day of surgery to discharge is taken as period of hospital. The total period of post-operative hospital stay in our study was around 5.04 days. Compared to our study, the study by U. Berggren et al [6] and Roohul-Muqim et al [10] reported a post-operative stay of 1.8 days and 2.06 days respectively which is much shorter than seen in our study.

The reason for the longer hospital stay in the hospital could be because most of our patients were from rural and poor background who insisted on staying till sutures were removed and therefore majority of cases discharged after a week even though many of the patients could have been discharge much earlier. Conversion to open procedure is considered a major morbidity of laparoscopic cholecystectomy as it loses its supremacy over open cholecystectomy once the conversion takes place.

The conversion rate in our study was 8 % and this is similar to the conversion rate of 2.6% to 14% reported in most studies. In 5 cases (83.3%) out of the 6 cases, conversion was enforced due to dense adhesions in the calots triangle, 1 case (16.6%) due to common bile duct injury. This may be due to the fact that there are differences in the institutional and individual practice as well as experience of operating team. Difficult anatomy at the Calot's triangle accounted for conversions (83.3 %); the reasons for common bile duct injury due to bowel adhesion (16.7%). Ibrahim et al [2] also found difficult anatomy as the most common reason for conversion to open procedure. According to our study we observed that individual anatomy was obscured primarily due to dense omental adhesions (83.3%).

Conclusion

Patients presenting on admission with acute cholecystitis had a higher rate of conversion. An ultrasound finding suggestive of a thickened gallbladder wall is a good indicator of conversion. Therefore ultrasonography can predict difficult laparoscopic cholecystectomy and thus the likelihood of conversion to open surgery. The main reason for conversion from laparoscopic cholecystectomy to open procedure was difficult anatomy due to dense omental adhesions.

Conversion from laparoscopic cholecystectomy to open procedure should not be visualized as a complication but rather it should be considered a reflection of sound surgical judgment in difficult cases. However, laparoscopic cholecystectomy is a safe and minimally invasive technique, with low conversion rate and the most common cause of conversion in our study was the presence of dense adhesions at Calot's triangle.

Bibliography

1. Henry A Pitt, Thomas R. Gadacz. Biliary system. In, Shackel ford's Surgery of the Alimentary Tract Volume 2, 6th edition, Saunders Publishers, 2007; 1444-9.
2. Ibrahim S, Hean TK, Ho LS, Ravintharan T, Chye TN, Chee CH. Risk factors for conversion to open surgery in patients undergoing laparoscopic cholecystectomy. *World J Surg* 2006; 30:1698-704.
3. Bingener-Casey J, Richards ML, Strodel WE, Schwesinger WH, Sirinek KR. Reasons for conversion from laparoscopic to open cholecystectomy: a 10-year review. *J Gastrointest Surg* 2002; 6: 800-5. 119.
4. Hugh TB, Chen FC, Bei LI. Laparoscopic cholecystectomy. *Medical Journal of Australia* 1992; 156:318-319.
5. Frazee RD, Roberts JW, Okeson GC, Symonds RE, Synder SK, Hendricks JC et al. Open versus laparoscopic cholecystectomy: A comparison of postoperative pulmonary function. *Ann Surg*. 1991; 651-653.
6. Berggren U, Gordh T, Grama D, Haglund U, Rastad J, Arvidsson D. Laparoscopic versus open cholecystectomy: Hospitalization, sick leave, analgesia and trauma responses. *Br J Surg*. 1994; 81:1362-1365.
7. PawanLal, MD, PN Agarwal, MD, Vinod Kumar Malik, MD, and AL Chakravarti, MD, A Difficult Laparoscopic Cholecystectomy That Requires Conversion to Open Procedure Can Be Predicted by Preoperative Ultrasonography, *JLS*. 2002 Jan-Mar; 6(1): 59-63.
8. Chahin F, Ishizaki Y, Miwa K, Yoshimoto J, Sugo H, Kawasaki S. Conversion of elective laparoscopic to open cholecystectomy between 1993 and 2004. *Br J Surg*. 2006; 93: 987-91.
9. Ashish O, Kuldip S, Peters JH, Krailadsiri W, Incarbone R, Bremner CG, et al. Reasons for conversion from laparoscopic to open cholecystectomy in an urban teaching hospital. *Am J Surg*. 1994; 168: 555-8.
10. Butt AU, Sadiq I. Conversion of laparoscopic to open cholecystectomy-six years' experience at Shalamar Hospital, Lahore. *Ann King Edward Med Coll*. 2006; 12:536-9.
11. Koo KP, Thirlby RC. Laparoscopic cholecystectomy in acute cholecystitis. What is the optimal timing for operation? *Arch Surg* 1996; 131:540-5.
12. Gharaibeh KI, Qasaimh GR, Al-Heiss H, Ammari F, Bani-Hani K, Al-Jaber TM, et al. Effect of timing of surgery, type of inflammation, and sex on outcome of laparoscopic cholecystectomy for acute cholecystitis. *J Laparoendosc Adv Surg Tech* 2002; 12: 193-8.
13. Alponat A, Kum CK, Koh BC, Rajnakova A, Goh PMY. Predictive factors for conversion of

- laparoscopic cholecystectomy. *World J Surg.* 1997; 21:629–633.
14. Jansen S, Jorgensen J, Caplehorn J, Hunt D. Pre-operative ultrasound to predict conversion in laparoscopic cholecystectomy. *Surg Laparosc Endosc.* 1997; 7:121–123.
 15. Rooh-ul-Muqim, Faryal Gul Afridi, Javeria Iqbal L. Comparison in Terms of Postoperative Morbidity and Hospital Stay between Open Cholecystectomy and Laparoscopic Cholecystectomy. *World Journal of Laparoscopic Surgery*, September December 2008; 1(3):17-21.
 16. Masoom Raza Mirza, Wajahat H. Wasty, LubnaHabib. An audit of cholecystectomy. *Pakistan Journal of Surgery.* 2007; 23(2): 104-8.