

## Complications in Laparoscopic Cholecystectomy

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### ABSTRACT

**Objective:** To list and understand the types and the rate of complications associated with laparoscopic cholecystectomy done by a small group of surgeons over a decade at four military hospitals PNS Shifa Karachi, CMH Rawalpindi, MH Rawalpindi and PNS Hafeez Islamabad. **Study Design:** Observational and descriptive study. **Place & Period of study:** CMH Rawalpindi from January 2003 to December 2012 [10 years]. **Patients and Methods:** Case records of all patients (both genders and all age groups) undergoing laparoscopic cholecystectomy over a period of ten years were reviewed. Fifteen hundred patients with a clinical follow up record of at least six months were included in the study. Complications were grouped into three main categories, per operative, early post-operative and late post-operative. They were further sub-grouped into major and minor categories. A major complication was regarded as one causing significant morbidity or likely to be potentially fatal if not treated expeditiously.

Data analysis included calculation of the number of patients, rate and percentage of different types of complications. **Results:** Complications occurred in 495 [33%] cases. Major complications occurred in 199 [13.27%] cases. In the remaining 296 [19.73%], the complications were labeled as minor. Conversion to open surgery occurred in 147 [9.8%]. Post-cholecystectomy laparoscopic re-intervention within 48 hours was done in 3 [0.2%] cases. There was one mortality due to septicemia following bowel injury. **Conclusion:** The risk of complications is a possibility in any patient undergoing laparoscopic cholecystectomy despite remarkable advances in instrumentation and video systems. Most common complication is hemorrhage (1.3%) followed by CBD injuries (.13%). Due attention to risk assessment, patient and family counseling, importance of valid consent and a flexible approach to conversion to open surgery is stressed. **Key words:** Cholelithiasis, Laparoscopic cholecystectomy, laparoscopy, complications.

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### INTRODUCTION

Laparoscopic cholecystectomy is now regarded as the gold standard in the surgical treatment for gall stone disease the world over.<sup>1,2</sup> With its wide acceptance and awareness amongst the masses, it is being practiced in multiple centers in Pakistan.<sup>3</sup>

Various aspects of this procedure have been discussed in literature in the past, particularly with reference to its safety and procedure related complications. Complication rates have been significantly reduced in recent years because of better knowledge, structured training, improved operative techniques and high definition video systems.<sup>4,5,6</sup> The selection criteria as regards age and co-morbid issues have also become more liberal and many cases, previously considered to be difficult are now routinely operated laparoscopically.<sup>8</sup> However, as with any major surgical procedure the threat of complications always remains with laparoscopic

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cholecystectomy in spite of its well established safety profile. Cholecystectomy whether open or laparoscopic has a wide variety of known complications.<sup>1,3,8</sup> In laparoscopy there are additional risks, peculiar to minimal access procedures.<sup>2,8</sup> The most important aspects of management before the patients are selected for laparoscopic procedure are a critical assessment of every individual case and anticipation of possible complications.<sup>9</sup> Strict adherence to proper patient counseling, a well informed, valid written consent and a flexible approach in favor of conversion to open surgery in a difficult situation is mandatory. This study reviews the complications of laparoscopic cholecystectomy encountered and describes the course of action taken.

### **MATERIALS & METHODS**

This was an observational and descriptive study, carried out at CMH Rawalpindi where ten years data from local and three armed forces hospitals PNS Shifa Karachi, MH Rawalpindi and PNS Hafeez, of the patients undergoing laparoscopic cholecystectomy from January 2003 to December 2012 was available. A specified format for data collection was developed and data of each individual patient recorded accordingly on a Proforma. After a scrutiny of the available record, fifteen hundred cases were selected for the study. The inclusion criteria were, patients operated by one or more members of a specified team of four surgeons working at these centers during this period (ten years from January 2003 till December 2012), all patients undergoing laparoscopic cholecystectomy (on both elective and emergency basis), those with complete, available clinical data and a follow up period of at least six months. Patients with incomplete record and those lost to follow-up, as well as patients with hepatitis B, hepatitis C or histopathological diagnosis of carcinoma and cases operated in the same hospitals by other surgical teams were excluded from the study. Patients in the study were from various age groups and of both genders.

