Outcomes of same admission cholecystectomy and endoscopic retrograde cholangiopancreatography for common bile duct stones: A post hoc analysis of an Eastern Association for the Surgery of Trauma multicenter study

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BACKGROUND: The optimal timing for cholecystectomy after endoscopic retrograde cholangiopancreatography (ERCP) for common bile duct (CBD) stones is unknown. We hypothesized that a delay between procedures would correlate with more biliary complications and longer hospitalizations.

METHODS: We prospectively identified patients who underwent same admission cholecystectomy after ERCP for CBD stones from 2016 to 2019 at 12 US medical centers. The cohort was stratified by time between ERCP and cholecystectomy: ≤24 hours (immediate), >24 to ≤72 hours (early), and >72 hours (late). Primary outcomes included operative duration, postoperative length of stay, (LOS), and hospital LOS. Secondary outcomes included rates of open conversion, CBD explorations, biliary complications, and in-hospital complications.

RESULTS: For the 349 patients comprising the study cohort, 33.8% (n = 118) were categorized as immediate, 50.4% (n = 176) as early, and 15.8% (n = 55) as late. Rates of CBD explorations were lower in the immediate group compared with the late group (0.9% vs. 9.1%, $p = 0.01$). Rates of open conversion were lower in the immediate group compared with the early group (0.9% vs. 10.8%, $p < 0.01$) and in the immediate group compared with the late group (0.9% vs. 10.9%, $p < 0.001$). On a mixed-model regression analysis, an immediate cholecystectomy was associated with a significant reduction in postoperative LOS ($\beta = 0.79$; 95% confidence interval, 0.65–0.96; $p = 0.02$) and hospital LOS ($\beta = 0.68$; 95% confidence interval, 0.62–0.75; $p < 0.0001$).

CONCLUSION: An immediate cholecystectomy following ERCP correlates with a shorter postoperative LOS and hospital LOS. Rates of CBD explorations and conversion to open appear more common after 24 hours. (*J Trauma Acute Care Surg.* 2021;90: 673–679. Copyright © 2021 Wolters Kluwer Health, Inc. All rights reserved.)

LEVEL OF EVIDENCE: Therapeutic, level III.

KEY WORDS: Common bile duct stones; ERCP; cholecystectomy; biliary complications; length of stay.

Common bile duct (CBD) stones occur in 10% to 20% of patients with symptomatic cholelithiasis and can lead to biliary complications in up to 55% of affected patients.[1–4] Endoscopic stone extraction is a highly successful treatment, yet adverse biliary sequelae still occur in up to 25% of patients if a cholecystectomy is not also performed.[2,5] Therefore, recommended treatment strategies for CBD stones include preoperative endoscopic retrograde cholangiopancreatography (ERCP) followed by cholecystectomy or a cholecystectomy with either intraoperative ERCP, intraoperative cholangiogram (IOC), postoperative ERCP, or surgical CBD exploration.[1,6] Given surgeon experience and equipment availability, preoperative ERCP followed by laparoscopic cholecystectomy is most commonly used.[1,7]

Studies have shown that operating soon after an ERCP can be difficult because of the inflammatory response triggered by biliary instrumentation.[1,2] Delaying a cholecystectomy, even as long as 6 weeks, is believed to provide sufficient time for ductal structures to become less inflamed.[2,8,9] Other investigations, however, have demonstrated a reduction in biliary symptom recurrence when a cholecystectomy is performed during the same admission as the ERCP.[2,10–12] A randomized controlled trial revealed that laparoscopic cholecystectomy within 72 hours of ERCP not only is safe but also can prevent most biliary complications.[13]

Data from the National Inpatient Sample show that the proportion of cholecystectomies performed during the same hospitalization as an ERCP has significantly increased since 1999 and nearly two thirds of ERCPs are now performed within 24 hours of cholecystectomy.[14] While a shorter duration between the two procedures appears to be more commonly used, the optimal time interval remains unclear.[1,2,8,15] Furthermore, as more retrospective case series emerge detailing single-center experiences with timing of cholecystectomy and ERCP,[3] the need for more nationally representative data is essential. Therefore, using prospectively collected data from 12 US academic medical centers, we evaluated patients with CBD stones who underwent same admission ERCP followed by cholecystectomy. We hypothesized that patients experiencing a delay between procedures would have more biliary complications and a longer hospital length of stay (LOS).

