Factors affecting the conversion to open surgery during laparoscopic cholecystectomy in patients with cholelithiasis undergoing ERCP due to choledocholithiasis

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BACKGROUND: *The rate of conversion to open surgery is high in laparoscopic cholecystectomy (LC) after Endoscopic Retrograde Cholangiopancreotocography (ERCP). The present study aimed to evaluate the risk factors associated with the conversion to open cholecystectomy and minimize the rate of conversion to open surgery.*
METHODS: *A total of 157 patients admitted to the Ondokuz Mayıs University Medical Faculty Hospital due to cholelithiasis and choledocholithiasis between January 2002 and December 2012, and they receiving laparoscopic cholecystectomy were included in the study. The patients were analyzed retrospectively. The predictive factors for conversion to open cholecystectomy were evaluated. Patients were compared to each other in terms of time passing from ERCP to operation, number of ERCPs, stent usage, stone extraction and complications that occurred while waiting for the operation. Patients were separated into three groups according to the time passing from ERCP to laparoscopic cholecystectomy, as follows; group I (short time intervals: 7 days or less): 53 patients, group II (intermediate time intervals: 8-42 days): 70 patients and group III (long time intervals: 43 days and more): 34 patients.*
RESULTS: *Of the 157 patients, 57 were male and 100 were female. The mean age was 54.5 (range: 19-87) years. Of these 157 patients who received laparoscopic cholecystectomy following ERCP, 22 (14%) underwent open surgery. The conversion to open cholecystectomy was distributed in groups, as follows: seven (13.2%) patients in group I, eight (11.4%) patients in group II and seven (20.6%) patients in group III. When the rate of conversion to open surgery was compared between groups, there was no statistically significant difference (p=0.406). The laparoscopic operations were converted to open surgery in 15 (11.3%) of the 133 patients who underwent single ERCP, and in seven (29.2%) of the 24 patients who underwent two or more ERCPs before surgery (p=0.048). The number of ERCPs was determined to be the most important factor that affects the conversion to open surgery in laparoscopic cholecystectomies following ERCP. The removal of stones from the common bile duct, stent placement in the common bile duct, and existence of biliary complications during waiting time from ERCP to LC had no effect on the conversion to open surgery (p=0.454, p=0.058, and p=0.465, respectively).*
CONCLUSIONS: *The results of this study reveal that the timing of LC following ERCP, removal of stones from the common bile duct, stent placement in the common bile duct and the existence of biliary complications during the waiting period have no effect on the rate of conversion to open surgery. The number of ERCPs is the only factor that affects the conversion to open surgery in LC following ERCP.*

KEY WORDS: Choledocholitiasis, Conversion, Endoscopic retrograde cholangiopancreatography, Laparoscopic cholecystectomy

Introduction

Stones of the common bile duct (CBD) exist in 3.4-7.2% of the patients the presented for cholecystectomy [1-3]. In these patients, the treatment of cholecystectomy alone is not sufficient because of the associated severe complications such as biliary pancreatitis, jaundice and cholangi-

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tis. Therefore, choledocholitiasis should be treated even in the asymptomatic patients [4]. Although there are a few treatment strategies for coexisting cholecysto-choledocholithiasis, preoperative ERCP and LC are the most frequently [5,6]. Although this is the preferred management, the conversion rate to open cholecystectomy in patients undergoing LC after ERCP is higher than that in patients undergoing standard LC for cholelithiasis [7-9]. However, few studies have reported the risk factors related to the laparoscopic procedure for conversion to open cholecystectomy after laparoscopic procedure. In this study, we evaluated the risk factors associated with conversion to open cholecystectomy in the patients undergoing LC after ERCP.

Materials and Methods

The patients who had both cholelithiasis and choledocholithiasis and who received laparoscopic cholecystectomy after ERCP at our institution from January 2002 to December 2012 were retrospectively enrolled in this study. The patients who had complications related to ERCP were excluded from the study. The data of the patients were collected retrospectively by investigating the patient files. The consent of the Medical School Ethics Committee was received prior to the study (OMU EC consent 2012/131).

