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Post–Endoscopic Retrograde Cholangiography Laparoscopic Cholecystectomy: Challenging but Safe

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ABSTRACT

Background and Objectives: Up to 19% of patients undergoing laparoscopic cholecystectomy (LC) have common bile duct stones and may require endoscopic retrograde cholangiography (ERCP) before LC. The risk of complications of LC after ERCP is higher, and the optimal interval between ERCP and LC is disputed. In our unit, LC is performed approximately 6 weeks after ERCP. This study aims to compare outcomes between subsets of patients undergoing LC with or without prior ERCP.

Methods: All patients undergoing ERCP and elective laparoscopic cholecystectomy (ELC) over a 1-year period were included. Outcome measures included ERCP outcomes, duration of surgery, intraoperative findings, and postoperative outcomes. Two groups of patients were compared: LC after ERCP and ELC.

Results: The study included 190 ELC patients and 43 patients with LC after ERCP (ERCP-LC) (December 2008 to December 2009). At ERCP, 25 patients (58%) had ductal stones. The post-ERCP complication rate was 5%. The median time to LC was 42 days, and 6 patients (14%) were readmitted before LC. There were more severe adhesions and longer median operating times in the ERCP-LC group (75 minutes for ELC vs 110 minutes for ERCP-LC, $P = .013$). We found no significant differences in rates of conversion to open surgery, postoperative complications, lengths of stay, and readmission rates.

Conclusion: Interval LC after ERCP is a more technically challenging procedure but is associated with a low rate of complications. Although there is emerging evidence that early LC after ERCP is feasible, our study shows that our current practice of delaying LC by approximately 6 weeks is safe.

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INTRODUCTION

The incidence of pancreatitis is rising and ranges from 150 to 420 cases per million in the United Kingdom.[1] There are approximately 52,000 laparoscopic cholecystectomies (LCs) performed nationally per year. Between 9% and 19% of these patients will have a stone in the common bile duct (CBD).[2]

Endoscopic retrograde cholangiopancreatography (ERCP) is indicated for those patients who have clinical features and radiologic evidence of CBD stones.[3] It has a periprocedural complication rate of 5.1%, including a 1.6% incidence of pancreatitis, and a procedure-related mortality rate of 0.4%.[4] Endoscopic sphincterotomy (ES) can be the definitive treatment for gallstones in a subset of patients for whom cholecystectomy is not appropriate because of a high operative risk,[5] although most patients with CBD stones will undergo LC to minimize the risk of further complications.

The British Society of Gastroenterology recommends that either ES or cholecystectomy should be performed within 2 weeks of diagnosis of gallstone pancreatitis or within the same hospital admission.[1] An acute LC can be performed effectively and safely for patients with mild pancreatitis.[6,7] Elective laparoscopic cholecystectomy (ELC) has an increased risk of complications after ERCP, with reports of longer operating times, increased bleeding, and higher rates of conversion to open surgery.[8–13] The reasons for these increased risks have not been fully elucidated, and these risks may be markers of the underlying severity of gallstone disease or because of secondary sequelae of ERCP.

The optimal timing of LC after ERCP is contentious.[2,9,12] The aim of this study was to compare the intraoperative findings and postoperative outcomes of a cohort of patients who had a scheduled LC after ERCP with a group undergoing an ELC for uncomplicated biliary disease. We aimed to evaluate the safety of delayed LC by reviewing the effects of ERCP on intraoperative and postoperative complications of LC.

METHODS

This study was a retrospective case-note review of every acute biliary admission, ERCP, and LC carried out at a single institution from December 1, 2008, to December 1, 2009. Patients were identified from a hospital episodes database by use of *International Classification of Diseases, (Tenth Edition)* diagnosis codes K80 (cholelithiasis), K83 (other diseases of the biliary tract), and K85 (acute pancreatitis) and operative codes J18 (total cholecystectomy) and J38.1 (ERCP). These 2 sets of codes were cross-referenced to create a single group of biliary patients who had LC after an ERCP for gallstones. Patients undergoing an ELC (ELC group) for uncomplicated cholelithiasis over the study period were included as a control group. Patients undergoing acute LCs were excluded from the study.

Data collected included patient demographics, preoperative investigations, diagnosis, ERCP outcomes and complications, intraoperative reports, postoperative complications, further interventions, and readmission rates. The severity of adhesions was graded by use of a previously published 4-point scale: 1, no adhesions; 2, mild adhesions; 3, severe adhesions encasing gallbladder; and 4, severe adhesions involving other structures.[14]

Parametric data are presented as means, standard errors, and 95% confidence intervals. Nonparametric data are presented as medians, and categorical data are presented as frequencies and proportions. Continuous data were analyzed with a 2-tailed paired *t* test, and categorical data were analyzed with contingency tables and the Fisher exact test. All statistical tests were performed with GraphPad Prism software, version 5 (GraphPad Software, San Diego, CA, USA).

