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Biliary

Acute cholecystitis: Delayed cholecystectomy has lesser perioperative morbidity compared to emergency cholecystectomy

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A R T I C L E I N F O

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A B S T R A C T

Background: In comparison to delayed laparoscopic cholecystectomy, emergency laparoscopic cholecystectomy has a shorter length of stay and eliminates the risk of recurrent episodes of acute cholecystitis. Nevertheless, there is concern that emergency laparoscopic cholecystectomy is associated with higher morbidity in acute cholecystitis patients. The present large cohort study compares operation-related adverse outcomes between emergency and delayed laparoscopic cholecystectomy and determines the risk of readmission before delayed laparoscopic cholecystectomy to guide surgical decision-making.

Methods: Patients diagnosed with acute cholecystitis who underwent emergency or delayed laparoscopic cholecystectomy between 2015 and 2019 were included. Perioperative outcomes were compared using univariate and multivariate analysis, adjusting for preoperative variables. The rate of readmission before delayed laparoscopic cholecystectomy was determined.

Results: In total, 811 patients were included (median age, 58 years; male:female, 1:1.5): 227 emergency laparoscopic cholecystectomies (28.0%), 555 delayed laparoscopic cholecystectomies (68.4%), and 29 emergency laparoscopic cholecystectomies whilst awaiting delayed laparoscopic cholecystectomy (3.6%). Emergency laparoscopic cholecystectomy was associated with increased incidences of subtotal cholecystectomy (OR 1.94; $P = .011$), bile leak (OR 2.38; $P = .013$), intraoperative drains (OR 2.54; $P < .001$), prolonged postoperative length of stay (OR 7.26; $P < .001$), postoperative imaging (OR 1.83, $P = .006$), and postoperative readmission (OR 1.90; $P = .005$). There was a 13.5% risk of readmission over 2 months while waiting delayed laparoscopic cholecystectomy and a 22.5% risk over the median waiting time (5 months, 9 days).

Conclusion: Emergency laparoscopic cholecystectomy is positively associated with a multitude of operation-related adverse outcomes in acute cholecystitis, compared to delayed laparoscopic cholecystectomy. The benefit of delayed laparoscopic cholecystectomy should be balanced against the significant readmission risk before delayed laparoscopic cholecystectomy. Emergency laparoscopic cholecystectomy may be the most pragmatic strategy for centers dealing with high volumes of biliary admissions and long elective-surgery waiting times. When opting for delayed laparoscopic cholecystectomy, confirming the date of surgery before discharge may ensure timely intervention and avoid the morbidity and expense of readmission.

Introduction

Patients admitted with acute cholecystitis (AC) can be managed by emergency laparoscopic cholecystectomy (ELC) or initial conservative management followed by delayed laparoscopic cholecystectomy (DLC). ELC is generally the preferred approach, at least for mild acute cholecystitis, due to a shorter length of stay, a similar conversion rate, and the elimination of recurrent biliary symptoms.[1–3] However, studies supporting ELC are typically small randomized controlled trials not powered according to rates of overall morbidity; therefore, the relative rates of many perioperative outcomes between ELC and DLC are overlooked.[4–7] Large population-level studies report significantly higher morbidity after ELC; however, these are not specific to AC.[8–10] The traditional surgical literature also has a strong emphasis on conversion-to-open as an endpoint, an increasingly