The indication for ERCP was the suspicion of common bile duct stone, based on clinical signs and symptoms and on findings obtained via ultrasonography or magnetic resonance imaging. Laparoscopic cholecystectomy was performed with standard four port and two-handed techniques in the American position. When possible, ERCP was followed by LC during the same hospital admission, but the interval between the two procedures was also influenced by the patient's medical condition and preferences. For patients who underwent more than one times ERCP, the final performed one was used in calculating the interval between ERCP and LC.

To investigate the potential effects of time from ERCP to LC on the rate of conversion to open surgery, intervals between the procedures were defined in the following groups, as group 1: short (7 days or less), group 2: intermediate (8-42 days) and group 3: long (43 days or more). In addition to the time from ERCP to LC, we also investigated the factors that might affect the conversion to open surgery, such as the number of ERCPs, stent usage, removal of stones and biliary complications existing during the waiting period.

Statistical Analysis

Statistical analysis of the data was performed using the SPSS (Statistical Package for Social Sciences) for Windows 15.0 (NCSS 2007) software. In addition to descriptive statistical methods (mean and standard deviation), independent univariate analysis of the quantitative data was performed using the Mann-Whitney U-test; independent univariate qualitative data were analyzed using the chi-square test. Multivariate relationships between dependent and independent risk factors were determined using the logistic regression model. Results were evaluated at the 95% confidence level. A p value less than 0.05 was accepted to be statistically significant.

Results

A total of 1120 patients with cholelithiasis who had undergone LC were investigated retrospectively, and 157 (14%) of these cases were determined to undergo also ERCP due to choledocholithiasis. Of the 157 patients who received LC after ERCP, 57 were male and 100 were female; the mean age of these patients was 54.5(19-

TABLE I - *Demographic and clinical characteristics of the patients.*

	Group 1 (0-7 day)	Group 2 (8-42 day)	Group 3 (>43 day)	P
Age	54.27± 17.1(20-87)	55 ± 17 (19-86)	53.3 ± 14.7(22-76)	0.338
Gender M/F	16/37	26 / 44	15 / 19	0.246
BMI	26.6 ± 3.5(20-36)	26.4± 3.3 (18-34)	26.6± 2.8 (21-31)	0.420
History of abdominal surgery: No	37 (% 69.8)	56 (% 80)	23 (% 67.6)	0.876
History of abdominal surgery: Yes	16 (% 30.2)	14 (% 20)	11 (% 32.4)	
Single gallstone	8 (% 15.1)	10 (%14.3)	6 (% 17.6)	0.785
Multiple gallstones	45 (% 84.9)	60 (% 85.7)	28 (%82.4)	
Diameter of CBD: Normal	22 (% 41.5)	30 (% 42.9)	13 (% 38.2)	0.803
Diameter of CBD: Dilated	31 (% 58.5)	40 (% 57.1)	21 (% 61.8)	
Operation time (minute)	66 ± 10 (48-105)	69 ± 10.5(46-120)	70 ± 9.3 (54-90)	0.523
Hospital stay (day)	3.7 ± 3.57 (1-20)	4.12± 4.16 (1-27)	4.23 ± 3.31(1-17)	0.980
Intraoperative complications	1 (%1.9)	3 (%4.3)	1 (%2.9)	0.709
Postoperative complications	5 (% 9.4)	9 (% 12.9)	4 (%11.8)	0.689

87) years. The patients were separated into three groups, regarding the time from ERCP to surgery. Demographic and clinical characteristics of the patients are presented in Table I. The age, gender, body mass index (BMI), and the rate of previous abdominal operations did not differ between the group 1, group 2, and group 3.

The characteristics of the cases in the three groups were similar regarding the properties of gallbladder stones, state of the CBD prior to ERCP (normal, dilated), removal of stone/biliary sludge from the CBD in ERCP, and the number of performed ERCP. The American Society of Anesthesiologists (ASA) scores were similar in the three groups. The durations of surgery and postoperative hospitalization did not show statistically significant differences between the groups (Table I: p=0.52 and p=0.98, respectively).

