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The Efficacy of Endoscopic Retrograde Cholangiopancreatography Immediately following Laparoscopic Cholecystectomy

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Summary. **To determine the efficacy of endoscopic retrograde cholangiopancreatography (ERCP) in detecting retained stones or bile duct injury immediately after following laparoscopic cholecystectomy (LC), 113 patients were reviewed undergoing LC between September 1993 and September 1996. Among them, 44 patients (38.9%) underwent ERCP within postoperative day 4. ERCP was indicated as follows: 1) patients with postoperative cholestasis and/or excessive amounts of bilious drainage from the intraabdominal drain; 2) patients with discrepancies between preoperative imaging modalities and intraoperative findings; and 3) patients without either preoperative ERCP or intraoperative cholangiography (IOC). Postoperative complications detected by ERCP included bile duct injury in 2 patients, retained common bile duct (CBD) stone in 1 patient, and hepatolithiasis in 1 patient. One patient mistakenly clipped CBD not to a cystic duct, and subsequent ERCP showed interruption of the bile duct so that an emergency operation was performed. Another patient had leakage from a cystic duct-CBD junction, and subsequent ERCP showed abundant leakage of the bile duct, so that endoscopic nasobiliary drainage (ENBD) was performed. The retained CBD stone was removed by endoscopic sphincterotomy (EST) following ERCP.**

In conclusion, ERCP immediately following LC in the selected patients on the basis of the above indications of 1) and 2) may be recommended as one useful method which detects accurately retained stones and bile duct injury.

Key words—endoscopic retrograde cholangiopancreatography, laparoscopic cholecystectomy, bile duct injury, retained bile duct stone.

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INTRODUCTION

The superiority of laparoscopic cholecystectomy (LC) over open cholecystectomy (OC) has been evidenced by the lower complication rate of this new standard for cholecystectomy.[1] Several recent studies, however, have reported common bile duct (CBD) injury rates of 0.25%,[2] 0.3%[3] and 0.5%.[4] Endoscopic retrograde cholangiopancreatography (ERCP) is a uniquely efficacious diagnostic and therapeutic tool in the management of laparoscopic biliary complications.[5,6]

Although ERCP appears to be the most useful tool for diagnosing CBD stones in patients undergoing LC, the optimal time for the use of ERCP relative to LC is controversial. Recently, Erickson et al.[7] reported lower cost and morbidity when ERCP was performed after LC. When choledocholithiasis is suspected, however, selective use of preoperative ERCP may have a clinically equivalent outcome.

The aim of this study was to examine the efficacy of postoperative ERCP in detecting retained stones and bile duct injuries immediately following LC.

MATERIALS AND METHODS

We reviewed all cases (n=113) of LC at the Nagano Red Cross Hospital from September 1993 to September 1996. Of these, 44 patients (38.9%) underwent ERCP within postoperative day 4 following LC. ERCP was indicated as follows: 1) patients with postoperative cholestasis and/or excessive amount of

bilious drainage from the intraabdominal drain (n=2); 2) patients with discrepancies between preoperative imaging modalities and intraoperative findings (n=2); and 3) patients without either preoperative ERCP or intraoperative cholangiography (IOC) (n=40). However, ERCP after LC was not indicated when patient had an uneventful postoperative course and refused it.

Methyl acid gabexate (200 mg/day) or methyl acid napthamostat (20 mg/day) was administered intravenously for 2 days following ERCP for pancreatitis prophylaxis.