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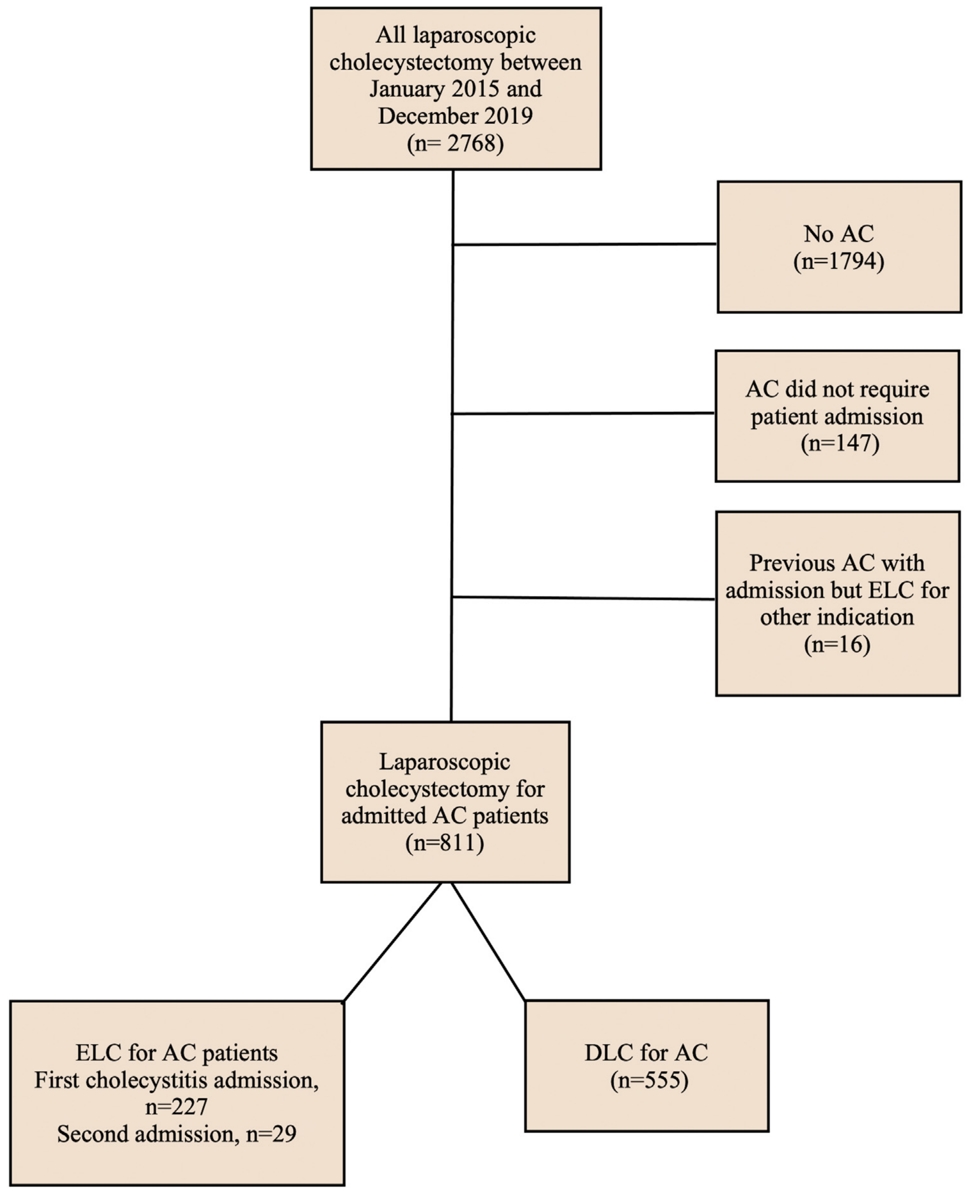

Figure 1. Study design.

uncommon event, particularly as the laparoscopic subtotal approach gains increasing popularity.[11] A large contemporary cohort study of AC patients is indicated to compare perioperative morbidity between the 2 approaches.

Proponents of ELC argue that readmission before DLC with further episodes of AC increases the difficulty of cholecystectomy due to repeated episodes of inflammation.[11] Currently, the risk of readmission before DLC is unreported in AC patients. Quantifying this risk would help surgeons and institutions decide whether to aggressively pursue ELC versus DLC, especially in conjunction with acknowledgment of the relative risks of outcomes between the 2 groups.

To better inform the surgical decision-making and consent process, the present study uses a large cohort to compare outcomes of ELC versus DLC in patients admitted with AC. The risk of readmission before DLC and risk factors for readmission are also determined.

