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Evaluation of early readmissions following laparoscopic cholecystectomy

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ABSTRACT

Aim: The aim of our study was to evaluate the causes of 30-day hospital readmissions after laparoscopic cholecystectomy.

Material and Method: This study evaluated patients who underwent laparoscopic cholecystectomy (LC) between September 2011 and April 2019 and were admitted to the hospital within 30 days after discharge for follow-up and treated in the general surgery clinic.

Results: The study included 6,857 patients who underwent LC with a readmission rate of 2.1%. Of the patients, 34.7% were hospitalized for gastrointestinal complications, 33 (22.9%) for intraabdominal infections and bilomas, and 24 (16.7%) for bile duct complications. The most common bile duct problem was bile duct stones (9%).

Conclusion: Readmissions after cholecystectomy should be evaluated in detail, and necessary interventions should be undertaken in the short term.

Keywords: Laparoscopic cholecystectomy, readmission, complication, laparoscopy

INTRODUCTION

Advances in surgical and anesthetic techniques and changes in postoperative care have facilitated the safe discharge of patients following a one-day hospital stay after certain operations. One of the areas of development is laparoscopic surgery. Laparoscopy is now used very frequently in general surgery, and laparoscopic cholecystectomy (LC) has become the gold standard in the surgical treatment of gallbladder diseases (1). As a minimally invasive method, LC presents advantages such as early discharge from the hospital and early return to work. However, readmission due to postoperative complications causes morbidity and mortality, as well as an economic burden and a loss of workforce (2). This retrospective analysis was conducted to investigate the causes of early hospitalization after LC.

MATERIAL AND METHOD

Trial Design

This study was conducted retrospectively in the Department of Surgery, University of Health Science Konya City Hospital. The study protocol was approved by the Health Sciences University Hamidiye Scientific Researches Ethics Committee (Date: 26.03.2021, Decision No:11/17).

Patients who underwent LC between September 2011 and April 2019 and were admitted to the hospital within 30 days after discharge for follow-up and treatment in the general surgery clinic were evaluated. The classical four-port technique (two 10-mm and two 5-mm ports) was used in the surgery of all patients. The "Strengthening the Reporting of Observational Studies in Epidemiology" (STROBE) criteria were utilized to develop the study protocol (3). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Participants and Eligibility Criteria

Inclusion criteria: Being 18 years or older, having undergone LC surgery, having a complaint associated with this procedure within 30 days of discharge, and being readmitted to the hospital again for a duration of 24 hours or more.

Exclusion criteria: Age under 18 years, laparoscopic surgery being converted to open surgery, the presence of gallbladder tumors, the use of anticoagulants, the use of a single port or incomplete or excess ports during surgery, and incomplete clinical data.

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Data Collection

Data were collected by reviewing the patient files and electronic hospital records of the patients included in the study. For the patients included in the study, demographic data, time elapsed from discharge to readmission, whether LC was performed under emergency or elective conditions, admission complaints, diagnostic methods, diagnoses, and comorbidities were recorded. Hypertension, diabetes mellitus, heart failure, chronic obstructive pulmonary disease/asthma, chronic steroid use, bleeding disorders, and chronic renal failure requiring dialysis were accepted as comorbidities. The length of hospital stay and treatment results were also evaluated.

Statistical Analysis

Statistical analyses were undertaken using SPSS 22.0 software (IBM Inc. Rochester, MN, USA). Quantitative variables were expressed as mean, standard deviation, percentage, median, minimum, and maximum values, and qualitative variables as rates.

RESULTS

Of the 6,857 patients who underwent LC, 144 were readmitted to the hospital in the early period for treatment. The rate of early readmission was 2.1%. The demographic characteristics and comorbidities of the patients are given in **Table 1**. Of the patients, 101 (70.1%) were female and 43 (29.9%) were male. The mean age of the patients was 51.9±15 years. There was no comorbidity in 86 (59.7%) of the patients, while 30 (20.8%) had multiple comorbidities and 28 (19.4%) had a single comorbidity. The most common comorbidities were hypertension and lung disease, followed by diabetes (**Table 1**).

Table 1. Comorbidities of the patients included in the study

Comorbidity	Number	Percentage
Lung disease	8	5.6%
Hypertension	8	5.6%
Diabetes	6	4.2%
Obesity	3	2.1%
Chronic renal failure requiring dialysis	1	0.7%
Smoking	2	1.4%
More than two comorbidities	30	20.8%
None	86	59.7%

Data are presented frequency and percent

LC was performed under emergency conditions in 34 (23.6%) of the patients and elective conditions in 110 (76.4%). The preoperative diagnosis leading to surgery was acute biliary cholecystitis in 34 (23.6%) of the cases, chronic biliary cholecystitis in 62 (43.1%), gallstones without cholecystitis in 43 (29.9%), biliary pancreatitis in four (2.8%), and chronic non-biliary cholecystitis in one.