PATIENTS AND METHODS

A prospective, observational, multicenter study was conducted on patients undergoing cholecystectomy for presumed gallstone pancreatitis (GSP) and/or choledocholithiasis (CDL) between 2016 and 2019. The Eastern Association for the Surgery of Trauma Multicenter Trials Committee approved the study. Each of the 12

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participating academic medical centers obtained their own institutional review board approval. No interventions were performed for the purpose of the study, and patients underwent workup as deemed necessary by the surgical team at each institution.

Definitions

A presumptive diagnosis of CDL was made by an elevated serum bilirubin (total bilirubin, >1.0 mg/dL; direct bilirubin, >0.4 mg/dL) with or without abdominal ultrasound (U/S) demonstrating a dilated CBD (diameter, >8 mm) or radiographic evidence of a stone in the CBD. Gallstone pancreatitis was defined by an elevated serum amylase or lipase greater than three times the upper limit of normal (normal range: amylase, <100 U/L; lipase, <60 U/L) with or without abdominal computed tomography demonstrating radiographic evidence of acute pancreatitis. We collected data on patient demographics, body mass index, Charlson comorbidity index (CCI), health insurance type, admission vital signs and laboratory values (white blood cell count, hemoglobin, total bilirubin, direct bilirubin, alkaline phosphatase, aminotransferases, amylase, lipase), and radiographic CBD diameter.

Patients

We included all patients older than 18 years who underwent a preoperative ERCP followed by cholecystectomy during the same hospitalization. We excluded patients with a history of a prior ERCP, prior biliary instrumentation, or patients presenting with cholangitis. Patients who underwent cholecystectomy more than 1 week (>168 hours) after ERCP were also excluded because prior studies demonstrate that the upper 75th percentile for hospital LOS for patients undergoing same admission ERCP and cholecystectomy is approximately 7 days.[1,2] The cohort was stratified into three groups based on the time interval between ERCP and cholecystectomy: immediate (≤24 hours), early (>24 to ≤72 hours), and late (>72 to ≤168 hours).

Outcomes

Primary outcomes included operative duration, postoperative LOS, and hospital LOS. Secondary outcomes included rates of IOC, conversion to open cholecystectomy, surgical CBD exploration, secondary interventions (postoperative ERCP, return to operating room), biliary complications (bile leak, ERCP-related,

TABLE 1. Cohort Details (N = 349)

Variable	Immediate (n = 118)	Early (n = 176)	Late (n = 55)	*p*
Age, y	47.7 (29.2–66.8)	53.5 (36.7–71.4)	60.6 (41.8–72.8)	0.03
Sex, female	84 (71.2)	117 (66.5)	32 (58.2)	0.2
BMI, kg/m^2	30.7 (25.6–34.2)	30.5 (26.3–35.6)	30.9 (25.1–34.4)	0.9
CCI	0 (0–2)	1 (0–4)	2 (0–4)	0.05
Insurance type				
Employer based	24 (20.3)	38 (21.6)	6 (10.9)	0.3
Medicaid	17 (14.4)	29 (16.5)	10 (18.2)	
Medicare	35 (29.7)	53 (30.1)	19 (34.5)	
Other	20 (16.9)	16 (9.1)	7 (12.7)	
Qualified health plan	7 (5.9)	12 (6.8)	1 (1.8)	
Uninsured	11 (9.3)	17 (9.7)	5 (9.1)	
Unknown	4 (3.4)	11 (6.3)	7 (12.7)	
Laboratory values, on admission				
ALP, U/L	176 (124–258.3)	173 (118–255)	174 (147–309)	0.2
ALT, U/L	299 (146.5–498)	278 (111.8–521)	334 (151–492)	0.8
Amylase, U/L	68 (34.5–1437)	49 (21–672)	51 (11–1146)	0.5
AST, U/L	222 (124.5–381.8)	213.5 (117–422.5)	208 (119–478)	0.9
Bilirubin, total, mg/dL	2.5 (1.5–4.4)	2.7 (1.7–4.3)	3.2 (1.7–5)	0.2
Bilirubin, direct, mg/dL	1.9 (1–3.4)	1.6 (0.7–3.2)	2 (1.1–3.5)	0.6
Hemoglobin, g/dL	13.6 (12.4–14.5)	13.7 (12.6–14.7)	13.2 (12.1–15)	0.4
Lipase, U/L	44 (26–188.8)	36.5 (21–141)	47.5 (25.5–2197.8)	0.1
White blood cell, 10^9/L	8.6 (6.7–11.7)	9.5 (6.5–12.1)	10.2 (6.8–13.9)	0.6
Vital signs, on admission				
Heart rate, bpm	78 (69–88.3)	80 (69–91.8)	75 (65–88)	0.3
SBP, mm Hg	133 (120.8–146.3)	133 (118–149)	136 (126–154)	0.4
Temperature, °C	36.7 (36.5–37)	36.7 (36.6–37)	36.7 (36.4–36.9)	0.5
CBD diameter, mm	8 (5.3–10)	8.1 (6–11)	10 (7–11)	0.02
Diagnosis				
CDL	91 (77.1)	135 (76.7)	35 (63.6)	0.1
GSP	27 (22.9)	41 (23.3)	20 (36.4)	
Admission to ERCP, h	30.2 (19.4–55)	34.9 (19.2–58.7)	21.9 (13.4–39.9)	0.003
ERCP to CCY, h	20 (16.7–22)	41.2 (26.8–48.6)	92.2 (76.7–97.1)	<0.0001

ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; BMI, body mass index; CCY, cholecystectomy; SBP, systolic blood pressure.

TABLE 2. Primary Study Outcomes (N = 349)

Primary Outcome	Immediate (n = 118)	Early (n = 176)	Late (n = 55)	p
Operative duration, min	84.5 (56.5–121.5)	93.5 (66.3–131)	100 (76–139)	0.02
Postoperative LOS, d	1.1 (0.8–1.8)	1.4 (0.9–2.8)	1.5 (1.1–2.8)	0.01
Hospital LOS, d	3 (3–5)	5 (4–6.8)	7 (6–8)	<0.0001

retained stone), and nonbiliary complications. Endoscopic retrograde cholangiopancreatography–related complications included post-ERCP pancreatitis or any iatrogenic injury from instrumentation. Nonbiliary complications were aggregated by body systems and included cardiopulmonary (atrial fibrillation, acute respiratory distress syndrome), gastrointestinal (ileus), hematologic (bleeding, venous thromboembolic event), infectious (*Clostridioides difficile* colitis, intra-abdominal abscess, sepsis, urinary tract infection), and renal (acute kidney injury, urinary retention). All complications were defined using the National Cancer Institute Common Terminology Criteria for Adverse Events, Version 5.[16]

Data Collection and Management

Data were entered as case report forms into Research Electronic Data Capture,[17,18] which is a secure web-based software platform that meets Health Insurance Portability and Accountability Act (HIPAA) compliance standards. Research Electronic Data Capture also provides automated export procedures for seamless data downloads to common statistical packages. Data entries were audited and validated on an ongoing basis by the lead researcher. Discrepancies or missing data fields were relayed back to individual centers for clarification. Any data elements that remained blank in the case report form were excluded from analysis.

Statistical Analysis

Continuous variables were compared between the three groups using Kruskal-Wallis tests and presented as medians (interquartile range). Categorical data were compared with χ^2 tests or Fisher's exact tests when appropriate and presented as, n (%). A p value of <0.05 was considered statistically significant.

Of note, because our primary outcomes were continuous variables, we first determined their appropriate distributions before regression analysis. We superimposed a Beta, Cauchy, Exponential, Gamma, Lognormal, Normal, and Weibull fit along the range of actual outcome responses. The corresponding Akaike information criterion for each of the fitted distributions were compared, and the one with the smallest Akaike information criterion was selected as the best fit. A generalized linear mixed model (GLMM) was then used to evaluate the effect of cholecystectomy timing on the fitted distribution of primary outcomes. The fixed effects in the GLMM included covariates (i.e., a preoperative variable with a $p < 0.05$ between groups) and potential confounders (i.e., a preoperative variable with a $p < 0.15$ between groups). GLMM random effects were each medical center. A restricted maximum likelihood (REML) estimator was used to provide random effect variances (σ^2).[19] Data analyses were performed with JMP Pro software, version 15.1 of the SAS System for Windows (SAS Institute Inc., Cary, NC).

