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Emergency versus elective cholecystectomy: Experience at a university hospital in the Eastern Province, Saudi Arabia

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Abstract:

BACKGROUND: Laparoscopic cholecystectomy (LC), the procedure of choice for treating most gallbladder pathology, has become the most trusted elective procedure for treating gallstone disease because of its effectiveness and safety. While the timing is an important factor in those cases, our aim in this study was to compare emergency and elective LC, determine the differences in postoperative complications, and assess the conversion rate to open cholecystectomy.

MATERIALS AND METHODS: This study included a total of 627 patients who had undergone laparoscopic cholecystectomy during 2017-2019 at King Fahd Hospital of the University (KFHU). Records of both emergency and elective cases were reviewed from Quadra-med (software package). All demographic data of the patients, presenting complaint, laboratory and inflammatory marker, type of the operation, intraoperative complications, procedure time, conversion rate from laparoscopic to open cholecystectomy, postoperative period, length of hospital stay, and pathological diagnosis were entered into an Excel sheet. The data was analyzed using SPSS 23.0. Qualitative variables were described as frequencies and percentages, and continuous variables were summarized with mean and standard deviation (SD). Chi-square test, *t*-test, and the Mann–Whitney *U*-test were applied to test for statistical significance at $P \leq 0.05$.

RESULTS: The mean age for patients undergoing elective LC was 39.94 years (SD=13.56) whereas, mean age of patients undergoing emergency LC was 40.64 years (SD=13.02). About 71% of cases in elective LC group were females compared to 55% in the emergency LC group. There was a significant difference in C-reactive protein (CRP) in relation to the type of surgery where $P < 0.05$. Twelve (1.9%) patients had subtotal cholecystectomy and two cases converted from LC to open. There was a significant association between postoperative complication and the type of surgery. The length of hospital stay (LOS) was also found to be significantly more in patients having emergency LC (6.0 vs. 4.5 d; $P < 0.05$).

CONCLUSION: The relation between conversion to an open procedure and type of surgery (elective or emergency) in our study was nonsignificant. There was a significant association between preoperative CRP, postoperative complication, length of hospital stay, and type of surgery. Further multicenter studies are required for further investigation.

Keywords:

Conversion rate, elective, emergency, laparoscopic cholecystectomy, postoperative complication

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Introduction

In 2007, the Japanese Society of Hepato-Biliary-Pancreatic Surgery

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developed the Tokyo guideline for grading the seriousness of acute cholecystitis on the basis of structured signs of the level of inflammation such as raised C-reactive protein (CRP), increase in white cell count (WCC) and fever, clinical signs (Murphy's sign, right upper quadrant mass, pain and gallbladder tenderness), and visualization findings.[1]

Twenty percent of all gallstones patients are likely to present with acute cholecystitis (AC).[2] Therefore, recent studies have focused their approach on the effectiveness and safety of laparoscopic cholecystectomy (LC). Several publications are in support of this.[2-10]

In this study, our aim was to compare the outcome of the patients who had emergency or elective LC and determine the differences in postoperative complications such as injury to the bile duct, pancreatitis, injury to bowel, bleeding, bile leak, and the length of hospital stay. In addition, the conversion rate from laparoscopic to open cholecystectomy and any undiagnosed pathology in the two groups were assessed.

Materials and Methods

In a retrospective, single-site review of 627 patients who had undergone LC, the data were collected from hospital records following codes for urgent or elective LC. Ethical approval was obtained from the Institutional Review Board (IRB) vide Letter No. IRB-2020-01-417 dated 20/12/2020 with a waiver of written consent since data were abstracted from medical records of patients with no human subjects directly involved in the study.

Data from 2017 to 2019 showed that all procedures were carried or supervised by consultants at King Fahd Hospital of the University (KFHU). All patients above 18 years of age who had undergone LC from January 2017 to December 2019 were included in the study. Patients who were pregnant, known cancer patients, and children below the age of 18 years were excluded from the study.

Records of both emergency and elective cases were reviewed from Quadra-med (software package). All demographic data of the patients, presenting complaint, laboratory and inflammatory marker, type of the operation, intraoperative complication, procedure time, conversion rate from laparoscopic to open cholecystectomy, postoperative period, length of hospital stay, and pathological diagnosis were abstracted.