RESULTS

There were 43 patients who had an ERCP before having LC during the study period. There were 190 patients who had an ELC without an acute gallbladder admission. The median age was 51 years (interquartile range [IQR], 22) in the ELC group and 53 years (IQR, 22) in the ERCP group ($P = .429$). The male-to-female ratios were significantly different between groups: 1:2.3 in the ELC group and 1:1.1 in the ERCP group ($P = .0128$).

Of the 43 patients in the post-ERCP group, there were 11 (26%) diagnosed with acute pancreatitis and 32 (74%) diagnosed with CBD stones. Ultrasonography had been performed in 42 patients (97%), showing 5 (12%) with CBD stones and 33 (79%) with dilated CBDs. Magnetic resonance cholangiopancreatography had been performed in 25 patients (58%), of whom 16 (37%) had ductal stones. The indications for ERCP are shown in **Table 1**.

All ERCP procedures were performed by surgeons with a subspecialty interest in upper gastrointestinal (UGI) surgery. The completion rate of ERCP was 100%. There were 25 patients (58%) who had CBD stones on cholangiography, and 23 (92%) of these patients went on to have a successful ductal clearance. The remaining 2 patients (8%) underwent stenting, and ductal clearance was achieved at a second ERCP. Post-procedural pancreatitis developed in 2 patients. There were no instances of perforation or death. The total complication rate was 5%. These data are summarized in **Table 2**.

The median interval between ERCP and LC was 42 days (IQR, 20–48). There is a high rate (55%) of acute LC performed in our unit, which includes experienced general and colorectal consultant surgeons. There were no patients who underwent an acute LC after ERCP. There were 6 readmissions in the ERCP group (14%): 4 patients were admitted for pain control and 2 for acute cholecystitis. Cholecystectomy was performed by experienced specialist UGI surgeons in 37 ERCP patients (83%) and 39 ELC patients (91%).

Table 3 compares various parameters of the procedure. The ERCP group showed a significantly longer median operating time. **Table 4** shows complications rates of 9% in the ELC group versus 14% in the ERCP group, which was nonsignificant. Of note, there were more empyemas in patients needing an ERCP ($P = .195$, not significant). **Table 5** shows the significant differences between grade 1 and grade 4 adhesion ratings between the ELC and LC-ERCP groups. The overall proportion of patients with high adhesion grades (grades 3 and 4) was higher in the LC-ERCP group than in the ELC group (53% and 20%, respectively; $P < .0001$). There were similar complication and conversion rates in both groups. There were no incidences of damage to the CBD in either group. The median

Table 1.
Indication for ERCP

Indication for ERCP	No. (%)
Radiologic evidence of CBD stones	21 (49)
Dilated ducts on US[a]/MRCP[a]	18 (42)
Clinically jaundiced	4 (9)

[a]MRCP=magnetic resonance cholangiopancreatography; US=ultrasonography.

Table 2.
ERCP Outcomes

ERCP Parameter	No. (%)
Completion rate	43 (100)
CBD stones	25 (58)
Successful clearance	23 (92)
Stented	2 (8)
Postoperative pancreatitis	2 (5)
Complication rate	2 (5)

Table 3.
Comparison of Operative Parameters

Parameter	ELC (%)	ERCP-LC (%)	*P* Value
Median operative duration, min	75	110	.013
Empyema	1 (1)	4 (9)	.195
Conversion to open	3 (2)	1 (2)	.560
Bile leak/CBD damaged	0	0	–
Complications	17 (9)	6 (14)	.393
Median length of stay	1	1	>.999

Table 4.
Comparison of Postoperative Complications

Complication	ELC (%)	ERCP-LC (%)
Return to theater	1 (1)	0
Intra-abdominal collections	0	2 (5)
Wound complications	7 (4)	2 (5)
Pain readmission rates	6 (3)	1 (2)
Medical complications	3 (2)	1 (2)
Total	17 (9)	6 (14)

length of stay was 1 day, with most patients treated as day cases or with a 23-hour stay.[15]

The ERCP group was further stratified to compare outcomes in patients with choledocholithiasis versus patients with acute pancreatitis (32 patients vs 11 patients). There were no significant differences between the 2 groups with regard to intraoperative adhesions from grades 1 to 3 (grade 1, 9 vs 0 [$P = .176$]; grade 2, 9 vs 2 [$P > .999$]; grade 3, 6 vs 2 [$P > .999$]), but grade 4 adhesions showed a significant difference (8 vs 7, $P = .004$). There were no significant differences between the choledocholithiasis and acute pancreatitis groups with regard to conversion-to-open surgery rates (1 patient vs 0, $P > .999$), complication rates (4 patients vs 2, $P = .637$), or median lengths of stay (1 day vs 1, $P > .999$).

