Original Article

Reasons of conversion of laparoscopic to open cholecystectomy in a tertiary care institution

Muhammad Shamim,[1] Amjad Siraj Memon,[2] Ashfaq Ahmed Bhutto,[3] Mir Muhammad Dahri[4]

Department of Surgery, Fatima Hospital & Baqai Medical University,[1] Department of Surgery, Dow University of Health Sciences & Civil Hospital,[2] Department of Surgery, Civil Hospital,[3] Sir Syed Girls Medical College,[4] Karachi, Pakistan.

Abstract

Objective: To determine the frequency and reasons of conversion of laparoscopic cholecystectomy (LC) to open cholecystectomy (OC) in a tertiary care teaching hospital.

Methods: A prospective analysis of conversion of laparoscopic to OC was performed in one Surgical Unit of Civil Hospital Karachi, from 1st September 1997 to 31st May 2005.

There were 1238 patients in the series. The inclusion criteria were: all patients with symptomatic cholelithiasis, who were subjected to LC. The exclusion criteria were: cases with incomplete laboratory or histopathology data, patients who were lost to follow-up, and patients with preoperative diagnosis of carcinoma of gallbladder.

Results: Eighty-one (6.5%) patients were converted to OC, due to difficult anatomy, complication or equipment failure. The frequency during learning curve was 9% vs. 6.3% during skill curve. The conversion rate was higher in male patients (16.45% males vs. 5.09% females), and in patients with acute cholecystitis (24.39% acute vs. 5.06% chronic). In eight cases, conversion was due to major complication: bleeding (6), and bowel injury (2). In 73 cases, conversion was carried out electively; disturbed anatomy at Calot's triangle (44), wide cystic duct (7), choledocholithiasis (5), dense adhesions between gallbladder and bowel (4), biliodigestive fistula (1), and equipment failure (12).

Conclusion: The overall frequency of conversion of LC to OC was 6.5%; the risk was more during the learning curve, in male patients and in patients with acute cholecystitis (JPMA 59:456; 2009).

Introduction

Laparoscopic cholecystectomy is the gold standard treatment of gallstones.[1] The advantages of LC made it attractive to patients, surgeons and hospitals (eg, less scarring, shortened hospital stays, earlier returns to usual activities).[2] Increased surgical experience and technical innovations have extended the indications for the laparoscopic approach to patients with complicated disease processes. Still, there are a number of patients who require conversion to open cholecystectomy for the safe completion of the surgical procedure.[3]

Conversion rates of 2.6% to 14% had been described in literature.[1,3,4-6] The factor to be born in mind with conversion is that it should never be considered a complication, but rather a prudent move on the surgeon's part, which does not suggest a lack of surgical ability.[7]

Peters[6] identified the following reasons for conversion of LC to OC: difficult dissection due to dense adhesions, severe inflammation, obscure anatomy and retraction difficulty, common bile duct (CBD) problems which includes abnormal laparoscopic intraoperative cholangiography (IOC), failed attempt at laparoscopic CBD exploration and failed attempt at IOC, complications which includes bleeding, duodenal injury, cystic duct avulsion, respiratory acidosis, and miscellaneous factors which includes enterobiliary fistula, inability to secure cystic duct, equipment problems and unsuspected pathology.

With this background our study aims at assessing the frequency, risk factors & reason of conversions from LC to OC, in a tertiary-care teaching hospital.

Patients and Methods

This descriptive case-series study included 1238 patients (with complete record) who underwent LC for symptomatic gallstones in a Surgical Unit of Civil Hospital Karachi. This study was done prospectively from 1/9/1997 to 31/5/2005. From 1309 patients enrolled into the study, 71 were excluded due to reasons mentioned below and were not included for statistical calculations.

The inclusion criteria for LC were: all patients with symptomatic cholelithiasis including acute cholecystitis, and ultrasound abdomen (US) demonstrating cholelithiasis and normal CBD. LC was not attempted in patients with previous upper abdominal surgery, portal hypertension, gallbladder malignancy, and severe cardiopulmonary disease or any other anesthaetic risk. In patients with

choledocholithiasis and acute pancreatitis, LC was attempted after clearance of CBD by endoscopic retrograde cholangiopancreatography (ERCP). Cases with incomplete laboratory or histopathology data, and patients who were lost to follow-up were excluded.