RESULTS

1. Patients characteristics

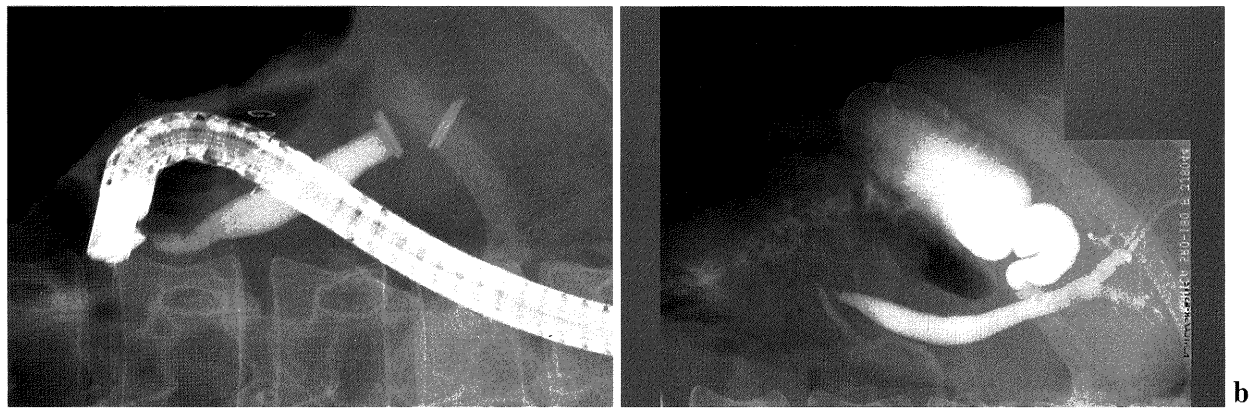
The patient composition was 27 women and 17 men, ranging in age from 18 to 77 years (mean age of 50.7±11.7 years). Histopathologic diagnoses consisted of 39 cases of chronic cholecystitis (37 with and 2 without gallstones) and 5 gallbladder polyps (4 cholesterol polyps and 1 inflammatory polyp).

Preoperative ultrasonography (US) was performed in all patients who underwent LC, computed tomography (CT) in 75 patients (66.4%), drip infusion cholangiography (DIC) in 43 patients (38.1%) and ERCP in 32 patients (28.3%). Preoperatively, CBD stones were detected in 3 patients and were removed by endoscopic sphincterotomy (EST) following ERCP. In the 44 patients with ERCP after LC, preoperative US was performed in all patients, CT in 32 patients (72.7%), DIC in 26 patients (59.1%) and ERCP in 7 patients (15.9%). IOC was performed for 20 (45.4%) of 44 patients; no bile duct injuries were seen. The other 69 patients without ERCP after LC had uneventful postoperative recovery.

The hospital course for all patients following ERCP was uneventful with the exception of one patient who suffered abdominal pain due to an acute gastric mucosal lesion resulting from *Helicobacter Pylori*. The patient's post-ERCP laboratory values, including serum amylase and liver function tests, were essentially normal. All patients were discharged within 7 days of LC, except for 2 patients with bile duct injury after LC.

2. ERCP findings

In 4 (9.1%) of 44 patients, abnormalities were detected by ERCP after LC. Each of the 4 patients was satisfied with the above indications of 1) and 2). On the other hand, the 40 patients with the indication of 3) did not show any abnormal findings. Two cases of bile duct injury were seen during ERCP after LC. Unfortunately, IOC was not performed in either because of severe wall thickening of the cystic duct-CBD junction. In one case, the patient had no complaints but severe cholestasis in blood chemistry for two days postoperatively, and subsequent ERCP showed interruption of the bile duct (Fig. 1a). We performed an emergency operation 2 days after LC, and then we confirmed that CBD was clipped and interrupted between the proximal and distal sides. Hepaticojejunostomy Rouxen-Y repair was performed. Liver enzymes were back to normal within 1 week of the reconstruction, and there were no complaints 3 months after the repair. In this case, CBD was mistaken for cystic duct because of its similar



a b

Fig. 1. **a.** ERCP performed after LC demonstrates interruption of the CBD, **b.** Preoperative ERCP demonstrates that CBD is as slight as a cystic duct. (ERCP, endoscopic retrograde cholangiopancreatography; LC, laparoscopic cholecystectomy; CBD, common bile duct).

