



Risk factors for conversion to open surgery in laparoscopic cholecystectomy: a single center experience

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ABSTRACT

Objective: This study aimed to demonstrate the demographic characteristics for laparoscopic cholecystectomy surgeries performed in the general surgery clinics of our hospital and to identify the rate of conversion to open surgery and the main reasons for convert to open surgery.

Material and Methods: Medical records of a total of 1.294 patients who underwent laparoscopic cholecystectomy in our hospital between October 2013 and May 2017 were retrospectively reviewed, and the rates of conversion to open surgery based on age groups were recorded.

Results: Of these patients, 1191 were females (92.0%) and 103 (7.9%) were males. Mean age was 48.6 ± 13.2 (range: 18 to 89) years. Indications for surgery were cholelithiasis in 1195 patients (92.4%), acute cholecystitis in 56 patients (4.4%), and gallbladder polyps in 43 patients (3.3%). The procedure was conversion to open surgery in 41 patients (3.16%), while 12 (0.9%) developed intraoperative complications. There was no mortality. Mean length of hospital stay was 1.2 (range: 1 to 6) days. The main reasons for conversation to open surgery were as follows: adhesions in the Calot's triangle (n= 3), acute cholecystitis (n= 29), choledocholithiasis (n= 2), adhesions due to previous surgery (n= 1), dissection difficulty (n= 2), organ damage (n= 2), anatomic variation (n= 1), and stone expulsion (n= 1).

Conclusion: Acute cholecystitis appears to be the significant factor increasing the rate of conversation to open surgery during LC procedures. Male sex and older age are the other factors increasing the risk of convert to open surgery. However, LC should be still the first choice of intervention.

Keywords: Laparoscopic cholecystectomy, open cholecystectomy, complication

INTRODUCTION

Laparoscopic cholecystectomy (LC) is widely used worldwide as in Turkey and has become the standard approach for the treatment of symptomatic cholelithiasis in recent years (1). Major advantages of LC including reduced postoperative pain, early return to normal physical activity, and improved cosmetic outcomes have made this method the first-line intervention over open cholecystectomy (OC). Several factors, which were previously definitive contraindications for LC, are currently diminished due to the recent improvements both in basic surgical concepts and in the technique used.

In the present study, we aimed to evaluate the outcomes of LC in relation to several clinical parameters and compare data in the light of the literature data.

MATERIAL and METHODS

Medical records of a total of 1294 patients who underwent LC in the General Surgery Clinics of our hospital between October 2011 and October 2016 were retrospectively reviewed. (The study protocol was reviewed and approved by our Institutional Ethical Committee. Consent from our patients treated in our hospital is received to use them in the future when they are operated or treated. Although the study was retrospective, approval was obtained to use the related information. The procedures followed were in accordance with the Helsinki Declaration of 1975 as revised in 1983. IRB number : E-15/622) Data including age and sex of the patients, preoperative diagnosis, (acute cholecystitis- (muphy (+), leucocyto-

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sis, CRP elevation, gallbladder wall thickness is >3mm)) number of patients scheduled for laparoscopic surgery and conversion to open surgery, demographic characteristics of these patients, and the reasons for conversion to open surgery were recorded. The relation between age and sex, preoperative diagnosis, and the decision to convert to open procedure was evaluated. All LC operations were performed by the general surgeons of our clinics using standard four-port entry and under 12-14 mmHg pressure.

Based on preoperative ultrasonography findings, gallbladder wall thicknesses higher than 3 mm were considered to be "thick" and thicknesses equal to or lower than 3 mm were considered to be "normal".

Statistical Analysis

All data were recorded on "SPSS 17.0 for Windows" (SPSS Inc. Chicago IL.) statistical analysis software. For these variables, univariate analysis was performed using chi-square and Student's t-tests. Multivariate analysis was additionally performed for those variables that had statistical significance. P values < 0.001 were considered statistically significant.