Intraoperative complications (injury of biliary duct, hemorrhage, and intestinal serosal injury) and postoperative complications (intra abdominal hematoma/hemorrhage, pancreatitis, intraabdominal abscess, wound infection, and non-specific abdominal pain) did not show statistically significant differences between the groups (Table I: p=0.709 and p=0.689, respectively).

Reasons for conversion to open surgery

Open surgery was applied to 22 (14%) of the cases who underwent LC after ERCP, and the operation was completed with laparoscopy in 135 (86%) patients. The reasons for conversion to open surgery were determined to be as follows: adhesion (13 cases), unpresented anatomical structure (4 cases), intraoperative bleeding (2 cases), injury of the bile ducts (2 cases), and intestinal serosal injury (1 case) (Table II).

When we investigated demographic data of the patients converted to open surgery of LC after ERCP and the patients who underwent LC after ERCP; age, gender, BMI and previous abdominal operations were found not to have any effect on the conversion to open surgery Table III (p=0.09, p=0.159, p=0.325, and p=0.442, respectively).

Factors Affecting the Conversion to Open Surgery

Waiting period from ERCP to LC

In the current study, the waiting period from ERCP to LC was a mean 30.8 (0-297) days. Of the 22 cases who underwent open surgery in the course of LC after ERCP, seven were in group I, eight were in group II, and seven were in group III (Table IV). The rate of conversion to open surgery did not show statistically significant differences between the groups (p=0.406).

Biliary complications during the waiting period from ERCP to LC

Biliary complications like cholecystitis, pancreatitis, choledocholithiasis, and cholangitis may be seen during the waiting period from ERCP to LC. In the mean 30.8 day waiting period (range:0-297 days) from ERCP to LC, nine cases (5.7%) had biliary complications which are seen in group I; one case(1.9%), in group II; three cases(4.3%) and in group III; five cases(14.7%) (Table V). The rate of biliary complications increased as the waiting period became longer; the rate increased linearly when it was

TABLE II - *Reasons of conversion to open surgery.*

Reasons	Grup 1 (53)	Grup 2 (70)	Grup 3 (34)	Toplam (157)
Adhesion	5	4	4	13
Intraoperative bleeding	1	1	0	2
Injury of bile ducts	0	1	1	2
Intestinal serosal injury	0	1	0	1
Unpresented anatomical structure	1	1	2	4

TABLE III - *Demographic characteristics of the cases converted to open surgery of LC following ERCP and the patients who underwent to LC after ERCP.*

Patient	Conversion to open surgery	LC	P
Age	59.81 ± 13.9 (20-87)	53.54 ± 16.81 (19-86)	0.099
Gender M/F	11/11 (%19.29/%11)	46/89 (%80.71 / %89)	0.159
BMI	25.86 ± 3.49(20-36)	26.60 ± 3.24 (18-34)	0.325
History of abdominal surgery	4 (%18.2)	37 (%27.4)	0.442

Table IV - *Factors affecting the conversion to open surgery.*

		Number	Conversion to open		P
			Yes	No	
Waiting time between ERCP and LC	Group 1	53	7 (% 13.2)	46(% 87)	0.406
	Group 2	70	8 (% 11.4)	62(% 88.5)	
	Group 3	34	7 (% 20.6)	27(% 79.5)	
Biliary complications during waiting time	Yes	9	2 (% 22)	7(% 78)	0.465
	No	148	20 (% 13.5)	128(% 86.5)	
Number of ERCP	One	133	15(% 11)	118(% 89)	0.048
	More than one	24	7(% 29)	17(% 71)	
Stone extraction with ERCP	Yes	56	10(% 18)	46(% 82)	0.454
	No	101	12(% 12)	89(% 88)	
Stent usage	Yes	7	3(% 43)	4(% 57)	0.058
	No	150	19(% 13)	131(% 87)	

compared between groups in regard to time, which was statistically significant (p=0.018). The rate of biliary complications decreased when the surgery was performed at an earlier time after ERCP.
ERCP was repeated in three of the cases that had biliary complications, and the others were treated with medication. Of the nine patients that had biliary complications while waiting, two (22%) had conversion to open surgery; of the 148 patients existing with no biliary complications, 20 (13.5%) converted to open surgery (Table 4). Conversion to open surgery did not show a statistically significant difference between these two groups (p=0.465).