Methods

Population cohort

All patients who were admitted with AC and then underwent either ELC or DLC between January 2015 and December 2019 in a UK health board were included in the study. The health board covers a defined geographical region with a stable population of approximately 493,000 people. Operations were performed in 1 tertiary center and 2 day-surgical units by a total of 25 general surgical consultants. Patients who had AC diagnosed in the outpatient setting not requiring admission and those who had an admission for AC but subsequently underwent an ELC for a different indication (eg, choledocholithiasis) were excluded (Figure 1). The definition for AC used in the present study was that described by the Tokyo 2018 Guidelines (TG18).[12]

Data collection

Data were collected retrospectively from multiple databases using a deterministic records-linkage methodology. Patients were tracked between databases using a unique 10-digit patient identifier. Data were collected for all biliary-related admissions until operation. Patients were then followed up for 100 days after the operation for all readmissions and outpatient reviews. These data yielded preoperative data, operative data, significant complications (Clavien-Dindo classification ≥2), postoperative imaging, postoperative intervention, postoperative length of stay (PLOS), related readmission data, total length of stay (TLOS), and mortality.

Analysis

Patients were divided into ELC and DLC groups. ELC patients were further divided into those undergoing ELC on first cholecystitis admission and those undergoing ELC on second cholecystitis admission. Perioperative and postoperative outcomes were compared between ELC and DLC groups using univariate and multivariate logistic analysis. Multivariate logistic regressions were conducted for the following outcomes measures: subtotal cholecystectomy; conversion to open; intraoperative complication; drain insertion; prolonged PLOS (≥3 days); postoperative complication/imaging/intervention; and readmission. PLOS of ≥3 days has been demonstrated to have a significant association with perioperative mortality and therefore was classed as the cut-off for the "prolonged PLOS" outcome measure.[13] Multivariate linear regression was used to identify variables associated with TLOS.

The multivariate regressions were conducted to adjust for other patient-specific factors between the 2 groups. Variables included in the regressions included ELC, age (<40; 40–59; ≥60 years), most recent admission white blood cell count (WBC) (<6.8; 6.8–9.7; 9.8–12.7; ≥12.8 × 10^9/L), most recent admission C-reaction protein (CRP) (<6; 6–21; 22–91; ≥91 mg/L), gender, American Society of Anaesthesiologists (ASA) score (1; 2; ≥3), number of biliary related admissions (1; 2; ≥3), preoperative radiological findings (thickened wall ≥4 mm, pericholecystic fluid), associated gallstone pancreatitis, associated choledocholithiasis, preoperative ERCP, and preoperative cholecystostomy. The cut-offs for WBC and CRP were derived from cohort quartiles (Q1, Q2, Q3) of the data and were used as an indicator of the degree of cholecystitis on admission. For each outcome measure (eg, subtotal, readmission), the most parsimonious model for each adverse outcome was determined by eliminating insignificant variables (P > .05) using a top-down approach.

A cholecystectomy grade score such as that outlined in TG18 was not used because it is has been shown to be poor predictor of operative-related adverse outcomes and does not account for particular preoperative variables (eg, age, comorbidities, number of previous admissions, CRP) that have demonstrated good diagnostic ability for operation-related adverse outcomes.[11,14–21]

ELC patients were divided into subgroups based on time from admission until surgery (<48 hours; 48–96 hours; >96 hours), and a subgroup analysis was performed. Outcome measures were compared between subgroups using χ^2, Fisher exact, and Mann-Whitney U tests.

In patients who did not undergo ELC on first admission, the risk of readmission was determined. This was calculating by calculating the time from discharge after conservative management until readmission and was displayed using a Kaplan-Meier graph. Cox proportional hazards model was used to identify factors associated with readmission. All statistical tests were performed using the STATA/IC 16.1 software package.

Results

Overall, 811 patients were included in the analysis (median age, 58 years; M:F, 1:1.5; median ASA, 2) (Table I); 227 patients underwent first cholecystitis admission ELC, 29 patients underwent ELC on subsequent admission whilst awaiting DLC, and the remaining 555 patients underwent DLC. ELC patients were younger than DLC patients (P = .004) and more likely to be female (P < .001). ELC patients were less likely to have undergone a preoperative CT abdomen/pelvis (20.3% vs 33.5; P = .008) and magnetic resonance cholangiopancreatography (35.1% vs 58.0%; P < .001). ELC patients were less likely to have choledocholithiasis during index admission and had lower admission CRP, creatinine, bilirubin, and alkaline phosphatase levels (P < .001). DLC patients were more likely to have a preoperative ERCP (21.8% vs 10.9%) and cholecystostomy (6.4% vs 1.6%) when compared to ELC patients.