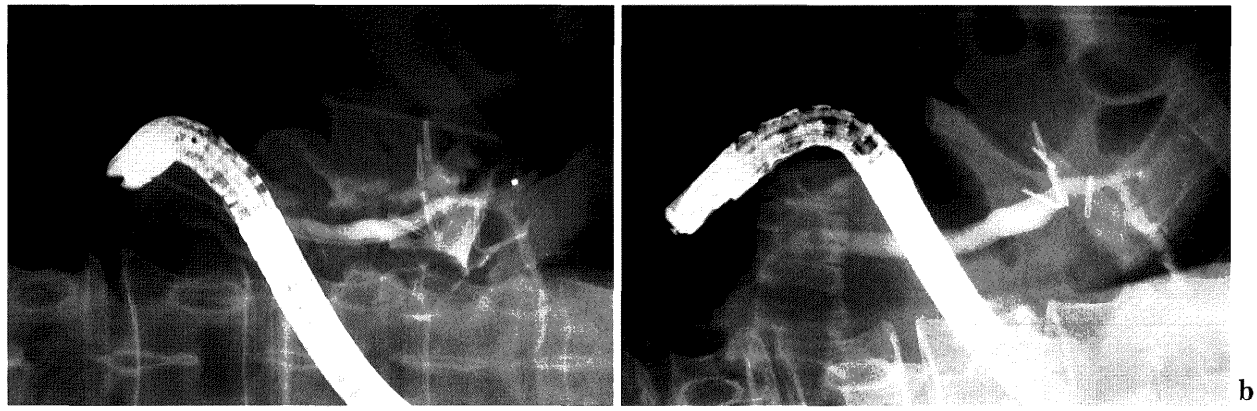


Fig. 2. **a.** ERCP performed after LC demonstrates bile leakage from a cystic duct-CBD junction, **b.** after which ENBD was performed. This bile leakage was not seen by ERCP at 10 days after ENBD. (ENBD, endoscopic nasobiliary drainage).

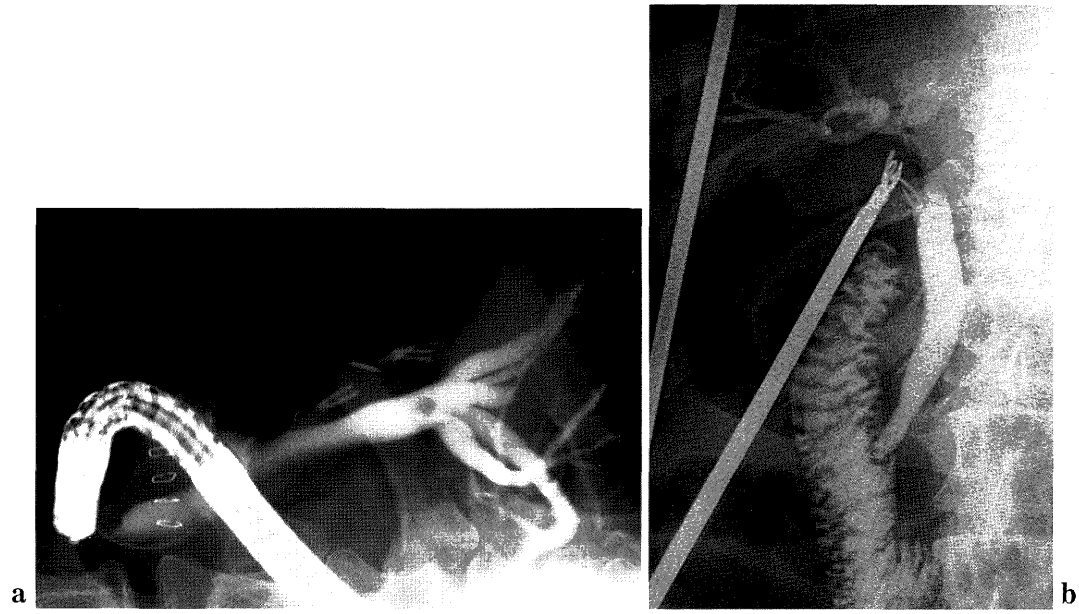


Fig. 3. **a.** ERCP performed after LC demonstrates a retained CBD stone, **b.** This stone was not seen on IOC. (IOC, intraoperative cholangiography).