TABLE 3. Secondary Study Outcomes (N = 349)

Secondary Outcome	Immediate (n = 118)	Early (n = 176)	Late (n = 55)	p
Cholangiogram, intraoperative	12 (10.2)	18 (10.2)	6 (10.9)	1.0
CBD exploration	1 (0.9)	8 (4.6)	5 (9.1)	0.02
Complications, biliary	3 (2.5)	7 (4.0)	0 (0.0)	0.5
Bile leak	2 (1.7)	1 (0.6)	0 (0)	0.7
ERCP related	1 (0.8)	2 (1.1)	1 (1.8)	0.7
Retained stone	0 (0)	5 (2.8)	0 (0)	0.1
Complications, nonbiliary	8 (6.8)	10 (5.7)	5 (9.1)	0.7
Cardiopulmonary	0 (0.0)	2 (1.1)	1 (1.8)	0.4
Gastrointestinal	1 (0.8)	1 (0.6)	0 (0.0)	0.8
Hematologic	1 (0.8)	2 (1.1)	0 (0.0)	0.7
Infectious	2 (1.7)	1 (0.6)	2 (3.6)	0.2
Renal	7 (5.9)	6 (3.4)	2 (3.6)	0.6
Conversion to open CCY	1 (0.9)	19 (10.8)	6 (10.9)	<0.001
Postoperative ductal clearance intervention	3 (2.5)	5 (2.8)	0 (0)	0.4

CCY, cholecystectomy.

RESULTS

Cohort Description

Of the 989 patients in the database, 35.9% (n = 355) of patients underwent preoperative ERCP. A total of six patients were further excluded because their cholecystectomy occurred >7 days after ERCP. When stratified by time intervals, 33.8% (n = 118) were categorized as immediate, 50.4% (n = 176) as early, and 15.8% (n = 55) as late. The distribution of patients per group for each of the 12 centers is shown in Supplementary Digital Content (Appendix A, http://links.lww.com/TA/B865). There was no difference in body mass index, CCI, admission laboratory values, or index vitals between groups. The proportion of female sex, health insurance type, and presumptive diagnosis (CDL or GSP) were also similar between groups (Table 1). Patients in the immediate group were significantly younger (47.7 years [immediate] vs. 53.5 years [early] vs. 60.6 years [late], $p = 0.03$), and the radiographic CBD diameter significantly increased as time intervals

TABLE 4. Effect of an Immediate Cholecystectomy (Versus Early and Late) on Primary Outcomes

Outcome	Estimate*	95% CI	p
Operative duration, min	0.92	0.83–1.02	0.1
Postoperative LOS, d	0.79	0.65–0.96	0.02
Hospital LOS, d	0.68	0.62–0.75	<.0001

*Adjusted for age, CBD diameter, CCI, underlying diagnosis, and medical center using a GLMM.

TABLE 5. Effect of an Early Cholecystectomy (Versus Late) on Primary Outcomes**

Primary Outcome	Estimate*	95% CI	p
Operative duration, min	1.03	0.90–1.19	0.7
Postoperative LOS, d	0.96	0.75–1.23	0.8
Hospital LOS, d	0.77	0.69–0.86	<0.0001

*Adjusted for age, CBD diameter, CCI, underlying diagnosis, and medical center using a GLMM.
**Patients undergoing immediate cholecystectomy excluded.

increased (8 mm [immediate] vs. 8.1 mm [early] vs. 10 mm [late], $p = 0.01$). There was also a significant difference in time to ERCP from admission among the three groups (30.2 hours [immediate] vs. 34.9 hours [early] vs. 21.9 [late], $p = 0.003$) (Table 1); however, when stratified by diagnosis, this distinction only remained significant for CDL patients (32.3 hours [immediate] vs. 32.7 hours [early] vs. 20.1 hours [late], $p = 0.002$).

Primary and Secondary Outcomes

On one-way analysis, operative duration ($p = 0.03$), postoperative LOS ($p = 0.01$), and hospital LOS ($p < 0.0001$) each increased as time intervals increased (Table 2). Operative duration, postoperative LOS, and hospital LOS also followed a lognormal distribution. Table 3 shows that rates of IOC, secondary interventions, and biliary and nonbiliary complications were similar between groups. The incidence of CBD explorations was different across groups ($p = 0.02$); however, on pairwise comparisons, only the immediate group versus the late group was significant (0.9% vs. 9.1%, $p = 0.01$). Rates of CBD explorations were comparable between the immediate group and early group (0.9% vs. 4.6%, $p = 0.1$) as well as between the early group and late group (4.6% vs. 9.1%, $p = 0.2$). The incidence of conversion to open cholecystectomy was also different across the three groups ($p < 0.001$); however, on pairwise comparisons, only the immediate versus early group (0.9% vs. 10.8%, $p < 0.01$) and immediate versus late group (0.9% vs. 10.9%, $p < 0.001$) were significantly different. The rates of conversion were comparable between the early and late group (10.8% vs. 10.9%, $p = 1.0$).