In the univariate analysis, ELC was positively associated with longer operative time (median operation time 93 minutes vs 86 minutes; P < .001), subtotal cholecystectomy (RR 1.41; P = .02), postoperative complication (RR 1.60; P < .001), postoperative imaging (RR 1.62; P < .001), postoperative ERCP (RR 2.46; P = .003), prolonged PLOS (RR 2.73; P < .001), and readmission (RR 1.66; P < .002) (Table II). Overall, ELC was associated with shorter TLOS (median 5 days vs 7; P < .001) (Table II).

In the multivariate analysis, ELC was positively associated with subtotal cholecystectomy (RR 1.94; P = .011), intraoperative drains insertion (OR 2.54; P < .001), prolonged PLOS (OR 7.26; P < .001), bile leak (OR 2.38; P = .013), postoperative imaging (OR 1.83, P = .006), and readmission (OR 1.90; P = .005) (Table III). There was no association between ELC and the rate of conversion to open, postoperative intervention, or death (P > .05). These findings were consistent when repeating the analysis with those with 1 admission of cholecystitis.

Multivariate linear regression was used to compare the TLOS across all admissions. After accounting for other variables, ELC patients had a shorter TLOS by 1.2 days on average (Table IV). This is from a baseline TLOS of 4.2 days. Other variables associated with longer TLOS included WBC ≥12.8 × 10^9/L (+1.6 days), CRP ≥92 mg/L (+1.2 days), choledocholithiasis (+4.3 days), gallstone pancreatitis (+3.6 days), ASA 2 (+1.8 days), ASA ≥3 days (+3.4 days), and preoperative cholecystostomy (+12.7 days).

In the subgroup analysis of the ELC group, rates of subtotal cholecystectomy were higher in the 48- to 96-hour group and >96-hour group compared to the 0- to 48-hour group (P = .004). Other than this finding, there were no other significant differences in adverse outcomes between groups, including operative time, intraoperative complication, intraoperative drains, conversion to open, rates of prolonged PLOS, postoperative complication/imaging/intervention, and readmission (P > .05).

Readmission before DLC

The overall risk of readmission before DLC in our cohort was 22.3% (130/584). In total, 61.5% (80/130) were readmitted with another episode of cholecystitis, 29 (36.3%) of which proceeded to ELC on second AC admission, and the remaining 51 (63.7%) proceeded to DLC.

The Kaplan-Meier graph demonstrated a 13.5% risk of readmission before DLC over 2 months after discharge (Figure 2). The median waiting time for DLC was 5 months and 9 days, at which point the readmission risk is estimated as 22.5%. In the present study, only 11.3% and 17.4% of patients had a DLC before 6 and 8 weeks, respectively.

Cox proportional hazard model was used to identify factors associated with early readmission before DLC. Variables included in the model included age<40, age 40 to 60, age >60, male sex, 2 previous biliary admissions, ≥3 biliary related admissions,