Table 5.
Comparison of Adhesion Grading

Grade of Adhesions	ELC (%)	ERCP-LC (%)	*P* Value
1	97 (51)	9 (21)	.0003
2	55 (29)	11 (26)	.712
3	30 (16)	8 (19)	.651
4	8 (4)	15 (35)	<.0001

DISCUSSION

The perception that LC after ERCP is associated with increased technical complexity and a higher incidence of complications has led to these patients being offered LC under the care of specialist UGI surgeons at our institution. This study looked at 2 groups of patients undergoing ELC and showed that operating times and severity of pericholecystic adhesions are increased after ERCP. Despite this, there were no significant differences in rates of major complications or conversion rates. The overall complication rate of 14% and conversion–to–open surgery rate of 2% were low and are comparable with larger series.[6,8,10,16]

Multiple studies have shown that ERCP is a predictor of conversion to open surgery and postoperative complications.[8,9] There are no validated standard measurements of operative difficulty, although adhesion grading or its corollary, "dissection difficulty," has been described.[17] Significantly higher levels of adhesions encountered during LC have been reported for patients who underwent ERCP.[13,18] Adhesions are also seen after biliary pancreatitis and choledocholithiasis in patients who have not had ERCP, meaning that the true etiology of adhesions is difficult to establish.[7,13,18] This finding is corroborated in this study, in which a significantly higher grade of adhesions was found in patients with pancreatitis compared with patients with simple choledocholithiasis. These measurements remain subjective and have poor interoperator reproducibility. A higher conversion-to-open surgery rate is associated with prior ERCP.[7,10,11] In this study, conversion rates were low in both groups and prior ERCP was not an appreciable risk factor for conversion to open surgery.

We have interpreted significantly longer operating times as a surrogate marker of operative difficulty. Even so, operative difficulty remains a function of other factors, including technical skill and experience of the surgeon, patient obesity,

and anatomic variations. A longer duration of surgery is associated with increased rates of perioperative complications in general surgery procedures and LCs.[19–21] The training grade of the primary surgeon does not necessarily correlate with operative difficulty or increased complications, and in our study all LCs were supervised directly by an experienced consultant surgeon.[19,22–24] A longer duration of surgery is a major predictor of the technical complexity of LC, along with other factors including male and elderly (>80 years) patients, a high body mass index, a non-UGI surgeon, and complicated gallbladder disease. Predicting a difficult procedure allows appropriate planning and may improve clinical outcomes.[21,25]

A causal relationship between ERCP and operative difficulty has not been conclusively established. ERCP is most commonly performed for patients in whom biliary pancreatitis and cholangitis develop, who are likely to have peripancreatic and pericholedochal inflammation. This would be reflected in the adhesion grading. ERCP itself may damage the structures within the hepatoduodenal ligament either because of instrumentation of the biliary tract or as a direct effect of the contrast, causing increased periportal inflammation and fibrosis.[10,26] Indirect evidence of this is provided by studies showing that the absence of ductal stones did not decrease the risk of conversion in post-ERCP cholecystectomy and that multiple ERCPs led to incrementally higher risks of complications and conversion.[26]

LC was performed approximately 6 weeks after ERCP in this study. The clinical rationale for this delay is to allow inflammatory changes after the index admission to settle, and such a delay has been advocated for >30 years.[27] There was an interval biliary complication rate of 14% in our study. Multiple studies have suggested that LC be performed earlier than 6 weeks to reduce the risk of interval biliary complications.[6,12,28–32] The optimal timing for LC is not clear, but it has been shown that earlier LC is less challenging and can be performed without significant adverse events.[6,10,12] 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.[6] The complication rates between acute procedures and interval procedures were nonsignificant, suggesting that an acute LC would reduce biliary complications after ERCP.

This is a small study, although we believe it describes the typical experience of a district hospital over a 1-year period. It would be useful to compare adhesion grades in patients undergoing ERCP for other biliary diagnoses, but the numbers of such patients in this study are too small to perform meaningful subgroup analysis. Although baseline demographic characteristics are generally comparable, there is a higher incidence of male patients in the ERCP group, in keeping with previously published evidence. Male patients have a higher incidence of gallstone pancreatitis and are more likely to require an ERCP. Male gender is an independent predictor for conversion to open surgery during LC.[16,19] Thus we believe that the findings of this study are still pertinent.

Our unit has an acute LC rate of 55%, and those patients who have ES for biliary pancreatitis have hitherto been excluded from an acute LC. Further service reconfiguration will be required to accommodate this cohort for acute LC.

CONCLUSION

Our study shows that interval LC after ERCP is safe and associated with a low rate of perioperative complications. The interval complication rates are low and consist of biliary colic and mild cholecystitis, in keeping with published evidence that ES prevents serious complications after the index presentation of gallstone pancreatitis.[5,6,27,32] Although some authors have proposed early LC after ERCP to prevent interval readmissions, our study shows that our current practice of delaying LC by approximately 6 weeks is safe.

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