Number of Ercps

In the present study, repetitive application of ERCP was determined to be the most important factor that affects the conversion to open surgery in LC. Of the 133 patients who were underwent to single ERCP, 15 (11%) converted to open surgery; of the 24 patients who were applied ERCP twice or more, seven (29%) converted to open surgery (Table IV). This difference between groups regarding the conversion to open surgery was statistically significant (P=0.048).

Stone Extraction

Fifty-six patients underwent stone extraction during the ERCP. Sludge/debris extraction or only sphincterotomy was applied to the remaining 101 patients. In the group that underwent stone extraction with ERCP, ten cases (18%) converted to open surgery; of the 101 patients who did not undergo stone extraction, twelve cases (12%) converted to open surgery. the rate of conversion to open surgery did not show a statistically significant difference (P=0.454) (Table IV).

Stent Usage

In some patients, a stent was used during ERCP. Stents are foreign bodies, and they may cause extensive inflammation in and around CBD. Extensive inflammation may lead to conversion to open surgery during LC, because of adhesions. In our study, stents were applied to only seven patients. Of the 7 patients who used stents, 3 converted to open surgery but conversion to open surgery was seen only 19 of the remaining 150 patients who did not undergo stent placement (Table IV). The conversion to open surgery did not show a statistically significant difference with stent usage; however, the rate of conversion to open surgery as high as 43% in the patients who underwent stent placement (p=0.058).

Discussion

LC is stil the reference treatment of cholelithiasis because it is an easy, effective, comfortable procedure with good cosmetic results and low complication rates despite today's technological advances [10]. Common bile duct stones are present in some patients with cholelithiasis and in these patients, cholecystectomy alone is not an adequate treatment. In such patients, stones in the CBD must be treated, in addition to cholecystectomy. ERCP is a common and useful procedure for in the imaging and treatment of bile duct stones [11].
Among patients who have undergone LC, preoperative ERCP has been associated with more frequent conversion to open surgery [7,9,12-14]. In the prospective study of Sarli et al. including 2137 patients, the rate of conversion to open surgery was reported as 8.3% in patients who underwent ERCP, and 3.4% in those who underwent standard LC [7]. Bostancı et al. have reported a conversion rate of 14% in the 308 patients who underwent LC after ERCP. In the standard LCs performed in their clinics in the same period, the rate of conversion to open

Table V - *Biliary complications during the waiting period from ERCP to LC.*

Complications	Group 1 (53)	Group 2 (70)	Group 3 (34)	Total (157)	P
Acute cholecystitis	0	2	3	5	0.018
Choledocholithiasis	1	1	0	2	
Cholangitis	0	0	1	1	
Biliary pancreatitis	0	0	1	1	
Total	1 (% 1.9)	3 (% 4.3)	5 (% 14.7)	9 (% 5.7)	

surgery has been reported to be 4% [12]. In the studies of Allen et al. and Donkervoort et al., the rate of conversion to open surgery was also reported to be high in the LCs performed after ERCP [13,14]. The results of our study are in accordance with the literature. Of the 157 patients who underwent LC after ERCP, 22 cases(14%) converted to open surgery. Of the 963 patients who underwent standard LC in the same period, 46 cases (4.8%) converted to open surgery. The rate of conversion to open surgery showed a statistically significant difference between these two groups (p=0.000077).

The findings of these studies raise the question of how CBD stones that requires ERCP might influence the course of LC. In the literature, the presence of severe adhesions around Calot's triangle and failure in cannulation have been reported to be the most important reasons of conversion to open surgery during LC [15]. When considering that extensive adhesions and difficulty in dissection might lead to increased rate of conversion to open surgery after ERCP. We can explain answer of the question why ERCP increases conversion rate to open surgery with under four headings:

– Gallstones in the CBD induce more extensive inflammation than stones in the gallbladder [12,16]. Because most of CBD stones occur in the gallbladder and move to the bile duct, the recurrent passage of small gallstones through the cystic duct can make inflammatory change around the duct and difficulty dissecting the Calot's triangle [15].