RESULTS

Of all patients, 1191 (92.0%) were females and 103 (7.9%) were males. Mean age of females, males and overall study population was 44.8 ± 12.3 , 49.6 ± 11.2 , and 48.6 ± 13.2 years, respectively. Mean age of the males who underwent LC was significantly higher than females ($p < 0.001$). In total, the procedure was switched to open surgery in 41 patients (3.16%), including 28 of 1,191 women (2.3%) and 13 of 103 men (12.6%). The rate of conversion to open surgery was higher among men compared to women ($p < 0.001$). Among the patients who were switched to open procedure, mean age of the women was 51.8 ± 15.1 years and mean age of the men was 57.9 ± 14.8 years, indicating a statistically significant difference ($p < 0.05$). Mean age of the patients who were switched to open surgery was 54.7 ± 12.9 years, and mean age of the patients who completed the surgery with laparoscopic method was 46.8 ± 13.7 years. Mean age of patients who switched to open surgery was statistically significantly higher $p < 0.001$. (Table 1).

An evaluation of preoperative diagnoses showed that 1,195 patients were operated for cholelithiasis (92.4%), 56 for acute cholecystitis (4.4%), and 43 for gallbladder polyps (3.3%). The procedure was conversion to open surgery in 18 patients operated for cholelithiasis (1.5%) and in 23 patients operated for acute cholecystitis (41%). The procedure was not switched to open surgery in any patient operated for gallbladder polyps. The rate of switch to open surgery was significantly higher among the patients operated for acute cholecystitis ($p < 0.001$).

Of the patients operated for acute cholecystitis, 22 were women (1.8% of all female patients) and 34 were men (3.3% of all male patients). The rate of operation due to acute cholecystitis was higher among men than women ($p < 0.05$).

Mean ages of the patients operated for acute cholecystitis and for cholelithiasis were 51.2 ± 13.0 and 48.4 ± 13.1 years, respectively. Mean age of the patients operated for acute cholecystitis was significantly higher ($p < 0.001$) Table 2 shows the causes of conversion to open surgery in the absence of a complication. The most common cause was adhesions in the Calot's triangle.

Table 2 presents complications developed during laparoscopic surgery. The procedure was conversion to open surgery in all of those patients. One patient, who had cystic duct injury, was reoperated two days later due to ongoing bile drainage. Stomach-small intestine injuries occurred in two patients due to trocar entry and in two patients during dissection. Primary repair was performed in patients whose injuries occurred due to trocar entry. Primary repair and omentoplasty were performed for other patients. Since the injury was close to the conjunction point of the right and left hepatic ducts in 3 patients with choledochal injury, Roux-en-Y hepaticojejunostomy was performed for these patients. Choledochoduodenostomy was performed for the other patient.

DISCUSSION

The advantages of LC over OC have been long discussed and now, LC has become the first choice (1,2). Until May 2017, all 1294 cases in our hospital underwent LC. When this method was introduced, despite its advantages, it was not considered as a harmless procedure due to high rate of injuries particularly in the main bile ducts (3,4). Acute cholecystitis accounts for almost

Table 1. The association of conversion with age and sex

	n (%)	p
Age (Mean \pm SD, y)		
Female	51.8 \pm 15.1	<0.005
Male	57.9 \pm 14.8	
Sex		
Female	28 (2.3%)	<0.005
Male	13 (12.6%)	
SD: Standard deviation, y: Year.		

Table 2. Reasons of conversion

Reason	n (%)
Bile leak	7 (17%)
Adhesion in Calot triangle	6 (14%)
Cystic duct injury	4 (9.7%)
Common bile duct stone	4 (9.7%)
Common bile duct injury	4 (9.7%)
Dissection difficulties	4 (9.7%)
Stomach-small bowel injury	4 (9.7%)
Adhesions due to previous surgery	2 (4.8%)
Anatomic variations	2 (4.8%)
Major abdominal vascular injury	2 (4.8%)
Stone loss	2 (4.8%)

20% of all gallbladder diseases, and it is no longer a contraindication for LC (5,6). The incidence of biliary system injuries during LC varies between 0.2-1.4%. This rate, recorded among 11 cases in the present study (0.8%), is consistent with the literature. Among those 11 cases, two had choledochal injury.

