Original Article

The Essence of Extra-Biliary Surgical Complications during Laparoscopic Cholecystectomy — 3 Year Observation

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ABSTRACT

Introduction: *Laparoscopic cholecystectomy has become the treatment of choice for cholelithiasis. Biliary tract injuries are the most serious consequences of laparoscopic cholecystectomy. Extra-biliary consequences can be just as severe and inconvenient, although they have got less attention in the literature. The purpose of the study was to highlight the importance of extra biliary complications by determining their incidence, nature, and management.* ***Methods & Materials:*** *This study presents a prospective analysis of extra-biliary complications occurring during 1400 laparoscopic cholecystectomies performed from January 2019 to December 2021. The study population comprised of all the patients with symptomatic gallstone disease in whom laparoscopic cholecystectomy was done. The extra-biliary surgical complications were divided into two distinct categories: (i) Procedure-related, and (ii) Access related in the current series.* ***Results:*** *The incidence of access-related complications was 2.71 % and that of procedure-related complications was 8.21%. Port-site bleeding was repellent at times and demanded a re-do laparoscopy or conversion. Six cases of duodenal and two of colonic perforations were the major complications encountered during dissection in the area of Calot's triangle. In 27(1.92%) patients the procedure was converted to open surgery due to different complications.* ***Conclusion:*** *Laparoscopic cholecystectomy is still the gold standard treatment for cholelithiasis. Extra-biliary problems may occur during the surgery or while accessing the peritoneum. These are quite rare but can be fatal if not discovered and*

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addressed during the operation. In tough circumstances, patience and a low threshold for conversion can significantly reduce morbidity and mortality.

Keywords: *Surgical, Extra-Biliary, Morbidity, Mortality, Cholecystectomy*

INTRODUCTION

Complications of laparoscopic cholecystectomy are the complications, which occur with the performance of laparoscopy. In addition to the complications which are specifically associated with cholecystectomy others are also associated with the creation of pneumoperitoneum (veress needle/trocar-related injuries), hemorrhage, bile duct injury, overlooked common bile duct stones, bile leaks, perihepatic collections, and gall-bladder perforations. Extra biliary surgical complications include those which are faced during the procedure and do not disturb the structural as well as the functional integrity of the biliary tree. The incidence of complications most of the time is directly related to the skill of the performing surgeon and his/her ability to deal with the "difficult situation". These complications may be quite benign but at times, may be serious enough to lead to increased morbidity, hospital stay, cost, and even rarely death.[1,2] Laparoscopic cholecystectomy is considered superior to open cholecystectomy in terms of morbidity, cosmesis, and rate of complications.[3-5] There are, however, other studies that report an increased rate of complications during laparoscopic cholecystectomy compared to open cholecystectomy.[6-10] Biliary complications are reported in many studies. Extra-biliary problems occur with similar frequency and severity but are under-reported in the literature.[11] Different techniques of abdominal access are described but none has been found to be superior in terms of preventing access-related injuries.[12] Although these complications are not as common as they were in the past but are still an important source of morbidity associated with laparoscopic cholecystectomy. Fuller et al. identified laparoscopic cholecystectomy as the surgery most commonly associated with both fatal and nonfatal trocar-related complications.[13] The purpose of this study is to quantify the importance of extra-biliary complications during laparoscopic cholecystectomy by assessing their incidence as a percentage of cases, categorizing them according to type and severity, and evaluating the success rates of different management strategies applied to mitigate these complications.

METHODS & MATERIALS

This was an retrospective observational study of 1400 patients in whom laparoscopic cholecystectomy was performed in the Department of Surgery, Enam Medical College and Hospital, Savar, from January 2019 to December 2021. The cases were operated on by seven surgeons with different levels of experience. The study population included all the patients with symptomatic gallstone disease regardless of their age and gender who underwent laparoscopic cholecystectomy within the specified period by purposive sampling technique. Records of patients with postoperative extra-biliary complications were excluded from the study. All the patients were operated on by the classical four-ports technique while few changes

were made if necessery according to the situation, such as placing an additional port, etc. In 186 cases, pneumoperitoneum was created using a Veress needle and in 1214, by a technique of direct trocar insertion. Complications were categorized into two main groups: (i) Procedure-related, which includes complications arising from the surgical procedure itself, like tissue or organ damage; and (ii) Access-related, referring to complications from accessing the surgical site, such as port-site infections. The choice of method for the creation of pneumoperitoneum was solely decided by the operating surgeon. Data were collected from hospital re cords into a standard data collection form. The complications recorded in the hospital database were classified into access-related and procedure-related. The relationship between access and procedure-related complications was assessed by the Pearson's chi-square test. All statistical analyses were carried out by using SPSS version 10.