A thorough record of patients' data was performed, including the history and clinical examination, laboratory investigations, ultrasound abdomen, x-ray chest and any other imaging study (if done), operative details, histopathology report, postoperative course and follow-ups of 6-months to 3-years. The variables noted and analyzed included: the demographic data, presenting complaint, previous history of jaundice or abdominal surgery, associated medical disease, abdominal tenderness, WBC count, LFTs, abdominal ultrasound, operative details, complications (peroperative or postoperative), histopathology report, postoperative course and follow-ups.

Conversions were divided in 2 groups, as enforced and elective. Enforced conversion was defined as conversion which was enforced to deal a peroperative complication, while elective conversion was defined as conversion which was needed to deal a peroperative finding or pathology (before happening of any complication during dissection).

Learning curve was defined as first 50 cases by one surgeon;[8] 100 cases were taken for 2 surgeons.

Results

The large prospective study, which spanned over a period of seven and half years, included all initial learning curve cases of LC. Mean age of patients in the series was 41.25±12 years (range 16-88). No risk of conversion was associated with increasing age. Indeed most patients (397) in the series presented with gallstone disease in 30s (between 30-39 years of age), and most conversions (32) also occurred in this age group. There was no conversion below 20 years and above 80 years. Age-wise conversion rates were: 2.31% in 20s, 8.06% in 30s, 7.49% in 40s, 7.98% in 50s, 4.21% in 60s, and 4% in 70s [Table-1].

Among the 1238 patients in the study, 1080 (87.24%) were females and 158 (12.76%) were males [Table-2]. Successful LC was performed in 1025 females and 132 males, whereas conversion was required in 55 females (5.09%) and 26 males (16.45%).

Table 1: Age Distribution.

Age range (years)	Attempted laparoscopic cholecystomies (1238) No. of cases	%	Conversions (81) No. of cases	%
10-19	14	1.13	0	0
20-29	173	13.97	4	2.31
30-39	397	32.07	32	8.06
40-49	307	24.80	23	7.49
50-59	213	17.21	17	7.98
60-69	95	7.67	4	4.21
70-79	25	2.02	1	4
> 80	14	1.13	0	0

P-value = 0.147
Conversions < 60 years = 76 (6.88%)
Conversions > 60 years = 5 (3.73%)

Among the 1238 patients in the study, chronic cholecystitis (CC) was found in 1146 patients (92.56%) and acute cholecystitis in 92 patients (7.43%). Conversion to open cholecystectomy (COC) was required in 58 patients with chronic cholecystitis (5.06%), and 23 patients with acute cholecystitis (24.39%) [Table-2]. In the acute cholecystitis converted group, 6 patients were males and 17 were females. In the chronic cholecystitis converted group, 20 patients were males and 38 were females. In acute cholecystitis, LC was performed on 3rd day of admission after initial conservative treatment.

First 100 cases were taken as the learning curve experience, during which 9 cases were converted to OC, with two operating surgeons. Subsequent cases (1138) were taken as skill curve experience, during which 72 cases were converted to OC [Table-2]; and in this period 4 new surgeons started doing LCs. The conversion rate fell from 9% during the learning curve, to 6.3% during the skill curve; this occurred in spite of new surgeons doing LCs, because the primary surgeons were there to tackle difficult cases.

In 73 cases, conversion was carried out electively: disturbed anatomy at Calot's triangle (44), wide cystic duct (7), choledocholithiasis (5), dense adhesions between gallbladder and bowel (4), biliodigestive fistula (1), and hardware or instrument malfunction (12) [Table-3]. Disturbed anatomy at Calot's triangle accounted for more than one half of conversions (54.32%); the reasons of obscured anatomy were

Table-2: Affect of sex, disease spectrum & experience on conversion.

	Sex		Disease spectrum		Experience	
	Males	Females	Acute cholecystitis	Chronic cholecystitis	Learning curve	Skill curve
No. of attempted laparoscopic cholecystomies	158	1080	92	1146	100	1138
Conversion (no.)	26	55	23	58	09	72
Conversion (%)	16.45	5.09	24.39	5.06	9	6.3
P-value	0.000*		0.000*		0.300	

*P = <0.05 was considered significant.

Table-3: Reasons for conversion of laparoscopic to open cholecystectomy.