Etiology of sex differences in symptomatic cholelithiasis can be multifactorial (9) From a psychosocial perspective, men less frequently refer to a physician at symptom onset compared to women. Similarly, men agree to surgery at a later stage than women. This results in an increase in disease severity. Moreover, higher daily activities of men cause a delay in their referral to a hospital. From a pathophysiological perspective, women can be more sensitive to inflammatory changes associated with cholecystitis compared to men (9). Moreover, anatomic differences and changes in dietary habits may also result in the variability between men and women for cholelithiasis. The most common causes for switch to open surgery were adhesions in the Calot's triangle, acute cholecystitis and bleeding in the present study. In the study of Kausnik et al. (10), adhesions in the Calot's triangle and injuries of the main bile duct have been to be the most common causes of switch to open surgery.

As shown in Table 2, the most remarkable problems in cases switched to open surgery in the absence of a complication were adhesions in the Calot's triangle and difficulties in dissection. Previous upper abdominal surgeries are also risk factors increasing the rate of switch to open surgery (11).

The rate of major complications during LC has been previously reported as 1-3%, and the rate of bile duct injuries has been found to vary between 0 and 0.7% (3). Complications due to Veres and trocar entry have been previously reported in the literature. In a study conducted by Deizel et al. (12), intestinal perforation has been reported as the most common cause of death that occurs after laparoscopic methods. In the present study, four patients received treatment was by open surgery af-

ter stomach-small intestine perforations which developed due to trocar entry and dissection.

The rate of conversion to open surgery due to bleeding has been reported as 0-1.9%, and the rate of secondary surgeries has been found to be 0.4% (4-13). In the case series of Shurkalin et al. (14), bleeding has been noted in 0.7% of the patients, and the most common causes of bleeding have been determined intra-operative injuries accompanied by anatomic variations of the vessels (14). Epigastric vessel injury occurred due to trocar entry in two cases in this study; these complications were noticed and successfully treated during the operation. Mortality due to LC is similar to OC and has been reported to vary between 0 and 0.9 % (15-17). Mortality frequently occurs due to concomitant diseases and peritonitis which develop as a result of intraabdominal organ injuries. None of the patients died in our patient series.

Assessment of age and sex distribution of the patients with acute cholecystitis indicated a higher rate of acute cholecystitis among men at all age groups. For both sexes, the rate of acute cholecystitis in the age group of 65 years or older was higher compared to the other age groups, and the difference reached statistical significance for men. Men with acute cholecystitis were younger compared to women.

In the study of Tocchi et al. (18), cholelithiasis complications have been more frequently observed in men, and male sex, as well as ages over 65 years, have been found to be factors negatively affecting operative mortality. Based on some series, higher rates of conversion to open surgery, morbidity and mortality have been reported among older patients (15-19). This is mostly associated with the frequency of cholecystitis episodes and concomitant diseases. Elective LC is recommended for older patients with symptomatic gallbladder stones before they experience an acute cholecystitis episode (20). In the present study, the rate of conversion to open surgery and the rate of complications were higher among patients older than 65 years, and the effect of age on the rate of complications was significant. On the other hand, older age had no significant effect on the duration of operation.

In the present study, acute cholecystitis was found to be the second most common cause of switch to open surgery. In a very large-scale study performed by Vecchio et al. (21) by reviewing data of more than 100.000 patients, the rate of switch to open surgery has been primarily associated with the severity of inflammation.

While patients with acute cholecystitis were initially not found eligible for LC, studies performed later on increased the experience on this procedure and demonstrated that LC can be routinely performed in this patient group as well (22-24). Early cholecystectomy is known to be beneficial also for patients with acute cholecystitis(25). In the present study, the presence of acute cholecystitis and increased wall thickness as shown by

USG were found to be risk factors for switch to open surgery, and their effects also reflected on the complications and duration of operation. These patients constitute the patient group, in whom LC must be performed by paying utmost attention and dissection must be done very carefully.