Preoperative evaluation included the following:

- a] a detailed history and clinical examination
- b] laboratory investigations: complete blood count, urinalysis, random and fasting blood sugar levels, blood urea and creatinine, liver function

tests, hepatitis B & C screening c] imaging: x-ray chest and ultrasound abdomen in all cases and plain x-ray abdomen, MRCP and ERCP advised in selected cases. Counseling of the patient and a responsible family member or next of kin was done and written consent obtained in all cases. A single dose of a third generation cephalosporin and an amino-glycoside were administered to every patient at the time of induction. In most of the patients with no previous history of abdominal or pelvic surgery, four standard ports were used for access i.e. umbilical port for camera, epigastric port for dissection and two right lateral ports for graspers. In patients with previous abdominal surgery and presence of abdominal incision scar, the position of access ports was altered as per requirement in individual cases. In such cases pneumo-peritoneum was established by open method and peritoneal examination done ensuring a safe access for dissectors and grasper ports. A preliminary examination was done to assess the local pathology, to determine the visibility of anatomical structures, extent of adhesions, vascular pattern, position and pattern of cystic duct and ease of dissection particularly at Callot's triangle. Decision was then made to proceed in routine manner, change the dissection method or abandon in favor of open cholecystectomy. In simple cases the cystic artery and duct were clipped and divided separately. In selected cases the artery was coagulated and cut with harmonic device (when available) and duct clipped as usual. In very difficult cases an anterior partial cholecystectomy was done instead of complete removal of gall bladder and the lumen of the duct closed with intra-luminal suture. In case of bleeding, saline irrigation, gauze packing and pressure, temporary control with grasper coagulation clipping were the methods used to achieve control and conversion to open cholecystectomy in the event of failure of these methods of haemostasis. In situations of extremely difficult dissection due to extensive adhesions and lack of visibility of the operative field, conversion to open surgery was resorted to. At the conclusion of operation, gauze packing of operative field (if necessary) and observation for leakage or oozing was routinely made. Drains were inserted in selected cases. Organ injuries

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detected during the procedure or post operatively were managed by open surgery. Laparoscopic cholangiography, choledochoscopy, laparoscopic choledochotomy or laparoscopic ultrasound were not done in any case. Post-operatively at least three doses of a combination of antibiotics was administered to every patient. Complications were documented in all individual cases. These were grouped into three main categories, per operative, early post operative detected or presented with in two weeks postoperatively and late post operative. They were further sub-grouped into, major and minor. A major complication was regarded as one causing significant morbidity or which could be potentially fatal if not treated expeditiously. A minor complication was defined as one which caused a clinical concern but did not have any significant morbidity. Data was analyzed using Statistical Package for Social Sciences [SPSS] version 12. Mean age, gender ratio, and total number, type and percentage of different complications were noted.

## RESULTS

A total of 1500 patients undergoing laparoscopic cholecystectomy were studied. There were 1155 (77%) females and 345 (23%) males with a female to male ratio of 3.4:1. Age ranged from 13 to 76 years, the mean age being 44 years. Most of the patients (55%) encountered in the study were between 41-60 years. (Table-1)

The majority of the cases i.e. 1375 [91.66%] were operated upon on elective operating lists and the remaining 125 [8.33%] as emergency cases within 48 to 72 hours after the onset of symptoms [Table-2].

Complications of varying types and grades occurred in 495 [33%] cases. Major complications (with a potential of significant morbidity) occurred in 199 [13.27%] [Table-3] and in the remaining 296 [19.73%] cases, the complications were minor and resulted in no significant morbidity [Table-4]. Technical difficulties during surgery causing hindrance and failure to proceed with safe dissection were documented in 165 [11%] cases. They were due to fibro vascular adhesions around the gall bladder, thick walled gall bladder, adhesions between gallbladder and adjacent gut or stomach, blurring of visual field

due to hemorrhage or bile leakage, electrical failures and problems with maintaining pneumo-peritoneum. Technical failure to proceed with safe dissection was the commonest reason for conversion to open surgery which was required in 124 [8.26%] cases. Other 41 [2.73%] technically difficult cases were successfully managed laparoscopically.