slightness (Fig. 1b). In another case, a patient was referred for ERCP 3 days after uneventful LC. Postoperatively, the patient complained of abdominal discomfort and blood chemistry showed cholestasis, and approximately 12 h after LC exhibited an excessive amount of bilious drainage from a Penrose drain that had been placed through a subcostal trocar site. Subsequent ERCP showed leakage from a cystic duct-CBD junction (Fig. 2a) and endoscopic nasobiliary drainage (ENBD) was performed. ERCP 10 days later did not show any bile duct injury (Fig. 2b). The patient improved rapidly and had no complaints 9 months after this procedure.

In one case, a retained CBD stone that was not seen on IOC was detected by ERCP (Fig. 3a and b). In this case, a cystic duct stone had been found by preoperative ERCP, but no stone was found in the resected specimen. The retained CBD stone subsequently was EST following ERCP. In another case, hepatolithiasis was seen with dilatation of the intrahepatic bile ducts and a filling defect in the left lateral segment (Fig. 4a). In this case, a tumor in the left lateral segment of the liver had been suspected on preoperative US and CT (Fig. 4b), but preoperative ERCP could not verify

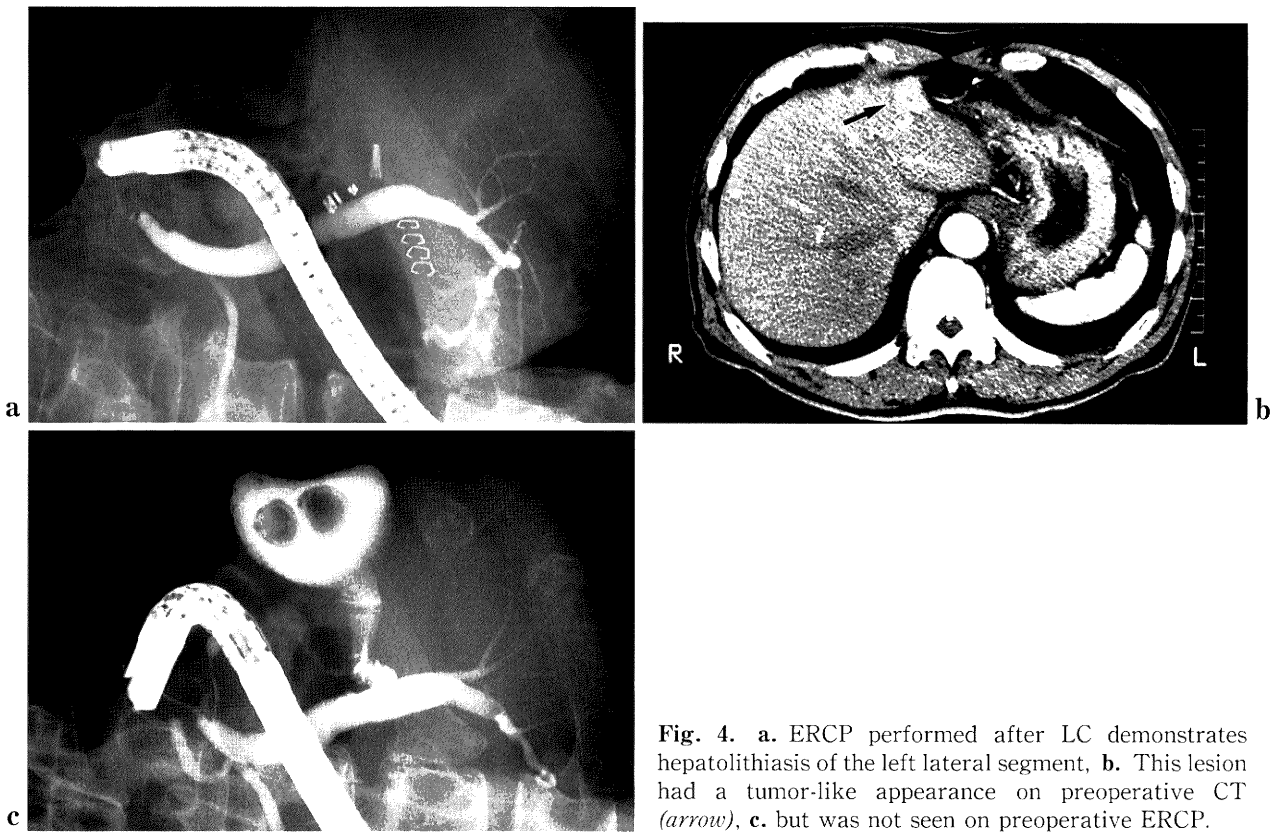


Fig. 4. **a.** ERCP performed after LC demonstrates hepatolithiasis of the left lateral segment, **b.** This lesion had a tumor-like appearance on preoperative CT *(arrow)*, **c.** but was not seen on preoperative ERCP.

a lesion (Fig. 4c). This patient currently is being observed with a presumptive diagnosis of hepatolithiasis because he is completely asymptomatic.

DISCUSSION

In our strategy of preoperative imaging modalities in LC, US is performed firstly in every patient, and ERCP is done in cases when CBD is dilated and a CBD stone is suspected on US evaluation. In the other patients without preoperative ERCP, DIC is performed to obtain anatomical information of the biliary tree. CT is carried out to detect characteristics of gallstones or polypoid lesions of the gallbladder; however, in the patients with stoneless cholecystitis or small cholesterol polyp, CT may be excluded.