RESULTS

There were 187(13.35%) males and 1213 (86.64%). The age ranged from 20 to 74 years with a mean age of 45.37 years as shown in **Table I**.

Table I: Distribution of Age and gender

Age Groups	Male	Female	Total
20-30	22	109	131
31-40	59	222	281
41-50	39	616	655
51-60	35	65	100
61-70	22	86	108
71-80	10	15	25
Total	187	1213	1400

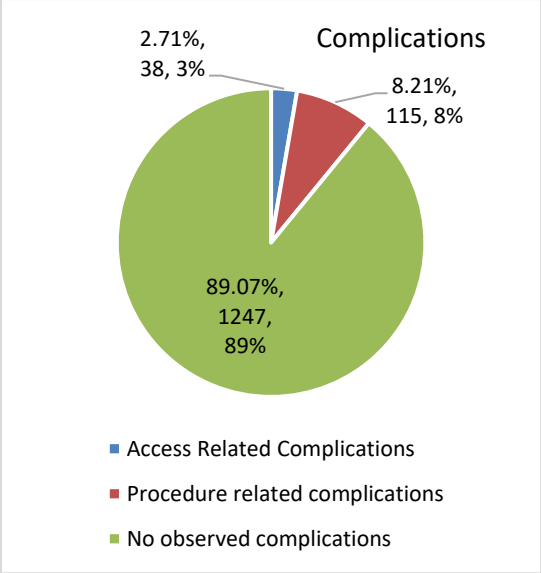

Figure 1: Distribution of complications among participants

The incidence of the extra biliary complication was 10.9% and their nature is depicted in **Figure 1**.

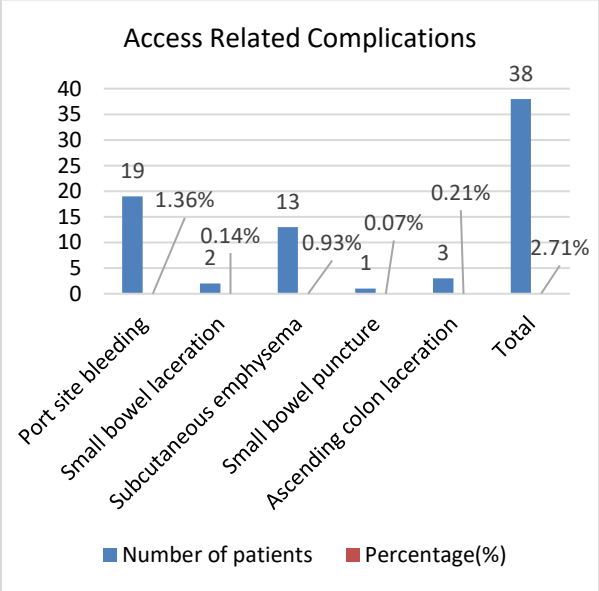

Figure 2: Access-related complications (*n*=1400)

A total of 2.71% access related complications were observed among the participants, and their distribution was presented in **Figure 2**.