– Patients with choledocholithiasis exhibit a significantly higher prevalence of acute biliary pancreatitis and cholangitis. The patients with biliary pancreatitis and cholangitis are more likely to have peripancreatic and pericholedochal inflammation, and therefore difficulty is experienced in dissecting the Calot's triangle [17,18].

– The ERCP procedure itself with potentially traumatic tissue manipulation (especially with the application of sphincterotomy and stone extraction) may cause inflammation and adhesions around the duct and Calot's triangle [12,16]. A few studies have demonstrated that local inflammation can be induced by ERCP because of an early increase of inflammatory cytokines such as serum interleukin-2, interleukin-6, and tumor necrosis factor alpha [19]. The increase in inflammatory cytokines may be seen due to inflammation that occurs when the contrast agent is infused during ERCP [20]. We consider that the ERCP procedure itself or contrast agent usage during ERCP increase adhesions, and therefore difficulty is experienced in dissecting the Calot's triangle.

– Bactobilia can develop and continue after disruption of Oddi's sphincter, which is caused by the endoscopic sphincterotomy and stone extraction during ERCP [16,21,22]. Sugiyama and Atomi took bile samples for bacterial culture at intervals after endoscopic sphincterotomy, they showed positive culture rates of 80%, 67%, and 60% at intervals of seven days, one year, and five years, respectively [23]. Bactobilia causes inflammation around the gallbladder and the hepatoduodenal ligament and difficulty in dissecting the Calot's triangle.

It is not easy to determine which of these possible causes leads to the conversion to open surgery in LC after ERCP. All of these factors may be the causes of conversion to open surgery.

There is not consensus about the timing of LC after ERCP. Some studies have been performed to investigate the effect of time from ERCP to LC on the conversion to open surgery. In the study of Boerma et al., the patients who underwent ERCP either planned elective surgery or they were followed-up (wait and see principle) and operated on when needed. The rate of conversion to open surgery was 23% in the elective group, and 55% in the "wait and see" group [21]. de Veries et al. demonstrated that the rate of conversion to open surgery decreases more as the time from ERCP to LC becomes shorter [16]. In the study of Salman et al., the rate of conversion to open surgery has been reported as 2.5% in LC performed within 24-72 hours following ERCP, and 17.5% in those performed within 72 hours and seven days following ERCP [20]. Bostancı et al. found no relationship between the conversion to open surgery and the time from ERCP to LC [12]. In our study, conversion to open surgery also did not differ significantly between the three groups that were arranged in regard to the time from ERCP to LC (p=0.406).

The rates of biliary complications like cholecystitis, pancreatitis, choledocholithiasis, and cholangitis increase as the waiting period from ERCP to LC becomes longer. In the study of Schiphorst et al., the time from ERCP to LC was a mean seven weeks. In this period, repetitive biliary complications developed in 33 (20%) of the

167 patients [24]. A recent meta-analysis showed a substantial risk of further biliary complications before LC, with 18% of patients having complications during the minimal interval of 40 days [25]. Multiple studies have suggested that LC should be performed earlier than six weeks in order to reduce the risk of interval biliary complications after ERCP [16,20,25,26]. In our study, during an approximate 30-day interval between the ERCP and LC, nine patients (5.7%) had biliary complications, the rate of complications increased as the waiting period became longer, which was statistically significant (p=0.018). The potential benefit of early LC is prevention of possiple recurrent biliary complications while waiting for the operation. In our study, we repeated the application of ERCP in three of the cases had biliary complications during waiting period; the remaining six patients were treated with medication. Of the nine patients who had biliary complications during waiting period, two cases (22.2%) converted to open surgery; of the 148 cases who did not have biliary complications while waiting, 20 cases (13.5%) converted to open surgery. Conversion to open surgery did not show a statistically significant difference between these two groups (p=0.465). While planning this study, we assumed that biliary complications would develop in patients as the time from ERCP to LC became longer, which would result in inflammation in the gallbladder. The inflammation would cause the adhesion of the gallbladder to the adjacent tissues, leading to difficulty in LC and elevation of the rate of conversion to open surgery. However, the results of this study revealed no statistically significant difference between the cases with and without biliary complications occurred during waiting period for LC after ERCP, regarding the conversion to open surgery.