Per-operative major hemorrhage was documented in 20 cases [1.33%] and the source of bleeding was from Callot's triangle and the liver bed. In 15 cases [1%] the hemorrhage was un-controlled, requiring conversion to open surgery and in the remaining 5 [0.3%] it was managed laparoscopically. Minor but noticeable bleeding was documented in 68 [4.53%] cases occurring at the site of trocar insertion, liver bed or at the site of dissected omental adhesions and was controlled by diathermy or with pressure using a gauze pledget. Post operative haemorrhage evidenced by the formation of a sub-hepatic collection occurred in 3 cases [0.2%] and these were managed by laparoscopic re-intervention in two [.13%] and open surgery in one [.06%]. Organ injuries documented during surgery were five, Injuries to the bile duct in 2 cases [0.13%], colon in 1 [0.066%] and, duodenum in 2 [0.13%]. All were managed by conversion to open surgery [table 5] and all patients had uneventful recovery thereafter. Injury to distal ileum occurred in one [.066%] case but was missed during surgery and detected in early post operative period by bilious discharge from drain. It was managed by open midline exploration. Patient developed severe sepsis and expired four weeks after surgery. This was the only mortality in this study; contributory co-morbid factors in this case were obesity, hypertension and diabetes.

Duodenal ulcer perforation was seen on the third post-operative day in one case [0.066%] and occurred in a middle aged lady known to have had acid peptic disease. This was managed by open surgical intervention with uneventful recovery. Surgical emphysema as a consequence of pneumo-peritoneum occurred in three female patients in their mid forties, who were obese and in whom considerable manipulation was required while removing the gall bladder. Though it resulted in quite a grotesque appearance of

patients postoperatively and was a cause of anxiety in both the patients and their attendants, the emphysema resolved in 2 to 3 days (the stitches at port sites were opened). Port site umbilical hernias occurred in 3 cases (0.33%). CBD stricture with development of jaundice more than two weeks after surgery developed in one case [0.066%] and was managed with ERCP and stenting. Post cholecystectomy syndrome with significant postprandial pain and dyspepsia occurred in two cases [0.13%]. Laparoscopic re-exploration revealed intestinal adhesion formation and release of adhesions was curative. The total number of conversions to open surgery were 147 [9.8%]. [Table-5] There was one death as mentioned above making the mortality rate 0.06%.

**Table 1: Age and gender of the patients (n1500)**

Characteristics		No of patients	Percentage
Age in years	<20	08	00.53%
	21-40	864	57.60%
	41-60	510	34.00%
	>60	118	07.87%
Sex	Male	345	23%
	Female	1155	77%

**Table 2: Indications for surgery/per operative findings (n1500)**

Emergency/early cholecystectomy	No of cases	Percentage
Acute calculus cholecystitis	100	6.6
Acute acalculus cholecystitis	5	0.3
Empyema gall bladder	15	1
Gall bladder perforation	5	0.3
Total	125	8.33%

Elective cholecystectomy	No of cases	Percentage
Chronic calculus cholecystitis	1340	89.33
Cholelithiasis/recurrent pancreatitis	20	1.3
Cholelithiasis and choledocholithiasis	10	0.6
Carcinoma gall bladder	5	0.3
Total	1375	91.66%

**Table 3: Major complications in laparoscopic cholecystectomy (n1500)**

A-Major per-operative complications	No of cases	Percentage
Massive hemorrhage	15	1
Callot's triangle	5	0.3
Gall bladder bed		
Bile duct injury	2	0.13%
Duodenal injury	2	0.13%
Transverse Colonic injury	1	0.06%
Technically difficult dissection and failure to proceed		
Adhesions	100	6.6
Thick gall bladder wall	35	2.3
Blurring of visual field/ chromatic abrasion	30	2
Electrical and equipment failure	25	1.6
Total	190	12.56%
B- Major early post-operative complications		
Bleeding from liver bed	2	0.13%
Perforated duodenal ulcer	1	0.06%
Bile leakage(missed aberrant Rt. hepatic duct injury)	1	0.06 %
Distal ileal perforation, missed per operatively	1	0.06%
Surgical emphysema	3	0.2%
Total	8	0.53%
C-Major late complications		
Umbilical (port-site) hernia	01	0.13%
Grand total	199	13.26%