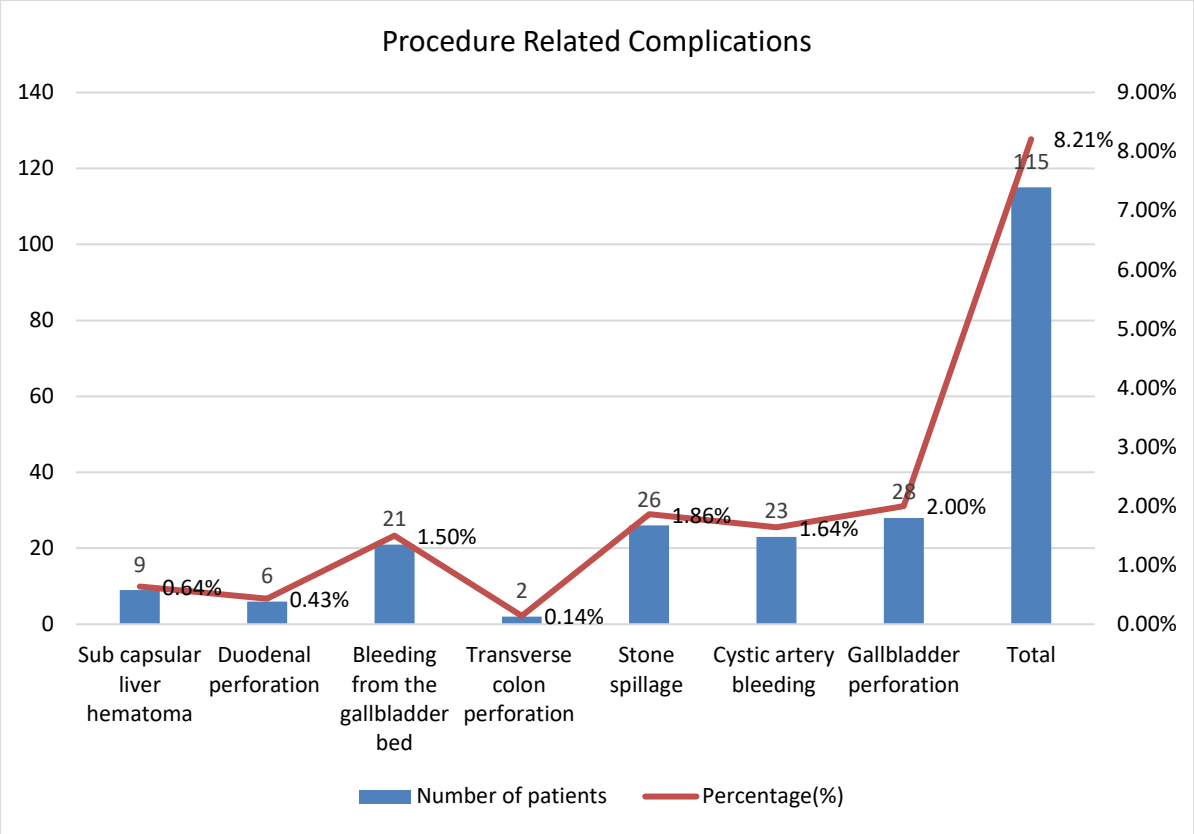

Figure 3: Procedure-related complications(*n*=1400)

8.21% of the participants in total had procedure related complications, presented in **Figure 3.** Simple gallstone disease was found in 1153 (82.35%) patients while the remaining 247 (17.6%) patients had complicated gallstone disease. The most prevalent access-related event was port site hemorrhage (1.35 percent), followed by subcutaneous emphysema (0.92 %) shown in figure 1. Perforation of the gall bladder during dissection from the liver bed was the most prevalent access-related perforation (2 percent). Patients with complex gallstone disease, such as empyema or acute cholecystitis, were more likely to experience procedure-related problems. The majority of patients who underwent open conversion of the operation did so to control bleeding from the cystic artery. The next most common occurrence is port site hemorrhage (0.5 %) **Table II**.

Table II: Conversion to open procedure (*n*=1400)

Complications	Number	Open Conversion	Percentage(%)
Port site bleeding	19	7	0.50%
Cystic artery bleeding	23	11	0.79%
Duodenal perforation	6	6	0.43%
Colon perforation	2	2	0.14%
Small bowel perforation	1	1	0.07%
Total	51	27	1.93%

The average hospital stay in this study was 48 hours, and there was no fatality. Following statistical analysis, it was discovered that procedure-related complications were not associated with access-related difficulties (p=0.69) **Table III**.

Table III: Relationship between access and procedure-related complication

Complications	Number	Conversion	No conversion	p-value
Access Related	38	8	30	0.69
Procedure Related	115	19	96	

