



and Other Interventional Techniques

Intraoperative cholangiography is still indicated after preoperative endoscopic cholangiography for gallstone disease

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Abstract

Background: Intraoperative cholangiography (IOC) is frequently omitted in patients undergoing laparoscopic cholecystectomy (LC) if they have had successful preoperative endoscopic retrograde cholangiography (ERC).

Methods: A prospectively maintained divisional laparoscopic cholecystectomy database was searched from 1991 to 1997 for patients who had IOC after preoperative ERC. The presence of recurrent or residual common duct stones seen on IOC and their impact on subsequent management were evaluated.

Results: We identified a group of 127 patients who underwent preoperative ERC. Thirty-one patients (31/127, or 24%) went on to receive an IOC during cholecystectomy. In 15 patients whose preoperative ERC was reported normal, five (33%) had an abnormal IOC. In 16 patients whose ERC was reported as having cleared the duct, eight (50%) had an IOC abnormality. Eight of these 31 patients required a further procedure to clear the duct.

Conclusion: Retained or recurrent common duct stones at cholecystectomy following diagnostic or therapeutic ERC were more common than expected. Therefore, IOC is recommended during LC regardless of the findings yielded by the preoperative ERC.

Key words: Cholangiography — Choledocholithiasis — Gallbladder — Laparoscopic cholecystectomy — Endoscopic retrograde cholangiography (ERC) — Intraoperative cholangiography (IOC)

There is evidence that single-stage clearance of the common duct at the time of laparoscopic cholecystectomy (LC) in fit patients is preferable to two-stage clearance by preoperative endoscopic retrograde cholangiography (ERC) followed some time later by LC [6, 8]. The combination of the low yield and perceived risk of preoperative ERC has led to a major reduction in its use. Yet some authors still consider ERC to be the method of choice when stones are suspected preoperatively [1, 9]. So although it is less commonly practiced than in the early days of LC, ERC is still performed in $\leq 5\%$ of patients referred for cholecystectomy. Surgeons can now perform intraoperative cholangiography (IOC) during LC with $> 95\%$ success rates, yet many surgeons do not perform this study routinely. Furthermore, it is tempting to believe that if the duct has been shown to be clear by preoperative ERC, there is little point to cholangiography during LC. However, solid evidence for this view is lacking.

When our database was initiated in 1991, IOC was performed during LC on a strictly selective basis. If the patient's duct was reported to be clear on prior ERC, IOC was not deemed necessary. In 1993, we began performing IOC more liberally and were surprised by the frequency of retained or recurrent stones in patients who had undergone preoperative ERC, even when it was administered by experienced endoscopists. We therefore decided to track the incidence of this occurrence in subsequent patients.

Methods

A prospective database of patients undergoing LC maintained since 1991 by two of us (M.E., B.S.) was used to record the indications for surgery, the results of the preoperative ERC (if performed), the results of the IOC (if performed), the overall surgical outcome, and the need for subsequent duct clearance procedures, including laparoscopic exploration of the common bile duct (LCBDE) and postoperative ERC.

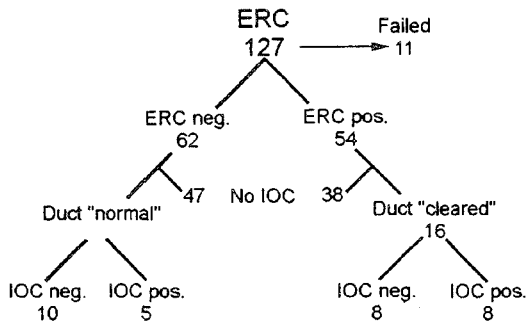


Fig. 1. Results of 127 preoperative ERCs in 1866 patients undergoing laparoscopic biliary surgery, grouped by outcome of ERC: *neg.* means ERC/IOC found the duct normal (a diagnostic ERC); *pos.* means ERC/IOC demonstrated stones in the common duct which were removed (a therapeutic ERC); *failed* means either that the duct could not be imaged at ERC or that clearance was unsuccessful if the duct was imaged satisfactorily.

All patients who had undergone preoperative ERC were extracted from the database and divided into three groups based on the result of the ERC (see Fig. 1): those who had a normal duct that was free of stones (a diagnostic study, ERC negative); those in whom stones had been cleared successfully (a therapeutic study, ERC positive); and those in whom ERC had failed to cannulate or clear the duct. From the first two groups, totaling 116 patients, 85 (73%) had undergone laparoscopic cholecystectomy without IOC and were not evaluated for the purposes of this report. In the balance of the patients, IOC was performed using 25% sodium diatrizoate (Hypaque) and digital real-time fluoroscopy with still-image and videotape documentation. Contrast is used in 1:1 dilution because a less dense solution is less likely to conceal the mobile densities that it surrounds in the duct. All 11 patients in the third group whose ERC had failed later underwent laparoscopic common duct clearance or drainage and were therefore also excluded.