The data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (IBM Corp. Released 2015. IBM SPSS Statistics for Macintosh, Version 23.0. Armonk, NY, USA: IBM Corp.) expressed in text and tables. Qualitative variables were described in frequencies and percentages, and continuous variables were summarized with mean and standard deviation (SD). Chi-square test, *t*-test, and the Mann–Whitney *U*-test were applied where appropriate. Statistical significance was set at $P \leq 0.05$.

Results

The mean age for patients undergoing elective LC was 39.94 years (SD=13.56) whereas, mean age of patients undergoing emergency LC was 40.64 years (SD=13.02). About 71% of cases in elective LC group were females compared to 55% in the emergency LC group. No statistically significant differences were observed on demographic data between the two groups [Table 1].

Table 2 presents diagnosis and investigation results of patients who had undergone laparoscopic cholecystectomy. Less than a third of our cases had endoscopic retrograde cholangiopancreatography and there were no significant differences between elective laparoscopic cholecystectomy (ELC) and emergency laparoscopic cholecystectomy (EMLC).

Table 3 shows that 90% of the elective and 98% of the emergency laproscopic cholycystectomies were performed by the consultant. The records show that there was one conversion in each group, ten patients had subtotal cholecystectomy in ELC, and two in the EMLC. The length of hospital stay (LOS) was statistically significantly higher (P=0.014) in the EMLC group (6.0 days) compared with ECL (4.58 days).

Three patients in both the groups had had a bile leak, and bleeding had been reported in seven patients in the ELC group; Chi-square test was used to determine relation between the type of surgery and postoperative complications. The calculated $P = 0.000$, which indicated that postoperative complications were significantly related to type of surgery.

Table 1: Demographic data of patients undergone laparoscopic cholecystectomy at King Fahd Hospital of the University, Al-Khobar 2017-2019

	Elective LC (*n*=571) *N* (%)	Emergency LC (*n*=56) *N* (%)	*P-value*
Age (mean±SD)	39.94±13.563	40.64±13.026	0.71
BMI (mean±SD)	30.52±8.161	32.61±8.252	0.45
Gender			
Male	164 (28.7)	25 (44.6)	0.12
Female	407 (71.3)	31 (55.4)	
Previous abdominal surgery (yes)	133 (23.3)	17 (30.4)	0.96

SD=Standard deviation, BMI=Body mass index

Table 2: Diagnosis and investigation results of patients undergone laparoscopic cholecystectomy at King Fahd Hospital of the University, Al-Khobar 2017-2019

	Elective LC (*n*=571) *N* (%)	Emergency LC (*n*=56) *N* (%)	*P-value*
Diagnosis			
Acute cholecystitis	165 (28.9)	30 (53.6)	0.64
Biliary colic	330 (57.8)	18 (32.1)	
Biliary pancreatitis	36 (6.3)	7 (12.5)	
Mirizzi syndrome/ascending cholangitis	-	1 (1.8)	
Gallbladder polyps	2 (0.4)	-	
Obstructive jaundice	28 (4.9)	-	
Size of largest stone, if applicable in mm (mean±SD)	27.86±49.9	22.74±22.81	0.62
Common bile duct diameter, if dilated in mm (mean±SD)	11.89±30.86	7.13±3.26	0.63
ERCP (yes)	92 (16.1)	12 (21.4)	0.36

SD=Standard deviation, ERCP=Endoscopic retrograde cholangiopancreatography

Table 3: Intraoperative findings and postoperative complication in patients undergone laparoscopic cholecystectomy at King Fahd Hospital of the University, Al-Khobar 2017-2019