Generalized Linear Mixed Model

The fixed effects for our GLMM included covariates (age; radiographic CBD diameter) and potential confounders (CCI; underlying diagnosis [CDL vs. GSP]). Although admission lipase values technically met the criteria to be a potential confounder, they were not included in the GLMM because they significantly correlated with a diagnosis of GSP (Spearman $\rho = 0.6$, $p < 0.0001$), which was already included.

An immediate cholecystectomy (compared with an early and late cholecystectomy) was associated with a 21% decrease in postoperative LOS ($\beta = 0.79$; 95% confidence interval [CI], 0.65–0.96; $p = 0.02$) and a 32% decrease in hospital LOS ($\beta = 0.68$; 95% CI, 0.62–0.75; $p < 0.0001$). An immediate cholecystectomy did not correlate with operative duration ($\beta = 0.92$, 95% CI, 0.83–1.02, $p = 0.1$) (Table 4). The REML variance component for medical center effect was insignificant for operative duration ($\sigma^2 = 0.1$; 95% CI, −0.001–0.2; $p = 0.053$), postoperative LOS ($\sigma^2 = 0.03$; 95% CI, −0.02–0.09; $p = 0.2$), or hospital LOS ($\sigma^2 = 0.02$; 95% CI, −0.002–0.04; $p = 0.1$).

An early cholecystectomy (versus late) was not associated with operative duration ($\beta = 1.03$; 95% CI, 0.9–1.19; $p = 0.7$) or postoperative LOS ($\beta = 0.96$; 95% CI, 0.75–1.23; $p = 0.8$); however, it did correlate with a 23% decrease in hospital LOS ($\beta = 0.77$; 95% CI, 0.69–0.86; $p < 0.0001$) (Table 5). The REML variance component for medical center effect was again insignificant for operative duration ($\sigma^2 = 0.07$; 95% CI, −0.002–0.15; $p = 0.06$), postoperative LOS ($\sigma^2 = 0.03$; 95% CI, −0.02–0.07; $p = 0.26$), and hospital LOS ($\sigma^2 = 0.01$; 95% CI, −0.004–0.02; $p = 0.21$).

DISCUSSION

In this prospective multicenter assessment of patients with CBD stones, an immediate cholecystectomy following ERCP was associated with a significant decrease in postoperative LOS and hospital LOS. These trends are maintained throughout the literature.[2,20,21] We also observed a significant difference in time to ERCP from admission in the CDL cohort but not the GSP cohort, which appears consistent with current societal recommendations.[22] For example, while the need for ductal clearance is fundamental for patients with CDL, several studies argue that an ERCP for GSP should only be considered in patients with concomitant cholangitis.[23,24] Routine ERCP for acute GSP has not been shown to improve outcomes and is potentially harmful and unnecessary if the offending gallstone has already passed.[23]

Undergoing an ERCP is not without consequence. Biliary instrumentation stimulates cholangiocytes within the ductal epithelium to secrete multiple proinflammatory cytokines.[25] These cytokines, which include interleukin (IL)-6, IL-1, IL-8, and tumor necrosis factor α, regulate the inflammatory cascade and repair of cholangiocytes. Oezcueruemez-Porsch et al.[26] evaluated acute phase reactants in patients with post-ERCP pancreatitis and noted that levels of procalcitonin, C-reactive protein, tumor necrosis factor α, IL-6, and IL-1 all peaked 24 hours after ERCP. Mechanical instrumentation during an ERCP can also damage the sphincter of Oddi, and a sphincterotomy renders the sphincter incompetent. Consequently, bile and bacteria can more easily reflux into the hepatoduodenal ligament, causing fibrosis and adhesive changes in the triangle of Calot.[25]

An inflamed and fibrosed operative field has been linked to longer operative times and to an increased risk of conversion to open cholecystectomy.[2,4,27,28] Salman et al.[1] and Reinders et al.[10] added that a longer duration between ERCP and surgery is associated with higher rates of conversion to open cholecystectomy. In a metanalysis by Friis et al.,[20] the open conversion rate was 3% higher (4.3% vs. 7.6%, $p = 0.02$) when a cholecystectomy was performed between 24 and 72 hours of ERCP compared with less than 24 hours. We infer that performing a cholecystectomy within 24 hours of ERCP could avoid maximum inflammation, which potentially explains why we had much lower rates of open conversion in our immediate group.