Table I
Patient background data, all patients, ELC and DLC groups

Variable	Patient group				P value (ELC versus DLC)
	All patients, N = 811 (%)	ELC on first cholecystitis admission, N = 227 (%)	ELC on second cholecystitis admission, N = 29 (%)	DLC, N = 555 (%)	
Age, years (%)					.004
<40	138 (17.0)	45 (19.8)	3 (10.3)	90 (16.2)	
40–59	296 (36.5)	102 (44.9)	11 (37.9)	183 (33.0)	
≥60	377 (46.5)	80 (35.2)	15 (51.7)	282 (50.8)	
Male:Female	1:1.5	1:2.1	1:2.1	1:1.3	<.001
American Society of Anesthesiologists score (%)					.72
1	226 (27.9)	69 (30.4)	5 (17.2)	152 (27.4)	
2	476 (58.7)	135 (59.5)	16 (55.2)	325 (58.6)	
≥3	109 (13.4)	23 (10.1)	8 (27.6)	78 (14.1)	
Number of biliary admissions (%)					.77
1	629 (77.6)	205 (90.3)	0 (0.0)	424 (76.4)	
2	137 (16.9)	19 (8.4)	22 (75.9)	96 (17.3)	
≥3	43 (5.3)	3 (1.3)	7 (24.1)	33 (5.9)	
Preoperative imaging					
Ultrasound abdomen	744 (91.7)	207 (91.1)	27 (93.1)	514 (92.6)	.29
CT abdomen/pelvis	238 (29.3)	40 (17.6)	12 (41.4)	186 (33.5)	.008
MRCP	412 (50.8)	72 (31.7)	18 (62.1)	322 (58.0)	<.001
Preoperative imaging findings					
Thickened gallbladder wall	701 (86.4)	200 (88.1)	26 (89.7)	475 (85.6)	.30
Pericholecystic fluid	352 (43.4)	99 (43.6)	12 (41.4)	241 (43.4)	.99
Preoperative procedure					
ERCP	149 (18.4)	18 (7.9)	10 (34.5)	121 (21.8)	<.001
Cholecystostomy	39 (4.8)	0 (0.0)	4 (13.8)	36 (6.5)	.003
Additional biliary disease					
Choledocholithiasis	154 (19.0)	21 (9.3)	8 (27.6)	125 (22.5)	<.001
Gallstone pancreatitis	107 (13.2)	25 (11.0)	1 (3.4)	81 (14.6)	.40
Mirizzi syndrome	6 (0.7)	2 (0.9)	0 (0.0)	4 (0.7)	.93
Index admission blood Biochemistry and hematology (median)					
WBC, $\times 10^9$/L	12.1	12.1	11.8	12.1	.64
NE, $\times 10^9$/L	9.8	9.9	9.8	9.9	.57
C-reactive protein, mg/L	21	18	30	26.5	<.001
Alkaline phosphatase, U/L	104	97.5	104	112	<.001
Bilirubin, umol/L	16	12	10	17	<.001
Creatinine, umol/L	66	63	66.5	68	<.001
Amylase, U/L	44	44	36	44	.43
Intraoperative Cholangiogram	25 (3.1)	5 (2.2)	3 (10.3)	17 (3.1)	.35

CT, computed tomography; *DLC*, delayed laparoscopic cholecystectomy; *ELC*, emergency laparoscopic cholecystectomy; *ERCP*, endoscopic retrograde cholangiopancreatography; *MRCP*, magnetic resonance cholangiopancreatography; *NE*, neutrophil count; *WBC*, white blood cell count.

choledocholithiasis, and gallstone pancreatitis. This model did not identify any factors significantly associated with earlier readmission ($P > .05$).

Discussion

In conclusion, these data suggest that DLC for AC results in lower rates of operation-related adverse outcomes (need for subtotal, intraoperative drain placement, postoperative complication/imaging/intervention, and readmission [$P < .05$]). The findings were corroborated in the multivariate analysis, after adjusting for key preoperative variables (eg, degree of inflammation, number of admissions, and comorbidities) that have demonstrated predictability for a difficult perioperative course after cholecystectomy. Adjusting for these variables offsets a significant degree of bias and indicates that the risk of ELC in AC patients is considerable relative to DLC. This should be used to inform surgical decision-making and the consent process.

Interestingly, it was noted that the patients in the ELC group were younger and had lower inflammatory markers on admission ($P < .05$). Despite these advantages, the ELC group had worse outcomes. This further supports the benefit of performing a delayed laparoscopic cholecystectomy after a "cooling off" period.[22,23]

The readmission risk before DLC is significant (13.5% over 2 months; 22.5% over the median waiting time [5 months, 9 days]) and must be minimized. Recurrent admissions ultimately result in increased morbidity that may actually outweigh the benefit of DLC.[11] Prompt DLC 6 to 8 weeks after discharge would ensure timely intervention and may avoid the morbidity, inconvenience, and expense of readmission. This should be emphasized and may be achieved by confirming the date of surgery before discharge.