	Elective LC (*n*=571) *N* (%)	Emergency LC (*n*=56) *N* (%)	*P-value*
Level of the surgeon			
Consultant	517 (90.5)	55 (98.2)	0.72
Senior resident	8 (1.4)	-	
Specialist	46 (8.1)	1 (1.8)	
Procedure			
Laparoscopic cholecystectomy	559 (97.9)	53 (94.6)	0.91
Laparoscopic cholecystostomy (tube insertion to drain the gallbladder)	1 (0.2)	-	
Laparoscopic subtotal cholecystectomy	10 (1.8)	2 (3.6)	
Conversion to open (yes)	1 (0.2)	1 (1.8)	0.12
Adhesion (yes)	150 (26.3)	15 (26.8)	-
Postoperative complication			
Bile leak	3 (0.5)	3 (5.4)	< 0.001
Bleeding	7 (1.2)	-	
Pathological diagnosis			
Adenocarcinoma	1 (0.2)	-	0.75
Cholecystitis	515 (90.2)	51 (91.1)	
Cholesterolosis	25 (4.4)	-	
ICU admission (yes)	5 (0.9)	0	0.48
Length of hospital stays (mean±SD)	4.58±3.88	6.00±4.996	0.014

SD=Standard deviation, ICU=Intensive care unit, LC=Laparoscopic cholecystectomy

None of the EMLC cases required an intensive care unit (ICU) admission, but five of the ELC cases were admitted in the ICU after the surgery; however, this was not statistically significant (P = 0.482). There was a significant difference in C-reactive protein (CRP) in relation to the type of surgery ($P < 0.05$).

Discussion

Acute cholecystitis used to be managed by the traditional treatment with antibiotics and analgesics in the acute phase followed by a cholecystectomy after few weeks. Recent studies have suggested that patients admitted with a higher level of pain and had biliary disease with recorded gallstones on ultrasound visualization could be managed with quick LC if found suitable for anesthesia and surgery.[3]

In 1992, the National Institute of Health in USA defined cholecystectomy by laparoscopy as a treatment of choice for gallstones.[11-13] Video-laparoscopic cholecystectomy (VLC) has a convalescence period of 7–10 days. It has been proved to be esthetically acceptable and with less pain after surgical operations. Other benefits are the reduction of the length of hospital stay and wound infections. It has also been proved that VLC reduces morbidity and mortality (0.1%). Although VLC is associated with very few complications, it can be converted to laparotomy because of the rising rates of morbidity and mortality on account of severe inflammation.[14]

With the advancement of laparoscopy in the past two decades, LC has become the procedure of choice for the treatment of most gallbladder pathology.[15] It is the most trusted elective procedure for treating gallstone disease because of its effectiveness and safety. Its improved postoperative recovery makes it economically advantageous as current evidence shows.[14]

This study was conducted at a university teaching hospital to compare the outcome of an ELC with EMLC. We examined our records of 2 years and compared the demographics, presentation, intraoperative and postoperative data, complications, and the duration of hospital stay.

Cholecystectomy is a well-known surgical procedure in gastroenterology. Despite being a standard procedure in that specialty, about one-third of patients continue to experience all kinds of abdominal pain after surgical procedure. Organic disturbances such as common bile duct stones and peptic ulcer, among others, have been proven as the cause of some of the postoperative symptoms. However, other origins of the pain are not clearly understood.[14] A survey by Middelfart *et al*., on the occurrence of pain and other postoperative

symptoms after cholecystectomy, pain intensity, and the overall satisfaction of the surgery suggested that postoperative pain and other symptoms are standard in surgery, but not related to the underlying gallbladder disease. Why some patients do not recover fully after a surgery is more likely to be multifactorial; hence, future studies should focus on the physical changes that occur after the removal of the gallbladder, and how to improve the selection of patients for elective cholecystectomy.[14]

Several studies have proved that the concentration of CRP involving more usable discriminative power is a better prediction of acute cholecystitis than WCC.[16-18] Different studies have also related the level of CRP to the rate of conversion of LC. The relationship considers the conversion as a surrogate of laparoscopic difficulty. Earlier studies have shown the same connection between increased CRP and acute cholecystitis.[19-22] However, the findings with regard to the time taken for the conduct of the laboratory tests or how long the symptoms last are limited. Another study done in 2014 by Mok *et al*., revealed that a concentration of 200 mg/l and above of CRP is a good forecast of gangrenous cholecystitis. This is related to current findings which is predicted by Nassar scale grading.[23] Other studies found a relationship between raised CRP levels and difficult LC that requires a change to open surgery. However, with varying CRP values, the reported rates of conversion to open surgery range between 5% and 35%.[19-22] The Ng *et al*'s study stated that increased preoperative CRP levels result in more significant difficulties during the surgical operation. The Nassar scale grading, published in 1995 that is used as the basis, consists of 4 grades that assess the gallbladder, cystic pedicle, and adhesions.[15] In our study, there was a significant difference in CRP in relation to the type of surgery where the *P* value of the test was <0.05 [Table 3].