The conversion to open during a cholecystectomy is important to examine because it can impact a patient's LOS.[29–31] For example, Ashfaq et al.[32] noted a 2-day increase in overall LOS ($p = 0.01$) for converted cholecystectomies. Furthermore, in a subgroup analysis of our data (not shown in results section), cases that were converted to open significantly correlated with longer postoperative LOS (3.5 days vs. 1.2 days, $p < 0.0001$) and hospital LOS (6 days vs. 5 days, $p < 0.0001$). Although most published studies demonstrating differences in LOS are based on patients with cholecystitis rather than CBD stones, a Cochrane review by Keus et al.[31] demonstrated that, among patients with cholecystolithiasis, an open operation correlates with both longer hospitalizations and postoperative convalescence.

It is critical to clarify that the trends we identified in the immediate cholecystectomy group were not evident when comparing patients from the early group to the late group. This distinction may be supported by Mador et al.[8] in their comparison of patients undergoing same admission to separate admission ERCP and cholecystectomy. The median time between procedures in their same admission group was 3 (1.75–4.25) days, indicating that at least 75% of the same admission patients would have been categorized as early or late according to our study definitions. The researchers found no difference in operative duration or postoperative LOS between their groups, which parallels our findings of no difference in operative duration or postoperative LOS after 24 hours. In addition, Sahu et al.[33] noted that patients undergoing a cholecystectomy within 24 hours of ERCP compared with beyond 24 hours (and up to a week) had a 2.5-day decrease in hospital LOS.

Moreover, in a comparison of short (≤2 days), medium (3 to 42 days), and long (≥43 days) time intervals between ERCP and cholecystectomy, Bostanci et al.[28] found no change in rates of conversion to open. Perhaps no difference was detected because they did not specifically have an immediate group (≤24 hours). We only observed an increase in conversion rates when comparing the immediate group with the early group and the immediate group with the late group. Considering our findings along with the results from Bostanci et al.[28] and Mador et al.,[8] it is plausible that the time interval between ERCP and cholecystectomy should not exceed 24 hours.

Limitations

Our study has several limitations. Because the design was observational, we did not have a standardized protocol for IOC, nor did we track whether routine IOC was performed at each medical center. We were also unable to account for the actual size or number of stones cleared during ERCP, which could have impacted the extent of biliary instrumentation required to extract the stone. The clinician or teams performing the ERCP and cholecystectomy may also have had different levels of experience, potentially affecting operative and procedural duration. We also did not account for operative delays due to scheduling or systems issues that were beyond a surgeon's control.[34]

In addition, because our research sought to examine the management of suspected CBD stones, we did not specifically account for differences among patients based on their underlying diagnosis (i.e., CDL or GSP). Nevertheless, CDL and GSP do represent two distinct pathologies, and the incidence of both diagnoses was similarly distributed across the three groups. Finally, many surgeons historically have waited for the pancreatic enzymes associated with GSP to normalize before cholecystectomy. Unfortunately, serial laboratory levels were not collected for this study, so we do not know if lipase levels normalized before surgery. However, we did collect initial and peak lipase levels, and patients with elevated peak lipases (i.e., ≥180 U/L) had a similar overall time to cholecystectomy compared with patients with lipases less than 180 U/L (88.4 hours vs. 63.1 hours, $p = 0.2$).

CONCLUSIONS

In this post hoc analysis of a prospective multicenter study including patients with CBD stones, performing a cholecystectomy immediately after ERCP was associated with a shorter postoperative LOS and hospital LOS. In addition, CBD explorations and conversion to open occured more frequently when surgery was delayed. Performing a cholecystectomy within 24 hours of ERCP for CBD stones may avoid more invasive operations and shorten hospitalizations.

AUTHORSHIP

B.M.T. and R.B.G. contributed in the study design. C.W.P., E.K., E.M., A.M., A.G., R.R., and M.B.M. contributed in the data acquisition. B.M.T., D.D.Y., and R.B.G. contributed in the analysis and interpretation. All authors contributed in the article drafting and critical revision.

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DISCLOSURE

The authors declare no conflicts of interest.

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