DISCUSSION

This series of extra-biliary problems are either access-related or procedure-related. Despite significant advancements in access approaches, access-related difficulties are widespread. Trocar injuries to the colon and major blood vessels have been reported by Hashizume and Sugimachi to be as high as 1%, with the majority occurring during the insertion of the first trocar[14]. *Schafer et al.* describe a similar outcome in their investigation[15]. According to several authors, blind trocar placemant and access by verres needle continue to be major cause of problems. In our experience, the most common access-related complications were port-site bleeding and extra-peritoneal insufflations resulting in surgical emphysema of varying degrees. According to Loffler and Pent, gaining access with a closed approach has a complication rate of 0.2-0.3 percent[16]. On the other hand, the open technique of trocar insertion appears to have reduced access-related major vascular injury and mortality[17,18]. Trocar insertion through avascular planes under the vision and a thorough check of the ports before deflation of the abdomen helps decrease port site hemorrhage which was followed in every case on this series. In their study, *Mayo et al.* made a similar suggestion[19]. An excessive thrusting effort during the first trocar insertion is likely to result in intestinal damage. Adequate manual raising of the abdominal wall during insertion is quite beneficial and provides excellent safety. Illuminating the abdominal wall by telescope may display the vessels and secondary ports may be created safely. Subcutaneous emphysema usually occurs due to leakage of gas from the site of trocar insertion and is likely when the patient is obese and gas is insufflated through a misdirected Veress needle. This may require manual pressure on the abdominal wall to evacuate the gas. This is consistent with other similar studies[20]. Previous operations may make abdominal access difficult and liable to produce bowel injury. Access-related intestinal injuries were observed to be more prevalent with the closed abdominal access approach. This is consistent with the findings of other similar research[21-23]. In this series, we report 8.21 percent overall procedure-related issues, of which 19 (1.35 percent) were significant enough to necessitate conversion to open procedure. When there is a history of repeated occurrences of acute cholecystitis, the anatomy of Calot's triangle is distorted, and procedure-related problems are more likely to arise. Colonic perforation was another serious procedure-related complication and occurred in two patients, both of which were converted. These procedural injuries to the gastrointestinal tract are associated with a high mortality rate as

indicated by various studies[21-24]. The duodenal injuries in our study were caused during difficult dissection in the Calot 's triangle. This is consistent with other reports[25] and usually results when dissection is continued in an obscured field. In our study, duodenal injury was in 0.42% of patients. This is in comparison with international studies like that of *Singh et al* (0.17%)[25] Patience, displaying of anatomy, and identification of structures before cutting or applying clips are vital to a safe outcome. Bleeding from the gall bladder fossa was encountered in 21(1.71%) of our patients, which was compatible with the study conducted by *Malik et al* (1.05%)[26]. Spillage of gall stones during cholecystectomy is much more frequent during laparoscopic than open. The open surgery complication was 1.85% in our study, however, in the study of Khan et al, this was much higher, (4.41%)[27].

Strengths and Limitations:

One of the primary strengths of this study lies in its considerable sample size. With 1400 patients, the findings gain robustness and reliability. Furthermore, by comparing our results with existing literature, the study provides a broader context and perspective on the topic. Another significant strength is the detailed methodology adopted. By clearly distinguishing between procedure-related and access-related complications, this study offers valuable insights that can guide future research in this area.

On the other hand, there are several limitations to consider. Firstly, since the research was conducted at a single hospital, the findings might not be wholly representative of a wider population, limiting the generalizability. Additionally, the involvement of multiple surgeons, each with varying levels of experience, could introduce variability in the outcomes. A notable limitation is the retrospective design of the study, limiting the possibility of proper follow-up. If patients weren't monitored over an extended period post-surgery, the study might overlook some delayed complications. Lastly, the use of purposive sampling could introduce a selection bias, potentially affecting the study's validity.

Conclusion:

Laparoscopic cholecystectomy remains a preferred treatment for cholelithiasis. While the procedure is generally safe, this study highlights the potential for extra-biliary complications, which, although infrequent, can have serious consequences if not promptly identified and addressed during surgery. The non-randomized nature of our sample and the variability in surgeon expertise are acknowledged limitations that may have impacted our findings. Nevertheless, our results underscore the importance of surgical vigilance, particularly in challenging cases, where a cautious approach and readiness to convert can be pivotal in minimizing patient risk. Notably, our analysis suggests a clear distinction between issues arising during the surgery itself and those related to accessing the peritoneal cavity.

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Author Contributions:

A.K.S. contributed to a) conception and design, b) acquisition, analysis, and interpretation of data, c) manuscript drafting and revising it critically, and d) approval of the final version of the manuscript. A.N. contributed to b) acquisition of data and c) manuscript drafting and revising it critically, and d) approval of the final version of the manuscript.

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