Reason	Nature	No. of cases	Percentage
Complications			
Bleeding from GB bed	Enforced	4	4.93
Bleeding from cystic artery injury	Enforced	2	2.47
Duodenal perforation	Enforced	1	1.23
Colonic injury	Enforced	1	1.23
Difficult dissection			
Disturbed anatomy at Calot's triangle	Elective	44	54.32
Dense adhesions between GB & bowel	Elective	4	4.93
Operative finding (associated pathology)			
Choledocholithiasis	Elective	5	6.17
Biliodigestive fistula	Elective	1	1.23
Technical problem			
Wide cystic duct	Elective	7	8.64
Equipment failure	Elective	12	14.81

No. of enforced conversions = 8
No. of elective conversions = 73

acute inflammation (52.27%), chronic cholecystitis (36.36%) and aberrant anatomy (11.36%).

The second major reason of elective conversion to OC was hardware or instrument failure (14.81%). In nine patients conversion was due to inability to establish and/or maintain sufficient pneumoperitoneum during the course of LC; in two patients clip applicator failed while in one patient diathermy failed, necessitating conversions. This was due to the fact that refurbished equipments were being used, which failed at times and required repairing at frequent intervals.

In 7 (8.64%) patients, wide cystic duct (with normal CBD) was found which was difficult to clip laparoscopically, so the procedure was converted to OC for successful ligation and division of cystic duct.

In 5 (6.17%) patients, conversion to OC was required to perform CBD exploration for suspected choledocholithiasis, based on laparoscopic finding of dilated CBD; preoperative LFTs and US were normal in these patients and there was no IOC facility available. LC was successfully performed, after initial clearance of CBD via ERCP, in 13 patients with gallstone pancreatitis and 9 patients with choledocholithiasis (diagnosed preoperatively). Those with failure of ERCP, were subjected to open CBD exploration.

In 5 (6.17%) patients, dense adhesions were found between gallbladder and bowel (3 with the stomach and 2 with the transverse colon); they were difficult to separate laparoscopically, so conversion to OC was made. On conversion, one (1.23%) patient was found to have biliodigestive fistula; fistulous communication was found between the fundus of GB and pylorus along lesser curvature.

In eight (9.87%) cases, conversion was enforced due to major complication: intraperitoneal bleeding (6) and bowel injuries (2). In 4 (4.93%) cases, there was uncontrolled bleeding from gallbladder bed, which occurred during diathermic dissection of GB. In another 2 (2.47%) cases, there was uncontrolled bleeding from Calot's triangle, which occurred during dissection of cystic duct and artery. Conversion to OC was required to achieve successful haemostasis, as they could not be controlled laparoscopically. In one case duodenal perforation (occurred due to diathermy burn) and one case of colonic injury (occurred from avulsion with grasping forceps), conversion to OC was required to repair the injury. There was no complication from access.

There was no peri-operative mortality. Four (0.32%) patients experienced major complications in early postoperative period: three with CBD injury, and one with retained CBD stone. There were two cases of incisional injuries to proximal CBD; one was managed successfully by conservative treatment of biliary fistula, while the other required exploratory laparotomy with suture of the stent and T-tube placement. One case with complete transaction of common hepatic duct at bifurcation (Strasberg type E3) was managed by Roux-en-Y hepaticojejunostomy. One patient with retained CBD stone was managed by choledocholithotomy with T-tube placement.

Discussion

The demography of the patient, the spectrum of disease and associated pathology, the level of experience of the surgeon, and technical factors all can play a role in the decision for conversion. Elective conversion is preferable to enforced conversion because of a serious iatrogenic injury. In this series the overall conversion rate was 6.5%. Daradkeh[4] reported a conversion rate of 2.6% from LC to OC; Bingener et al[3] 5.2%, Ishizaki et al[5] 7.5%, and Ibrahim

et al[1] 10.3%.

Our study population was younger, mean age 41.25±12 years. Daradkeh[4] reported mean age of 47.2 years, whereas Bingener et al[3] 40 years. We found conversion rates of 6.88% in patients below 60 years, and 3.73% in patients above 60 years; this was in contrast to Ibrahim et al[1] and Brodsky et al[9] who had identified age > 60 years as a significant risk factor for conversion. In our study, 16.45% males required conversion as compared to 5.09% females; this was similar to Ibrahim et al,[1] Brodsky et al[9] and Al Salamah[10] also found male gender as a most significant determinant for conversion to OC. Gharaibeh et al[11] reported 24% conversion rate in males vs. 4% in females, whereas Lim et al[12] reported 16.6% conversions in males vs 8.2% in females.