When duct stones were found on IOC, the type of LCBDE performed depended on the stone size, the diameter of the cystic duct, the presence of a sphincterotomy, or the patency of the papilla.

Results

In this series, preoperative ERC reached a peak in 1992 of 10.7% of all patients referred for cholecystectomy, falling to 2% in 1997. We accumulated 1866 patients in the database who underwent a laparoscopic biliary procedure between 1991 and 1997; 127 of them had undergone preoperative ERC. Thirty-one of these 127 patients (24%) had undergone both successful preoperative ERC and IOC. In 22, the IOC had been performed on a routine basis, regardless of the result of the ERC or the presence of intraoperative indications of choledocholithiasis (e.g., cystic duct stones, common duct dilatation). In nine patients, intraoperative indications led the surgeon to perform IOC.

Of the 31 patients, one-third (five of 15) who had a preoperative ERC that was reported as normal had an abnormal IOC. Despite the results of the postoperative ERC, three of these five cases were considered significant enough to warrant LCBDE, two of which required choledochotomy. An attempt to clear the duct trans-cystically in the third case, was unsuccessful, so the patient underwent repeat ERC and sphincterotomy. In the remaining two cases, the stones were thought to be

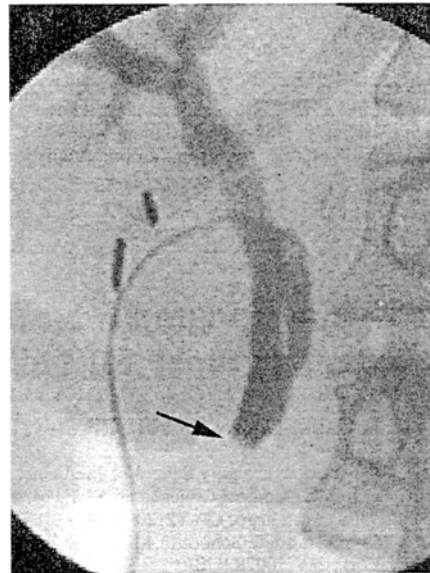


Fig. 2. Intraoperative cholangiogram of a 20-year-old woman who had undergone ERC with sphincterotomy for intractable biliary colic 2 months earlier while postpartum. Liver chemistries were not elevated, and choledocholithiasis was not suspected preoperatively. The cystic duct enters the distal duct low on the left. A small calculus (arrow) is impacted in the ampulla. No contrast passes into the duodenum. The calculus was cleared by transcystic passage of a Dormia basket and flushing.

small enough to pass spontaneously, so no exploration or subsequent ERC was performed.

One-half of the patients (eight of 16) whose duct had reportedly been cleared by preoperative ERC, usually with sphincterotomy, had an abnormal IOC. LCBDE was attempted in five cases and was successful in three cases (Fig. 2). Two of these five were converted to laparotomy, each because of difficulty with an impacted ampullary stone. In the first conversion, the cystic duct entered the common duct low on the left side. Chole-dochoscopic visualization of the lower duct was not possible, transduodenal sphincteroplasty was necessary to resolve the problem. In the second conversion (in a patient who had undergone endoscopic sphincterotomy), after antegrade disimpaction of the stone through the ampulla at laparoscopy, there was concern that the common duct might have been perforated. The patient was opened, a Kocher maneuver was performed, and methylene blue dye was injected into the duct, confirming the absence of extravasation from the lower duct. Postoperative ERC may have been a preferable way to manage this impacted stone because the papilla was known to be accessible. Three patients had tiny opacities that we believed would pass spontaneously. Two of these three patients had undergone endoscopic sphincterotomy.

Thus, eight of 31 cholangiograms (26%) identified clinically significant common duct stones, necessitating further efforts at duct clearance.

In addition to these 31 patients, there was a third group of 11 patients (11/127, or 9%) in whom at pre-operative ERC the common duct had not been cannulated or had not been cleared of stones. One of these

Table 1. Delay (in days) between performance of ERC and IOC (range)

	IOC negative	IOC positive
ERC negative	1 (1-5)	2 (0.25-180)
ERC positive	1 (1-34)	7.5 (1-56)

ERC, endoscopic retrograde cholangiography; IOC, intraoperative cholangiography

Values given as median (range)

patients had a Mirizzi syndrome due to obliteration of the cystic duct and ulceration of a 20-mm stone into the common hepatic duct. This condition was treated with laparoscopic cholecystectomy, removal of the impacted stone, and closure of the duct around a T-tube. Laparoscopic choledochotomy was performed to clear large or multiple stones in four patients. Four of the 11 patients were elderly, and because of gross ductal dilatation (>8 mm) and the presence of numerous large stones, laparoscopic choledochoduodenostomy was necessary. Three IOCs performed after failure to cannulate at ERC showed no ductal stones.