Number of ERCP is one of the most important reasons for conversion to open surgery, since ERCP itself may damage the structures within the hepatoduodenal ligament either because of instrumentation of the biliary tract and direct effect of the contrast, causing increased periportal inflammation and fibrosis [12,21]. The study of Bostancı et al. included 18 patients who underwent multiple ERCPs, and 290 patients who underwent single ERCP; the patients who underwent multiple ERCPs experienced a greater frequency of conversion to open surgery. The conversion to open surgery was present in 6 (33.3%) of the cases who underwent more than one ERCP, and in 37 (12.8%) of the patients who underwent single ERCP [12]. In the study of Boerma et al., multiple ERCPs led to higher risks of complications and conversion to open surgery during LC [21]. In the current study, the rate of conversion to open surgery was also significantly higher in the group with more than one ERCP (29.2%), compared to the group with single ERCP (11.3%) (p=0.048). Although strict criteria were defined regarding the selection of patients for the application of ERCP, the rate of inessential ERCPs is still between 38% and 57% [27]. In order to prevent the conversion of LC to open surgery, unnecessary applications of ERCP must be avoided, which is the main issue in this regard.

Does the conversion to open surgery differ between the cases who underwent stone extraction during ERCP and those who did not undergo this procedure? In the study of Bostancı et al., higher rates of conversion were not associated with the application of stone extraction during ERCP; of the 191 patients who underwent stone extraction with ERCP, 28 (14.6%) patients converted to open surgery; and of the 117 cases who did not undergo stone extraction, 15 (12.8%) patients converted open surgery [12]. In the study of Vries, patients with a stone extraction (conversion rate 16%) during ERCP did not have an adverse outcome of their laparoscopic procedure compared to the patients with an uneventful ERCP (conversion rate 13%) [16]. In our study, conversion to open surgery was experienced in ten (17.8%) of the 56 cases who underwent stone extraction during ERCP, and in 12 (12%) of the 101 cases who did not undergo this procedure during ERCP. There was no statistical significant difference (p=0.454).

We also evaluated the effect of stent placement to CBD on the conversion to open surgery. de Vries et al. reported a rate of conversion of 20% in the patients with stent placement; however, the rate of conversion to open surgery did not differ significantly between patients with and without stent placement [16]. Nair et al. showed that the rate of conversion to open surgery in patients with a CBD stent was 51.4% compared to 3.2% after ERCP alone during LC [28]. In our study, conversion to open surgery was experienced in three (43%) of the seven patients who used stents, and in 19 (13%) of the 150 patients who did not use stents; this difference was not statistically significant (p=0.058) but the presence of a stent greatly increased the difficulty as well as the conversion rate for LC.

Conclusion

Results of the present study revealed that higher conversion rates were associated with the application of multiple preoperative ERCPs, but not related to the interval between the ERCP and LC, the application of stone extraction during ERCP, stent usage, and biliary complications during the waiting period. The number of ERCPs is the only factor that affects the conversion rate. In order to decrease the conversion rate to open surgery during LC, unnecessary applications of ERCP must be avoided.

Riassunto

Il tasso di conversione a chirurgia laparotomica delle colecistectomie laparoscopiche (LC) è elevato dopo la colan-