Early experience with LC was associated with an overall increased incidence of CBD injury.[8–10] CBD injury, however, has always held a potential complication of cholecystectomy. Many surgeons consider IOC essential to LC for reduction of the risk of CBD injury and recognition of injury, should it occur. The data, however, do not support the necessity for the thoroughness of this approach, as several large series, in which IOC is used only selectively, have an equally low rate of ductal injury.[11,12] The non selective use of IOC appears to require longer operative time, unnecessary effort, and increased potential for ductal injury with overzealous efforts to obtain cholangiograms in settings when CBD stones are not suspected.[13] Although we tried to complete IOC in every patient, the rate of success was only 45.4% mainly because of severe inflammatory changes in the wall of the cystic duct-CBD junction. Two patients with bile duct injury were seen during ERCP after LC. Unfortunately, IOC was not performed in these patients, and bile leakage was not visualized in the operation. Because of this, bile duct injury was not detected intraoperatively. These results suggest that every effort for IOC should be made for the early detection of bile duct injury.

Recently, ERCP with sphincterotomy and stenting have won acceptance as an approach for bile leaks in LC.[5,6] ERCP has led to a further diagnosis and aided treatment strategy of bile duct injuries after LC. The treatment of bile leakage after OC, by EST or stent replacement, has been reported to yield acceptable results, especially when the patient is referred in an early phase.[14,15] ERCP for bile leakage cases after

LC shows high success rates (83%-100%) in treating biliary injury.[5,6] These results show that similar guidelines for decompression of the biliary tree after OC can be applied after LC as well. Therefore, we selected ERCP as the postoperative first choice to detect retained stones or bile duct injury.