In the first hospitalization of the patients, the mean length of hospital stay was 4±3.1 days. It was determined that 125 (86.8%) of the patients were discharged within one week after surgery, while 19 (13.2%) were hospitalized for longer than one week. Of these, six were hospitalized for more than one week due to an intra-abdominal abscess, 5 biliary tract injuries, 2 ileus, 2 biliary pancreatitis, 2 choledocholithiasis, 1 acute renal failure, and 1 surgical site infection. The number of patients discharged after one day was 63 (43.8%). The patients were readmitted to the hospital within an average of 6.1±5.8 days after their first discharge. For the second hospitalization, the mean length of hospital stay was 4.1±2.8 days, with 122 (86.5%) of the patients being discharged within one week and 19 (13.5%) being hospitalized for longer than one week.

The most common reason for hospital readmission was abdominal pain (n=86, 59.7%), followed by nausea and vomiting (n=22, 15.3%) (**Figure 1**). Surgical complications were present in 93.8% of the patients and non-surgical complications in 6.3%. Four patients were treated surgically, 21 with endoscopic retrograde cholangiopancreatography (ERCP), 34 with percutaneous drainage, and the remaining patients with medical therapy.

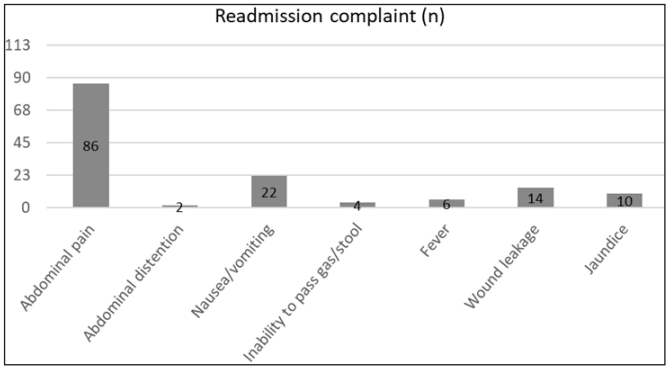

Figure 1. Readmission complaints of the patients

Bile duct complications were detected in 24 (16.7%) patients, with the most common being choledocholithiasis. Twenty-one of these patients were treated with ERCP (**Table 2**). In one patient with a bile duct injury, a percutaneous drainage catheter was inserted, and the patient was followed up with a controlled fistula that regressed during follow-up. In a patient with Strasberg Type A injury, the bile duct was repaired primarily. In the last patient, a bile leak occurred from the duct of Luschka, which was treated laparoscopically. Both patients who underwent surgery during their second hospitalization were discharged without any problems. Jaundice was the presenting complaint of six (25%) patients with bile duct complications.

In the diagnostic procedures of patients hospitalized with intraabdominal infections and bilomas, a percutaneous drainage catheter was routinely used under ultrasonography

Table 2. Diagnoses and treatments of the readmitted patients

Diagnosis	Number of patients n (%)	Treatment applied	Length of hospital stay, mean days (min-max)
GIS complications	50 (34.7%)	Medical therapy	2.7 (1-9)
Intraabdominal infections and bilomas	33 (22.9%)	Percutaneous drainage	4.8 (1-13)
Bile duct complications			5.5 (1-16)
Bile duct stones	13 (9%)	ERCP, stone extraction	
Bile duct injury and bile leak	6 (4.2%)	Surgery (n=2)	
		ERCP, biliary stenting (n=3)	
		Percutaneous drainage (n=1)	
Bile duct stenosis	5 (3.5%)	ERCP, biliary stenting	
Pancreatitis	13 (9%)	Medical therapy	4.9 (2-9)
Surgical site infections	13 (9%)	Wound care, medical therapy	3.8 (1-9)
Bleeding complications	2 (1.4%)	Medical therapy	2 (2-2)
Incarcerated trocar site hernias	2 (1.4%)	Surgery	7 (4-10)
Respiratory complications	3 (2.1%)	Medical therapy	2 (2-2)
Urinary complications	3 (2.1%)	Medical therapy	5.6 (2-8)
Neurogenic complications	1 (0.7%)	Medical therapy	8

Data are presented frequency (percent) or mean (min-max), GIS: gastrointestinal system; ERCP: endoscopic retrograde cholangiopancreatography

guidance. A Richter hernia was seen in one of the two patients with trocar site hernias, and segmental small bowel resection was performed. The other patient had omental herniation and underwent herniorrhaphy. Both patients had multiple comorbidities. Mortality occurred in a total of three patients, of whom two had bile duct complications and one had respiratory complications.