giopancreatografia endoscopica retrograda (ERCP). Questo studio è finalizzato alla individuazione dei fattori di rischio di dover convertire per minimizzare questa esigenza.
Nello studio sono stati utilizzati retrospettivamente 157 pazienti ricoverati per colelitiasi e coledocolitiasi tra gennaio e dicembre 2012 all'Ondokuz Mayıs University Medical Faculty Hospital, e sottoposti a colecistectomia laparoscopica, per individuare i fattori predittivi della conversione a colecistectomia laparotomica.
Questi pazienti sono stati paragonati in termini di intervallo tra ERCP ed intervento chirurgico, numero delle ERCP, uso di stent, estrazione di calcoli e complicanze insorte nell'attesa dell'intervento, separandoli in tre gruppi in rapporto all'intervallo di attesa: Gruppo I di 53 con intervallo di un massimo di 7 giorni; Gruppo II di 70 pazienti con intervallo tra 8 e 42 giorni; Gruppo III di 34 pazienti con intervallo di 43 giorni ed oltre.
Casistica: 57 uomini e 100 donne, dell'età media di 54,5 anni (da 19 a 87), tutti sottoposti a colecistectomia laparoscopica dopo ERCP, di cui 22 (14%) convertiti a chirurgia laparotomica.
La conversione, in relazione ai gruppi, è stata di 7 (13,2%) nel I gruppo, 8 (11,4%) nel secondo gruppo, 7 (20,6%) nel terzo gruppo.
Paragonando l'incidenza della conversione tra i gruppi non si è rilevata una differenza statisticamente significativa (p=0.406).
Dei 133 pazienti con una sola ERCP preliminare le conversioni sono state 15 (11,3%); nei 24 pazienti sottoposti a due o più ERCP pre-intervento la conversione si è avuta in 7 (29,2%) di essi (p=0.048).
Il numero di ERCP preoperatorie ha rappresentato il fattore più importante a determinare la conversione ad addome aperto. L'asportazione di calcoli dal coledoco, l'apposizione di stent nel dotto biliare comune e il verificarsi di complicanze durante il periodo di attesa tra esecuzione di ERCP e LC non hanno avuto alcun effetto sulla conversione a chirurgia laparotomica (rispettivamente (p=0.454, p=0.058, and p=0.465, respectively).
Si conclude che secondo questo studio l'intervallo tra ERCP e LC, l'asportazione di calcoli dal coledoco, l'apposizione di stent nel dotto biliare comune e il verificarsi di complicazioni durante il periodo di attesa non hanno alcun effetto sull'incidenza della conversione a laparotomia. Il numero di ERCP è il solo fattore determinante il ricorso alla conversione laparotomica.

References

1. Alkhaffaf B, Parkin E, Flook D: *Endoscopic retrograde cholangiopancreatography prior to laparoscopic cholecystectomy: A common and potentially hazardous technique that can be avoided.* Arch Surg, 2011; 146:329-33.

2. Collins C, Maguire D, Ireland A, Fitzgerald E, O'Sullivan G: *A prospective study of common bile duct calculi in patients undergoing laparoscopic cholecystectomy.* Ann Surg, 2004; 239:28-33.

3. Katz D, Nikfarjam M, Sfakiotaki A, Christophi C: *Selective endoscopic cholangiography for the detection of common bile duct stones in patients with cholelithiasis*. Endoscopy, 2004; 36:1045-49.

4. Scientific Committee of the European Association for Endoscopic Surgery (E.A.E.S): *Diagnosis and treatment of common bile duct stones (CBDS). Results of a consensus development conference.* Surg Endosc, 1998; 12:856-64.

5. Liu TH, Consorti ET, Kawashima A, et al.: *Patient evaluation and management with selective use of magnetic resonance cholangiography and endoscopic retrograde cholangiopancreatography before laparoscopic cholecystectomy*. Ann Surg 234:33-40.

6. Taylor EW, Rajgopal U, Festekjian J: *The efficacy of preoperative endoscopic retrograde cholangiopancreatography in the detection and clearance of choledo*cholithiasis. JSLS, 4:109-16.

7. Sarli L, Iusco DR, Roncoroni L: *Preoperative endoscopic sphincterotomy and laparoscopic cholecystectomy for the management of cholecystocholedocholithiasis: 10-year experience.* World J Surg, 2003; 27:180-86.

8. Alimoglu O, Ozkan OV, Sahin M, Akcakaya A, Eryilmaz R, Bas G: *Timing of cholecystectomy for acute biliary pancreatitis: Outcomes of cholecystectomy on first admission and after recurrent biliary pancreatitis.* World J Surg, 2003; 27:256-59.

9. Costantini R, Caldaralo F, Palmieri C, Napolitano L, Aceto L, Cellini C, Innocenti P: *Risk factors for conversion of laparoscopic cholecystectomy.* Ann Ital Chir, 2012, 83(3):245-52.