The total length of stay is an important consideration with significant financial implications. Although ELC is associated with a shorter total length of stay compared to DLC (mean difference, -1.2 days), the cost related to the additional morbidity of ELC must be recognized. These patients require more imaging, intervention, and emergency readmissions, all of which have resource implications. A cost analysis that incorporates these aspects is necessary before a valid financial comparison can be made between ELC and DLC.

Previous studies that have compared ELC and DLC are often limited to the comparison of bile duct injury, conversion rates, and total length of stay. It could be argued that bile duct injury is relatively rare in contemporary practice and therefore may have somewhat limited utility as an endpoint in all but the largest studies. Likewise, rates of conversion to open surgery are decreasing, suggesting this factor may not be quite

Table II
Univariate analysis: comparison of outcomes between DLC and ELC

Variable	Patient group				Relative risk (ELC versus DLC)	P value, ELC versus DLC
	All patients, N = 811 (%)	ELC on first cholecystitis admission, N = 227 (%)	ELC on second cholecystitis admission, N = 29 (%)	DLC, N = 555 (%)		
Intraoperative complication	17 (2.1)	10 (4.4)	0 (0.0)	17 (3.1)	1.28	.54
Bile leak	14 (1.7)	4 (1.8)	0 (0.0)	10 (1.8)	0.89	.83
Hemorrhage	8 (1.0)	4 (1.8)	0 (0.0)	4 (0.7)	2.17	.75
Bile duct injury	1 (0.1)	0 (0)	0 (0.0)	1 (0.2)	-	1
Median operation time (minutes)	88	93	120	86	-	<.001
Subtotal cholecystectomy	76 (9.4)	23 (10.1)	7 (24.1)	46 (8.3)	1.41	.02
Conversion to open	20 (2.5)	3 (1.3)	2 (6.9)	15 (2.7)	0.72	.61
Intraoperative drains	146 (18.0)	48 (21.1)	14 (48.3)	84 (15.1)	1.60	<.001
Postoperative complication	90 (11.1)	28 (12.3)	6 (20.7)	46 (8.3)	1.60	<.001
Bile leak	22 (2.7)	10 (4.4)	3 (10.3)	9 (1.6)	3.13	.002
Collection	35 (4.3)	11 (4.8)	3 (10.3)	21 (3.8)	1.45	.12
Retained stone	23 (2.8)	9 (4.0)	2 (6.9)	12 (2.2)	1.99	.04
Pneumonia	13 (1.6)	5 (2.2)	0 (0.0)	8 (1.4)	1.35	.39
Prolonged PLOS (≥3 days)	199 (24.5)	89 (39.2)	22 (75.9)	88 (15.9)	2.73	<.001
Postoperative imaging and intervention						
Imaging	103 (12.7)	35 (15.4)	9 (31.0)	59 (10.6)	1.62	<.001
ERCP	32 (3.9)	14 (6.2)	3 (10.3)	15 (2.7)	2.46	.003
Return to theatre	15 (1.8)	1 (0.4)	1 (3.4)	13 (2.3)	0.33	.21
CT-Guided drainage	4 (0.5)	1 (0.4)	0 (0.0)	3 (0.5)	0.72	.91
Mortality	2 (0.2)	1 (0.4)	0 (0.0)	1 (0.2)	2.17	.57
Readmission	83 (10.2)	30 (13.2)	6 (20.7)	47 (8.5)	1.66	.002
Median TLOS, days (all admissions)	6	5	12	7		<.001

CT, computed tomography; *DLC*, delayed laparoscopic cholecystectomy; *ELC*, emergency laparoscopic cholecystectomy; *ERCP*, endoscopic retrograde cholangiopancreatography; *PLOS*, post-operative length of stay; *TLOS*, total length of stay.