In the study group, 81 (56.2%) of the patients were hospitalized for more than one postoperative day, whereas 63 (43.8%) were admitted for one day. Table 3 presents the clinical characteristics of patients according to whether they were discharged on the first postoperative day. There was no statistically significant difference between age, gender, preoperative diagnosis, ASA scores, readmission diagnosis, and pathologic diagnosis between those discharged on the first day and those with longer hospitalization.

DISCUSSION

In this study, we aimed to develop foresight to evaluate the possible early complications of LC and prepare an action plan accordingly. With the developing technologies and increasing experience of surgeons, LC operations can be performed very successfully, and patients can be discharged without any problems. Although it is predicted that patients will have completely recovered at the time of discharge, readmissions may occur due to undesirable complications or complaints in the early postoperative period. In the current study, the rate of readmissions after LC was found to be 2.1%. In a meta-analysis of McIntyre et al. (4) evaluating 52,628 readmissions among 1,573,715 LC cases, the overall readmission rate was reported to be 3.3% (range, 0.0-11.7). Thus, the rate of readmission in our study was lower than that reported in the literature.

Currently, LC is used as the first treatment option in the surgical treatment of gallbladder diseases across the world, with up to 92% of cholecystectomies being performed laparoscopically (5). In a study by Rosero et al. (6), surgical complications, postoperative pain, infections, postoperative nausea, and vomiting constituted 61% of readmission diagnoses. In the same study, it was observed that resurgery was required at a rate of 0.06% after LC (6). In our cohort, the rate of surgical complications was low, which supports the literature. In addition, 59% of the patients requiring readmission improved with medical therapy, confirming that LC is an ideal treatment procedure in terms of both complications and patient comfort.

It has been reported that 74% of surgical patients still experience moderate/extreme pain after discharge. Despite clinical advances in pain management, there appears to be little progress in pain management following surgery (7). It is common for LC patients to be discharged the day after surgery. However, postoperative abdominal pain remains the most common cause of readmission, and most patients are hospitalized again for only one day for observation purposes (2). Similar to the literature, in our study, 43.8% of the patients were discharged on the day after LC, 59.7% of the patients were readmitted to the hospital with abdominal pain, and 43.8% of these patients were followed up in the hospital for at least one day. Although it remains controversial whether certain types of surgery are associated with a higher incidence of nausea and vomiting, both the laparoscopic approach and the cholecystectomy procedure have been reported as risk factors for postoperative nausea/vomiting (8).

In this study, 56.2% (n=81) of those who were readmitted to the hospital were hospitalized for more than 1 day after surgery. However, when clinical features were compared according to whether or not there was hospitalization for

Table 3. Clinical features according to discharge on the first postoperative day

Items	Discharged on the first day 63 (43.8%)	Not discharged on the first day 81 (56.2%)	p
Under 65 years	82.6%	72.8%	0.51
Female sex	71.4%	69.1%	0.77
Preoperative diagnosis			0.13
Acute gallstone cholecystitis	19%	27.2%	
Chronic gallstone cholecystitis	81%	72.8%	
ASA score			0.07
1	38.1%	25.9%	
2	38.1%	40.7%	
3	23.8%	25.9%	
4		7.4%	
Readmission diagnosis			0.28
Ileus	30.2%	38.3%	
Bile duct complications	12.7%	19.8%	
Intraabdominal infection	28.6%	18.5%	
Surgical site infection	6.3%	8.6%	
Bleeding	1.6%	1.2%	
Respiratory complications	3.2%	1.2%	
Other	17.4%	12.4%	
Pathologic diagnosis			0.50
Acute gallstone cholecystitis	12.7%	13.6%	
Chronic gallstone cholecystitis	84.1%	80.2%	
Gangrenous cholecystitis	1.6%	1.2%	
Malignancy	-	1.2%	
Xanthogranulomatous cholecystitis	1.6%	1.2%	
Erosive cholecystitis	-	1.2%	
Biliary cystadenoma	-	1.2%	

Data are presented frequency or percent

more than one postoperative day, there was no significant difference (**Table 3**).