10. Kartal K, Uludag M: *Can 4-port laparoscopic cholecystectomy remain the gold standard for gallbladder surgery?* Ann Ital Chir, 2016; 87: 13-17.

11. Vavrecka A: *Complications of endoscopic retrograde cholangiopancreatography and how to minimize them*. Vnitr Lek, 2011; 57:1053-56.

12. Bostanci EB, Ercan M, Ozer I, et al.: *Tof elective laparoscopic cholecystectomy after endoscopic retrograde cholangiopancreaticography with sphincterotomy: A prospective observational study of 308 patients*. Langenbecks Arch Surg, 2010; 395:661-66.

13. Allen NL, Leeth RR: O*utcomes of cholecystectomy after endoscopic sphincterotomy for choledocholithiasis.* J Gastrointest Surg, 2006; 10:29-96.

14. Donkervoort SC, van Ruler O, Dijksman LM, van Geloven AA, Pierek EG: *Identification of risk factors for an unfavorable laparoscopic cholecystectomy course after endoscopic retrograde cholangiography in the treatment of choledocholithiasis.* Surg Endosc, 2010; 24:798-804.

15. Thompson MH, Tranter SE: *All-comers policy for laparoscopic exploration of common bile duct.* Br J Surg, 2002; 89:1608-12.

16. de Vries A, Donkervoort SC, van Geloven AA, et al.: *Conversion rate of laparoscopic cholecystectomy after endoscopic retrograde cholangiography in the treatment of choledocholithiasis: does the time interval matter?* Surg Endosc, 2005; 19:996-1001.

17. Tate JJ, LauWY, Li AKC: *Laparoscopic cholecystectomy for biliary pancreatitis*. Br J Sur, 1994; 81:720-22.

18. Ammori BJ, Larvin M, McMahon MJ: *Elective laparoscopic cholecystectomy: Preoperative prediction of duration of surgery.* Surg Endosc, 2001; 15:297-300.

19. Kilciler G, Musabak U, Bagci Sm et al.: *Do the changes in the serum levels of IL-2, IL-4, TNF alpha, and IL-6 reflect the inflammatory activity in the patients with post-ERCP pancreatitis?* Clin Dev Immunol, 2008; 481560.

20. Salman B, Yilmaz U, Kerem M, et al.: *The timing of laparoscopic cholecystectomy after endoscopic retrograde cholangiopancreatography in cholelithiasis coexisting with choledocholithiasis*. J Hepato Biliary Pancreat Surg, 2009; 16:832-36.

21. Boerma D, Rauws EA, Keulemans YC, et al.: *Wait-and-see policy or laparoscopic cholecystectomy after endoscopic sphincterotomy for bile-duct stones: A randomised trial.* Lancet, 2002; 360:761-65.

22. Prat F, Malak NA, Pelletier G, et al.: *Biliary symptoms and complications more than 8 years after endoscopic sphincterotomy for choledocholithiasis.* Gastroenterology, 1996; 110:894-99.

23. Sugiyama M, Atomi Y: *Does endoscopic sphincterotomy causes prolonged pancreatobiliary reflux* D? Am J Gastroenterol, 1999; 94:795-98.

24. Schiphorst AHW, Besselink MGH, Boerma D, et al.: *Timing of cholecystectomy after endoscopic sphincterotomy for common bile duct stones*. Surg Endosc, 2008; 22:204-50.

25. van Baal MC, Besselink MG, Bakker OJ, et al.: *Timing of cholecystectomy after mild biliary pancreatitis: A systematic review*. Ann Surg, 2012; 255:860-66.

26. Reinders JS, Goud A, Timmer R, et al.: *Early laparoscopic cholecystectomy improves outcomes after endoscopic sphincterotomy for choledochocystolithiasis*. Gastroenterology, 2010; 138:2315-320.

27. National Institutes of Health: *Consensus development conference statement on gallstones and laparoscopic cholecystectomy.* Am J Surg, 1993; 165:390-98.

28. Nair MS, Uzzaman MM, Fafemi O, Athow A: *Elective laparoscopic cholecystectomy in the presence of common bile duct stent.* Surg Endosc, 2011; 25:424-36.