Table III
Multivariate logistic regression: Variables associated with adverse outcome measures, most parsimonious models

Outcome measure	Independent variable	Odds ratio	Standard error	Z	P value	95% CI
Subtotal cholecystectomy	ELC	1.94	0.47	2.3	.011	1.16–3.25
	2 Previous admissions	2.46	0.72	3.06	.002	1.38–4.37
	≥3 Previous admissions	4.69	1.87	3.87	<.001	2.14–10.24
	CRP 21-90	2.66	1.13	2.31	.021	1.16–6.12
	CRP ≥91	4.58	1.86	3.74	<.001	2.06–10.15
	Male sex	1.99	0.51	2.69	.007	1.21–3.82
Drain insertion	ELC	2.54	0.53	4.51	<.001	1.70–3.81
	2 Previous admissions	2.41	0.56	3.74	<.001	1.52–3.81
	≥3 Previous admissions	4.58	1.64	4.25	<.001	2.27–9.25
	CRP 21–90	1.78	0.43	2.37	.018	1.11–2.86
	CRP ≥91	2.56	0.59	4.05	<.001	1.62–4.03
	Male sex	2.04	0.40	3.61	<.001	1.38–3.00
	Preop cholecystostomy	3.21	1.19	3.14	.002	1.55–6.65
Bile leak	ELC	2.38	0.84	2.47	.013	1.20–4.74
	≥3 Previous admissions	3.27	1.71	2.27	.023	1.17–9.13
	Male sex	2.55	0.91	2.63	.009	1.27–5.12
Postoperative imaging	ELC	1.83	0.40	2.77	.006	1.19–2.81
	2 Previous biliary admissions	2.05	0.51	2.89	.004	1.26–3.34
	≥3 Previous biliary admissions	2.43	0.97	2.22	.027	1.11–5.33
Prolonged postoperative stay (≥3 days)	ELC	7.26	1.51	9.53	<.001	4.83–10.92
	Age ≥60	1.50	0.30	2.02	.044	1.01–2.24
	2 Previous biliary admissions	2.49	0.59	3.84	<.001	1.56–3.97
	≥3 Previous biliary admissions	3.33	1.30	3.09	.002	1.55–7.15
	CRP 21–90	1.81	0.42	2.59	.01	1.16–2.84
	CRP ≥91	1.75	0.41	2.37	.0188	1.10–2.76
	ASA 2	1.86	0.45	2.57	.01	1.12–2.98
	ASA ≥3	2.50	0.82	2.8	.005	1.32–4.76
	Preop ERCP	1.73	0.42	2.23	.026	1.07–2.80
	Preop Cholecystostomy	2.50	0.94	2.43	.015	1.19–5.23
	Male sex	1.59	0.31	2.42	.015	1.09–2.33
Readmission	ELC	1.90	0.44	2.8	.005	1.21–2.98
	2 Admissions	1.96	0.53	2.49	.013	1.15–3.34
	≥3 Admissions	2.73	1.09	2.53	.012	1.25–5.95

CRP, c-reactive protein; *ELC*, emergency laparoscopic cholecystectomy; *ERCP*, endoscopic retrograde cholangiopancreatography.

so relevant as it once was. The present study and other contemporary publications demonstrate that rates of other operation-related adverse outcomes are surprisingly common after laparoscopic cholecystectomy.[2-7,24,25] These include, but are not limited to, rates of lesser severe postoperative complications, the utilization of drains, and postoperative readmissions. Future studies addressing the issue of emergency or delayed cholecystectomy should report the multitude of problems that can occur

Table IV
Multivariate linear regression: variables associated with total length of stay

Independent variable	Coefficient (days)	Standard error	T	P value	95% CI
Constant	4.2	0.52	8.03	<.001	3.17–5.22
ELC	−1.2	0.49	−2.45	.015	−2.15 to −0.24
Choledocholithiasis	4.3	0.59	7.37	<.001	3.18–5.49
Gallstone pancreatitis	3.6	0.67	5.37	<.001	2.29–4.93
WBC ≥12.7	1.6	0.47	3.37	<.001	0.66–2.5
CRP ≥91	1.2	0.53	2.30	.022	0.18–2.26
ASA 2	1.8	0.52	3.57	<.001	0.83–2.86
ASA ≥3	3.4	0.75	4.48	<.001	1.89–4.83
Preoperative cholecystostomy	12.7	1.04	12.2	<.001	10.69–14.78

CRP, c-reactive protein; *ELC*, emergency laparoscopic cholecystectomy; *WBC*, white blood cell count.