In the present study, 90% of the elective and 98% of the emergency LC procedures were performed by the consultant. This, however, might not reflect the real picture as in many of the operation notes, the consultant's name is put down as the surgeon's name. In most elective LCs, the consultant is scrubbed in but might be supervising a senior resident in training. However, most emergency LCs were done by the consultants. We could not measure the difficulty of the procedure because our study was retrospective, and the notes were not clear on this.

In line with earlier studies, the present study showed significant differences in complications. However, dealing with this acute pathology radically saves money as the average hospital stay for patients is 2–3 days postoperative, which is the same time they would have spent taking antibiotics only. This reduces outpatient visits and visits to the different specialties and shortens the waiting list. The problem with this policy is that the procedure demands an experienced surgeon with expertise in this type of surgery.

LC is often a 1-day procedure in the elective outpatient setting. However, this changes when conversion to open surgery is necessary, since open surgery increases the length of stay at the hospital (LOS) and is associated with increased mortality and morbidity rates. A conversion rate of 5%–20% is reported nationally in all attempted LCs.[15] However, in our study, the conversion was much lower in both the emergency (EMLC) and elective (ELP) (0.32%). This might be explained by our policy of adopting subtotal or partial cholecystectomy in difficult cases and avoiding conversion as much as possible. Twelve (1.9%) patients had subtotal cholecystectomy, which would have been converted in the past.

To *et al*'s study on the conversion rate in individual hospitals and the national surgery unit and the complications and results in elective and emergency cholecystectomy showed that CRP was almost twice higher in nontrauma emergency patients requiring cholecystectomy, but lower than the earlier published reports. However, there was wide variability in morbidity and mortality.[24] On the other hand, there was a significant association between postoperative complication and type of surgery. In our study, the conversion rate was less than 1% and there were no statistically significant differences in the conversion rate between the two groups.

The Lawrentschuk *et al*'s study that aimed at examining the effects of delay of surgery for elective LC for patients concluded that delays in the surgery resulted in a morbidity rate of 14% of patients at the Launceston General Hospital.[25]

Preoperatively, carcinomas of the gallbladder are suspected in only 30% of cases, the remaining cases being discovered incidentally either during or after LC.[26] The incidence of finding incidental gallbladder cancer through histopathological examination has significantly increased and is considered the most frequent presentation of this entity.[27] A study by Figueiredo *et al*., which compared the incidence of incidental finding of gallbladder cancer in emergency cholecystectomies with elective cholecystectomies, showed that incidental finding of gallbladder cancer was more frequent in emergency cholecystectomies than is found in the cases of elective cholecystectomies. The analysis showed a significant association of incidental findings of gallbladder cancer in both types of procedure in patients, female, older than 60 years, and

with histopathological diagnosis of adenocarcinoma.[27] In our study, only one case of adenocarcinoma was found in the pathology postoperatively, and the relation between gallbladder cancer and the type of surgery was nonsignificant.

The limitation of our study was mainly that it was a retrospective study. All data were obtained from notes, documentation of which was not perfect and complete. Data did not show the important factors of the impact on the quality of life or cost effectiveness. For better results, a prospective study which includes all these factors is necessary.

Conclusion

No statistical differences were evident in the demographics, the operative data, and the rate of conversion. The relation between conversion to open and type of surgery (elective or emergency) was found to be nonsignificant. There was a significant association between preoperative CRP, postoperative complication, and the type of surgery. The length of hospital stay was significantly more in emergency LC patients than elective patients. Further multicenter studies to investigate further are required.

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Conflicts of interest
There are no conflicts of interest.

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