With increasing laparoscopic experience, an inverse trend in conversion rates is seen. Mattioli et al reported a decrease in conversion rate from 10% (learning curve) to 2.8% (skill curve).[8] Our results support this as the conversion rate fell from 9% during the learning curve, to 6.3% during the skill curve; this occurred in spite of new surgeons doing LCs, because the primary surgeons were there to tackle difficult cases. LC can be performed safely by surgery residents under the direct supervision of an experienced laparoscopist without significant changes in perioperative outcomes.[13]

LC can be safely performed in patients with acute cholecystitis; however, the rate of conversion remains higher when compared with patients having chronic cholecystitis.[1,14] The reported conversion rates for acute cholecystitis range from 12% to 37.5%.[3,15,16] However, conversion rate for acute gangrenous cholecystitis has been reported upto 40%.[17] In our study, the conversion rate for acute cholecystitis was 24.39% vs. 5.06% for chronic cholecystitis. Similarly, Chahin et al[15] found conversion rate for acute cholecystitis as 22% vs. 5.5% for chronic cholecystitis, whereas Tan et al[18] found conversion rate for acute cholecystitis to be 20.6% vs. 4.2% for chronic cholecystitis. Failure to identify the Calot's triangle is the main risk factor associated with conversion.[1,19]

In our study, inability to correctly identify the anatomy at Calot's triangle accounted for more than one half of the patients undergoing conversion to OC (54.32%). Al Salamah,[10] Ibrahim et al[1] and Bingener et al[3] also found it as the most common reason for conversion observed in 41.5%, 48.5% and 50% of patients respectively. We observed that individual anatomy was obscured primarily by acute inflammation (52.27%), but dense adhesions from chronic cholecystitis (36.36%) and aberrant anatomy (11.36%) were also noted.

We identified equipment failure as the second major reason of conversion to OC (14.81%). It was mainly due to the inability to establish and/or maintain sufficient pneumoperitoneum during the course of LC. Peters,[6] Bingener et al[3] and Wiebke et al[20] also identified equipment failure as a cause of conversion. Shea et al[2] found equipment failure in 2.1% of conversions, but he included failure of pneumoperitoneum and inability to clip cystic duct separately in the other category accounting for 7.4% conversions. We found 8.64% patients with wide cystic duct which were difficult to clip laparoscopically, so the procedure was converted to OC for successful ligation and division of cystic duct.

Adhesions are amongst the common reasons for conversion of LC.[21] In our study, only 6.17% conversions were due to dense adhesions between gallbladder and bowel. This reflects our laparoscopic policy of excluding patients with previous upper abdominal surgery for LC and increasing laparoscopic experience. On conversion, we found one patient with biliodigestive fistula (1.23%); fistulous communication between the GB fundus and pylorus was excised along with cholecystectomy and primary repair of defect was done. With advanced laparoscopy skills, laparoscopic management of biliodigestive fistulas is possible with low morbidity and no mortality.[22,23]

Accidental injuries to the bile duct and bowel are significant risks of laparoscopic surgery and sometimes require conversion to open surgery.[24] Bowel injuries can be successfully repaired using laparoscopic techniques, autosuturing devices, or extracorporeal suturing via the umbilical incision.[24] Similarly, haemorrhage from GB during LC is one of recognized reasons for conversion to OC.[25] Shea et al[2] reported following conversion rates: bleeding including cystic artery injury (9.8%), duct injury (2.9%), and bowel injury (0.9%). In our study, eight conversions (9.87%) were due to peroperative complications: intraperitoneal bleeding (7.4%) and bowel injuries (2.46%). A low conversion rate for peroperative complications such as bleeding and injury to the biliary tree and bowel reflects our overall laparoscopic policy and increasing experience. Careful GB retraction, dissection limited to GB-cystic duct junction, and the use of the open technique with sequential clipping and lifting of umbilical ligament for abdominal access, all contribute to the reduction in peroperative complications.

Conclusion

The overall frequency of conversion of LC to OC was 6.5%; the risk of conversion is more during the learning curve and in male patients, but increasing age is

not associated with increased risk of conversion. Although unclear anatomy at Calot's triangle and acute cholecystitis remain the most common reasons for conversion, the use of refurbished equipments was also a cause of concern.

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