The rate of gallbladder injuries during LC is higher than the rate observed during open surgery and has been reported to vary between 0.2 and 1.4% (26). Despite all precautions, the best time of repair in case of an injury appears to be during the operation. Hollow organ injuries are also commonly seen complications during LC procedures. Some reports indicate that their incidence may reach up to 0.9% (26). Attention must be paid for such injuries, particularly while constructing the pneumoperitoneum and during the use of cautery. The rate of retroperitoneal major vessel injury due to trocar entry has been reported as 0.05% in the previous studies, and mortality associated with such injuries has been found to be 8.3% (12). Baliya et al. (27) have evaluated bile duct variations in patients who underwent LC and detected accessory bile ducts in 52% of their patients. In the present patient series, seven patients who had bladder bed leakage were followed-up by medical means and the leakage was successfully controlled by ERCP in one patient.

Complications due to cystic artery injury, which were previously reported in 0.2-2% of the patients, did not develop in any patient in the present patient series (23).

CONCLUSION

In conclusion, acute cholecystitis appears to be the most significant factor increasing the rate of conversion to open surgery during LC procedures. Male sex, older age, and the presence of acute cholecystitis are the main factors increasing the risk of convert to open surgery. However, LC must still be the first choice of intervention. We believe that the rate of complications will decrease even more, as we gain additional experience in the treatment of acute cholecystitis, in particular.

Ethics Committee Approval: The ethical approval for this study was obtained from Başkent University Medical And Health Sciences Research Board (Date: 02.02.2020 Decision no: 603339-604.01.02/13101).

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ORIJİNAL ÇALIŞMA-ÖZET

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Laparoskopik kolesistektomide açığa dönüş risk faktörlerinde tek merkez deneyimi

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ÖZET

Giriş ve Amaç: Bu çalışmadaki amacımız hastanemiz genel cerrahi kliniklerinde yapılan laparoskopik kolesistektomi ameliyatlarının demografik özelliklerini ortaya koymak, açık cerrahiye geçiş oranı ve başlıca nedenlerini irdelemektir.

Gereç ve Yöntem: Ekim 2013-Mayıs 2017 tarihleri arasında hastanemizde laparoskopik kolesistektomi uygulanan toplam 1.294 hastanın tıbbi kayıtları geriye dönük olarak incelendi ve yaş gruplarına göre açık cerrahiye geçiş oranları kaydedildi.

Bulgular: Bu hastaların 1191'i kadın (%92,0) ve 103'ü (%7,9) erkekti. Ortalama yaş $48,6 \pm 13,2$ (18-89) yılı. Ameliyat endikasyonları 1195 hastada (%92,4) kolelitiazis, 56 hastada (%4,4) akut kolesistit ve safra kesesi polipleri idi. 43 hasta (%3,3). İşlem 41 hastada (%3,16) açık cerrahiye geçerken, 12 hastada (%0,9) intraoperatif komplikasyon gelişti. Ölüm olmadı. Ortalama hastanede kalış süresi 1,2 (1-6) gündü. Açık cerrahiye geçmenin ana nedenleri şunlardı: Calot üçgeninde yapışıklıklar (n= 3), akut kolesistit (n= 29), koledokolitiazis (n = 2), önceki ameliyata bağlı yapışıklıklar (n = 1), diseksiyon zorluk (n= 2), organ hasarı (n= 2), anatomik varyasyon (n= 1) ve taş çıkarma (n= 1).

Sonuç: Akut kolesistit, laparoskopik kolesistektomi sırasında açık cerrahiye geçiş oranını artıran en önemli faktör olarak görünmektedir. Erkek cinsiyeti, artan yaş ve akut kolesistit varlığı açık cerrahiye dönüş riskini artıran ana faktörlerdir.

Anahtar Kelimeler: Laparoskopik kolesistektomi, kolesistektomi, komplikasyon

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