Abnormalities detected by ERCP after LC were 9.1% (4 patients), while no patient without ERCP had postoperative complications. Thus, our indication of postoperative ERCP appeared to be appropriate. For two patients with bile duct injury having blood chemistry cholestasis, subsequent ERCP accurately detected bile duct injury and offered useful information for treatment. Namely, ERCP may be necessary to confirm CBD injury, especially in patients with prolonged cholestasis after LC.

In another case, a retained CBD stone was detected on postoperative ERCP but not IOC. It should be noted that a cystic duct stone had been detected by preoperative ERCP and likely passed from the cystic duct to the CBD subsequently. Thus, ERCP after LC was effective for patients who had significant differences between preoperative cholangiogram and intraoperative findings. Many surgeons have recommended routine IOC as the standard for the exclusion of CBD stones. The incidence of CBD stones, however, is less than 10% in most current series, and therefore 90% of patients undergoing routine IOC would be subjected to the risks associated with an unnecessary procedure. Furthermore, 2% to 4% of IOC are falsely positive. False positive cholangiograms that show questionable filling defects lead to additional manipulation and the associated risks of CBD injury, bile leak, and pancreatitis.[13] In cases when preoperative cholangiogram and IOC offer contradictory findings and further evaluation appears to be necessary, postoperative ERCP may be the most effective and safest method of diagnosing and treating a retained CBD stone. Vitale et al.[5] have reported the efficacy of ERCP and the associated endoscopic procedures of sphincterotomy, balloon dilatation, and stenting in the diagnosis and management of post-LC biliary complications.

Hepatolithiasis was detected in another case because ERCP after LC provides good visualization of the peripheral, intrahepatic bile ducts, once the gallbladder has been removed. However, this lesion might be adequately evaluated by preoperative ERCP if a balloon catheter is placed into the intrahepatic duct. The optimal time to perform ERCP relative to LC is controversial. Voyles et al.[13] recommend preoperative ERCP in cases when CBD stones are strongly suspected, for example: 1) cases with sonographic visualization of stones in a large duct (although false positives do occur); 2) elderly patients with strong clinical or biochemical evidence of cholangitis and persistently elevated liver enzymes.

At institutions where LC is performed routinely, the use of IOC as a means of detecting CBD injury has not been substantiated; indications for preoperative ERCP should become fewer as laparoscopic techniques evolve.[13] Neuhaus et al.[16] suggests that ERCP is an accurate method for detecting stones for showing the biliary anatomy, and can be combined with the endoscopic extraction of bile duct stones. ERCP is an invasive procedure, however, and thus has not been recommended as a routine procedure before LC. A current report[7] supports postoperative ERCP over other clinical strategies, regardless of whether routine IOC is performed. Performing ERCP after LC minimizes costs and morbidity, although when choledocholithiasis is highly suspected, selective preoperative ERCP might have a clinically equivalent outcome. The clinical presentation of postoperative bile duct injury includes distinct symptoms such as cholestasis, jaundice, persistent bile drainage by drains, and sepsis as described OC.[17] More important, however, is the occasional presence of an initial relatively symptom free period, which can mislead the clinician; this period can last for several days and even weeks, after which the patients eventually develop cholestasis.[6] Therefore, when patients do not recover uneventfully after LC even without cholestasis or jaundice, early ERCP is recommended as a safe and worthwhile method to detect bile duct injury and to suggest treatment.[6] In this study, since 109 patients (96.4%), except for 4 patients with abnormalities detected by ERCP, had uneventful recoveries after LC, routine ERCP after LC may be unnecessary for patients without perioperative abnormal conditions even though both preoperative ERCP and IOC have not been performed. Our findings indicate that ERCP immediately following LC should be indicated in the patients with postoperative cholestasis and/or excessive amounts of bilious drainage from an intra-abdominal drain, and with discrepancies between preoperative imaging modalities and intraoperative findings.

In conclusion, although further study is required to apply ERCP more judiciously in the future, ERCP immediately following LC in patients selected on the basis of final indications may be recommended as one useful method for detecting accurately retained stones and bile duct injury.

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