As in every surgical procedure, gastrointestinal system (GIS) complaints are also naturally observed in patients after cholecystectomy and may even be severe enough to require hospitalization. GIS symptoms are expected to be seen even more frequently following surgery performed on the gallbladder compared to other operations. In the current study, a high rate of patients had severe GIS complaints requiring hospitalization; however, most of these symptoms improved with medical therapy. Therefore, we consider that physicians should favor drug treatments for GIS symptoms at the time of discharge to reduce the rate of readmission.

In the literature, the incidence of bile duct injuries is reported to be 0.4% in LC and 0.2% in open cholecystectomy (9). Although LC is regarded as the gold standard, bile duct injuries, which are less likely to occur in open surgery, are more prevalent in LC and can lead to bile duct problems later. Surgeons need to anticipate this during the postoperative discharge. Considering the high incidence of bile duct complications after LC in our study, it would be appropriate to call the patients for a control in the early period after discharge, evaluate whether there is any bile duct injury, and perform necessary investigations accordingly.

In a study by Rosero et al. (6), it was reported that 63.6% of the patients who presented to the hospital with surgical complications had bile duct obstruction, which was noted to be the most common diagnosis at readmission. In our study, readmission due to bile duct complications was seen at a rate of 16.7%. While the rate of all bile duct complications related to LC is 0.4-0.6% in the literature, it was found to be 0.35% in our study (9-13). Bile duct injuries were present in two of the three patients who died. Two of the patients readmitted to the hospital with bile duct complications died during their hospital stay. Bile duct complications were examined under three main headings: bile duct stones, bile duct injuries/bile leakage, and biliary stenosis. Ultrasonography or magnetic resonance cholangiopancreatography was used in the diagnosis of these patients, and sphincterotomy, stone extraction, and stent insertion were performed using ERCP in their treatment. One of the patients with bile duct injuries was followed up and treated with a controlled fistula by inserting a percutaneous catheter. We consider that a detailed examination should be conducted to diagnose bile duct complications, and the diagnosis and treatment processes should not be delayed due to the possibility of their fatal progression.

Most of our patients (66.7%) who were readmitted to the hospital with the complaint of fever were diagnosed with intraabdominal infections or bilomas. Interventional procedures were performed on these patients. Therefore, we consider that patients who have undergone LC should not be neglected in the early period after discharge and should be evaluated in detail in terms of complications of bile duct injuries, bilomas, and abscesses. This can prevent delays in interventions and longer hospitalizations due to possible complications.

Pancreatitis often originates from biliary stones. However, due to the traction on the gallbladder during LC and manipulations for dissection in difficult cases, small stones may enter the bile duct. As a result, patients may suffer from pancreatitis after LC. In our study, pancreatitis developed in 9% of the patients within the first 30 days after LC, while this rate is reported to be 5.02% in the literature (2). Although all patients with acute pancreatitis in our series improved with medical therapy, some previous studies have reported the requirement of ERCP and even surgery (14). These patients presented with severe symptoms beyond expected postoperative

abdominal pain (**Figure 1**). Therefore, it would be appropriate to evaluate the current symptoms of patients in terms of acute pancreatitis during early follow-up.

Another aspect that is often overlooked in LC is the possibility of trocar site hernia development. Trocar site hernias are late complications commonly seen after LC. Based on the results of our study, we recommend that surgeons pay attention to these complications and take the necessary precautions during surgery, since they can also require emergency surgical treatment in the early period.

In a study by Moghadamyeghaneh et al. (2), the 30-day mortality rate of 3,315 hospitalized patients was found to be 1.4%. In our study, mortality occurred in three (2.1%) of the 144 patients. Two of these patients died due to bile duct injuries and related complications after LC, and one patient due to respiratory complications. Therefore, bile duct injuries can be considered the most alarming complications after LC, and especially undetected bile duct injuries may be the most important cause of mortality.

Limitations

We were not able to obtain data on the duration of surgery, whether the gallbladder was perforated, or the number of cholecystitis attacks before surgery.

CONCLUSION

Complications that may develop after LC can result in severe morbidity and even mortality. Readmission to the hospital after cholecystectomy should be evaluated in detail, and necessary procedures should be undertaken in a short time. If necessary, patients should be hospitalized and followed up. As described in the literature, bile duct complications were also prominent in our study and resulted in the highest morbidity and mortality in our cohort; therefore, they should be prioritized in the evaluation of readmitted cases. The close monitoring of patients' ongoing abdominal pain, nausea, and vomiting symptoms before discharge and the investigation of the etiology of these symptoms if they do not resolve can prevent readmission after discharge and allow for the detection of complications earlier.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study protocol was approved by the Health Sciences University Hamidiye Scientific Researches Ethics Committee (Date: 26.03.2021, Decision No:11/17).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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