The delay (in days) between performance of the ERC and IOC is shown in Table 1. Although the numbers are too small to submit to meaningful statistical analysis, the finding of a positive cholangiogram was associated with greater delay between the two procedures. In one patient, ERC was performed the morning prior to cholecystectomy and reported as normal. IOC showed small opacities in the common duct, similar in size to the stones in the gallbladder. The stones flushed into the duodenum during transcystic choledochoscopy, so it could be argued that they would have passed spontaneously.

Discussion

There has been a steady decline in the preoperative use of ERC in patients suspected of harboring common duct stones who have been treated in our service. In contrast, there has been a marked increase in our practice of primary common duct exploration, which was employed in 99 of the last 503 patients (19.7%) referred to one of us (M.E.) for the treatment symptomatic cholelithiasis. One-stage duct clearance is attractive to patients and their physicians. This higher proportion of primary duct explorations reflects changes in patterns of referral rather than a greater incidence of choledocholithiasis, usually reported at 10-12% of patients with symptomatic gallstones. This change resulted from an aggressive approach to the performance of routine IOC, which in turn necessitated the development of techniques of LCBDE to deal with the duct stones thus found. With few exceptions, we proceed directly to cholecystectomy with IOC, attempt to clear the duct laparoscopically if stones are found, and refer the patient for postoperative ERC if LCBDE is not successful or not possible. For example, mechanical or optical failure of the choledochoscope was the single most common reason for not performing LCBDE.

Was there any selection bias in this group of 31 patients? Certainly many of them had demonstrated potential for the presence of duct stones because they had all undergone a preoperative ERC. The two operating surgeons in this series contributed 22 (M.E.) and nine (B.S.) patients, respectively, in a consecutive fashion. All 31 patients underwent routine IOC regardless of the indication of the presence of CBD stones.

Why did we stop collecting patients? The endpoint became clear when the number of patients referred after preoperative ERC decreased away so substantially and the pattern of one stage laparoscopic treatment became so standardized that too few were accumulating for meaningful evaluation.

The majority of surgeons do not yet have the skills or inclination to perform laparoscopic common duct exploration; thus, ERC will remain an important tool in the postoperative management of choledocholithiasis for some time. Fewer patients who are now referred to us have already had ERC, due in part to our policy of proceeding directly to operation in the presence of known or suspected choledocholithiasis. Moreover many endoscopists now recognize that the liberal use of preoperative ERC is associated with greater morbidity and mortality [2, 4] and fails to reveal choledocholithiasis in somewhat less than half of patients suspected of harboring common duct stones [3, 7]. The availability of reliable ERC services is a major asset for any biliary surgeon, especially one who does not perform LCBDE. In this circumstance, ERC can be employed more efficiently after cholecystectomy should the IOC show common duct stones [10, 11]. As has already been observed, when local expertise in performing ERC is less than optimal, cholangiography should be used more liberally in the preoperative setting [5]. In the event of failure to visualize or clear the common duct by preoperative ERC, the surgeon knows that the stones must be removed operatively and can proceed promptly to the most expedient laparoscopic or open method of duct clearance.

Some patients will still be referred for LC even though their duct stones have already been removed or their duct is found to be normal by ERC. If a selective rather than routine policy toward IOC is used, the surgeon may be tempted to dispense with IOC. This study shows that the incidence of recurrent or retained stones after ERC was high when checked with routine IOC. Many patients operated without IOC will recover without further problem, but $\leq 15\%$ may go on to develop the symptoms of retained stones and thus require a second ERC. This situation can arise years later, when the patient is no longer under the care of the original surgeon (as is usually the case if the surgeon does not perform ERC). Up to 10% of patients can develop symptoms of papillary stenosis following ERC and sphincterotomy [2]. IOC can show whether stones have passed from the gallbladder since the ERC and whether sphincterotomy or duct clearance was complete.

As would be expected, when the time between preoperative ERC and cholecystectomy was prolonged, the IOC was frequently positive. This finding supports what is by now the common practice namely, to proceed as

soon as possible to cholecystectomy once the preoperative ERC has been performed.

Conclusion

The incidence of clinically significant retained or recurrent common duct stones requiring additional duct clearance procedures was 26% in patients after apparently successful preoperative diagnostic or therapeutic ERC. Performance of an IOC is therefore still advisable, regardless of the results of the preoperative ERC.

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