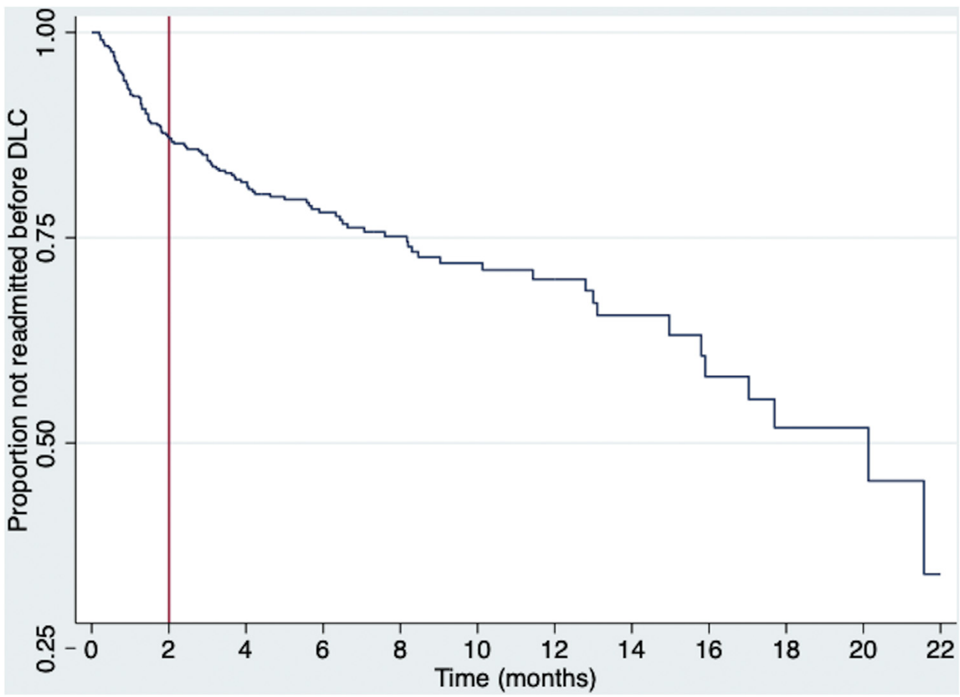

Figure 2. Risk of being readmitted before DLC after first emergency admission (red vertical line represents 2 months after discharge).

after cholecystectomy (Table II) to provide a detailed comparative analysis.

Although the TG18 guidelines are generally seen as being supportive of ELC for AC, it must be recognized that most of the nonrandomized studies included in the guidelines suffer from low sample sizes and do not conduct multivariate analysis to adjust for preoperative variables, thus subjecting them to significant bias.[3,11] The randomized studies reported in TG18 also depend on small sample sizes, short follow-up times and are largely outdated.[4–7] It must be acknowledged that some of the randomized studies listed in the TG18 guidelines such as Ozkardeş et al and Kolla et al actually found higher rates of operation-related adverse outcomes in the ELC group, a finding replicated in this study.[4,5] Similar outcomes have been reported by Blythe et al, Vaccari et al, and Donder et al, who found a significantly higher rate of complication after ELC compared to DLC.[26–28]

Large cohort studies comparing ELC and DLC have been conducted by Giger et al, the CholeS group, and the Swedish Registry and have all found significantly higher rates of perioperative adverse outcomes in the emergency group.[8–10] Although the above studies were not conducted solely on patients with AC, they strongly imply the increased risk of performing a laparoscopic cholecystectomy at the time of acute inflammation and are consistent with the present article.

In conclusion, the benefit of reduced morbidity by opting for DLC should be balanced against the significant risk of readmission before DLC. In this regard, the most pragmatic strategy is dependent on regional waiting list times for elective surgery; centers dealing with high volumes of biliary admissions and long waiting times may benefit from routine ELC despite the increased morbidity. Where DLC is chosen, every effort should be made to ensure timely intervention to avoid the morbidity, inconvenience, and expense of readmission.

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Conflict of interest/Disclosure

There are no conflicts of interest to declare by any of the authors.

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