**Table 4: Minor complications of laparoscopic cholecystectomy (n1500)**

<b>A-Minor Per-operative complications</b>	No of cases	Percentage
Minor (controllable) hemorrhage	78	5.2
Stone spillage	50	3.3
Spillage of bile from gall bladder	60	4
Spillage of pus from gall bladder	14	0.9
Total	202	13.4
<b>B-Minor Early post-operative complications</b>		
Bleeding from port-sites	18	1.2
Drain / port-site discharge	15	1
Port-site infection	54	3.6
Stones impacted in port-site	02	0.13
Pneumonia/septicaemia	05	0.33
Total	94	6.26
Grand Total	296	19.63%

**Table 5: Conversion to open surgery [n1500]**

Early Conversion [During Surgery]		
Type of cases	No of cases	Percentage
<b>A-acute cholecystitis</b>		
Failure to proceed with smooth and safe dissection	12	0.8
Uncontrolled Bleeding	03	0.2
Total	15	1
<b>B-Chronic cholecystitis</b>		
Failure to proceed with smooth and safe dissection	112	7.46
Uncontrolled Bleeding	12	0.8

Bile duct injury	2	0.13
Colonic injury	1	.066
Duodenal injury	2	0.13
Total	129	8.6
Grand total	144	9.6
Late Conversions [for Complications Detected Post -op]		
Sub-hepatic haematoma collection	1	0.066
Perforation Distal Ileum	1	0.066
Peptic duodenal ulcer perforation	1	0.066
Total No. of Conversions	147	9.8%

## DISCUSSION

An increasing number of patients now opt for laparoscopic cholecystectomy. Patients of an older age group and those with co-morbid conditions are also increasingly being considered for laparoscopic cholecystectomy. Although the safety of laparoscopic surgery is well established<sup>1-4</sup>, major complications may still occur in spite of due care. Immediate recognition and management of the complication is critical for safe outcome. Most of the cases in this study underwent elective surgery for chronic cholecystitis and as observed in other studies<sup>2</sup> Only 125 [8.33%] were operated as emergency surgery for acute cholecystitis. This study is consistent with other studies e.g. those of Malik A and colleague<sup>7</sup> and Masood R and colleagues<sup>10</sup> as regards the safety and good outcome of laparoscopic cholecystectomy in acute emergencies. Arshad M. et al<sup>11</sup> and Polychronidis A et al<sup>12</sup> have described laparoscopic cholecystectomy in elderly patients and regard the procedure as safe. In this study most of the patients were in the age groups around forty in the earlier part of the study, but a greater number of elderly patients were selected for laparoscopy in the later parts of the study. The maximum number of complications in this study occurred in patients above fifty years and were more among males as compared with females, though the gender

distribution was marked by female predominance as observed in other studies as well.<sup>1,13</sup> Diabetic and hypertensive patients with fibro vascular adhesions were observed to have a greater incidence of post-operative complications and conversion to open surgery. These findings are consistent with observations of Murphy M et al,<sup>14</sup> Salamah M<sup>15</sup> and Shamim and colleagues.<sup>16</sup> The types and pattern of complications in this study were similar to the study by Marakis GN et al<sup>4</sup> and Duca et al.<sup>17,18</sup> Three major life threatening complications that were encountered in this study included bile duct injury in 3 [0.2%], major haemorrhage in 20 [1.3%] and gut injuries in 4 cases [0.26%]. Out of three cases of bile duct injuries 2 [0.13%] were detected during operation and 1 [0.06 %] post operatively. Connor S and Garden OJ<sup>19,20,21</sup> regard surgery with Roux en Y hepatico-jejunostomy as the operation of choice and consider endoscopic treatment in selected cases. In our study the bile duct injuries detected per operatively were managed by conversion to open surgery and T tube placement. One detected post operatively was managed with ERCP and stenting. None of our cases underwent a biliary bypass. Incidence of per-operative and post operative haemorrhage of varying extent has been reported to occur in up to 10% cases.<sup>22</sup> Haemorrhage can occur during trocar insertion, dissection about Callot's triangle or in the liver bed or due to slippage of clips and could be during or after the surgery. It can range from minor hematomas to life-threatening massive hemorrhage. Injuries to the hepatic artery, aorta, vena cava and even the iliac vessels have been reported.<sup>23</sup> Incidence of major haemorrhage in this study was 1.3 % and the majority of these were managed by conversion to open surgery. Minor haemorrhage occurred in 5.7% case and could be dealt with laparoscopically. Bowel injuries have mostly been associated with insertion of trocars or Veress needles, followed by injuries due to dissection and coagulation. Bowel injuries have been reported as 0.13 per cent and a mortality rate of 3.6 percent has been reported by Van der Voort M and colleagues.<sup>24</sup> Binenbaum SJ & Goldfarb MA<sup>25</sup> have described a frequency of 0.39%. In our study the incidence of bowel injuries was 0.26% and included duodenal injury in 2 [0.13%],

transverse colon injury in 1 [0.06%] and distal ileal perforation, that was missed per operatively. All were managed with open surgery. Duodenal injuries were managed by direct suture repair of the duodenum.<sup>26</sup> The case of ileal injury was associated with multiple co-morbid issues i.e. obesity, diabetes and hypertension and after a protracted illness it resulted in fatality. This was the only mortality in the whole series, making the mortality rate as 0.06%. An unusual case of duodenal perforation was diagnosed on the third post operative day in a previously known case of duodenal ulcer disease. It was successfully managed by open surgery. Technical difficulties in dissection due to thick adhesions, thick walled gall bladder, blurring of visual field and equipment failure were documented in 165 [11%] cases. These were the main reasons for conversion to open surgery and are consistent with the observation of Shamim M. and colleagues<sup>16</sup> and Tayab M and Ahmed S and K Sabzo.<sup>27,28,29</sup> However overall rate of conversion in our study was 10.33% which is significantly higher than generally described rates of 3 to 6%, quoted in various international studies.<sup>1,7,26</sup> This could be because of a lower threshold for conversion amongst the cohort of surgeons involved in this study who also performed a considerable number of open procedures in the same period. Surgical emphysema is a rare complication of minimal access abdominal surgery<sup>30</sup> and in this study two cases were documented, both were treated by opening the stitches at the port-site and observation. Both recovered uneventfully. Spillage of calculi and minor port site infections are reported by many in literature<sup>31,32,33</sup> and were observed in our study as well but were not of significant clinical concern and were managed without any adverse outcomes. Critical view of safety, low threshold for conversion, video recording and repeated revisit of difficult and complicated surgeries, absolutely clear and unambiguous operation notes, are some of the strategies that if strictly adhered to can significantly reduce the incidence of many of these complications.<sup>34,35,36,37</sup>

## CONCLUSION

Due to remarkable advances in instrumentation

and availability of high definition video systems, the number of contraindications to perform laparoscopic cholecystectomy has significantly been reduced. Similarly more cases of the elderly are being done laparoscopically. The risk and severity of known complications consistently haunts laparoscopic surgeons though for different reasons today as compared to the past. Major complications included hemorrhage (1.3%), CBD injury (0.13%) and bowel injuries (0.19%) Due attention to risk assessment, patient and family counseling associated with preoperative consent taking and strict adherence to surgical principles cannot be over stressed if the number of complications in laparoscopic surgical practice are to be reduced to a minimum.

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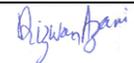
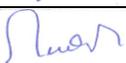
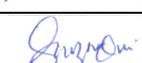
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