Current Management of Common Bile Duct Stones in a Teaching Community Hospital

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The advent of laparoscopic cholecystectomy (LC) has complicated management of common bile duct (CBD) stones. While LC is routine, laparoscopic CBD exploration (LCBDE) is not, and an algorithm to manage suspected choledocholithiasis has not been uniformly accepted. We evaluated current management of choledocholithiasis. Patients suspected of having CBD stones over a 2-year period were evaluated, and 42 studies in the literature were reviewed. Thirty-two patients were identified. Fourteen patients (41%) had LC with intraoperative cholangiogram (IOC) with no preoperative studies. IOC revealed CBD stones in nine (64%). Seven had CBD exploration (CBDE) at cholecystectomy, and two had postoperative endoscopic retrograde cholangiopancreatography (ERCP). CBDE was successful in five cases, and ERCP was successful in one. Eighteen patients (56%) underwent preoperative ERCP. Five (28%) had no CBD stones. ERCP removed stones in nine patients, and four had open CBDE after failed ERCP. Current literature supports LC with IOC without any preoperative studies. Laparoscopic CBDE is highly successful but depends on surgeon experience. Removing CBD stones with ERCP is also very successful but is associated with increased cost, hospital stay, and complications. We conclude that LC with IOC should be performed without preoperative ERCP when choledocholithiasis is suspected. If found, stones should be removed laparoscopically if possible.

Laparoscopic surgery has changed the management of many surgical conditions. This is especially true regarding the treatment of gallbladder disease. Laparoscopy has transformed cholecystectomy into an outpatient procedure that is often performed in less than one hour with very low morbidity and mortality. However, since the advent of laparoscopic cholecystectomy (LC) the management of common bile duct (CBD) stones is less clear and has been the subject of much debate between surgeons and gastroenterologists.

Laparoscopic CBD exploration (LCBDE) is an advanced laparoscopic procedure that requires a high level of technical expertise and experience. It requires a significant amount of time, patience, and skill and has not been uniformly embraced. 1 For these reasons not all surgeons who perform LC consider LCBDE part of their armamentarium.

Options available to physicians treating patients with suspected choledocholithiasis include preoperative endoscopic retrograde cholangiopancreatography (ERCP), LC with intraoperative cholangiogram (IOC), and LC with observation for symptoms of CBD stones. Stones found on IOC can be managed with LCBDE, open CBD exploration (OCBDE), or postoperative ERCP. 2 Each of these options has advantages and limitations, and the ideal algorithm for the management of CBD stones has not been established.

The purpose of this review was to retrospectively evaluate our experience with the management of suspected CBD stones over a 2-year period at a community teaching hospital. The literature regarding the management of suspected CBD stones was also reviewed.

Methods

A retrospective review of the Department of Surgical Education database at the Greenville Hospital System was performed for the 2-year period from July 2000 to July 2002. The charts of all patients referred for evaluation for management of CBD stones were reviewed. Inclusion criteria were: sonographic evidence of choledocholithiasis or CBD dilation, abnormal liver function tests, evidence of gallstone pancreatitis, or jaundice. Patients with cholangitis were excluded; these patients underwent emergent or urgent

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endoscopic decompression. Hospital charts, operative records, and procedure notes were reviewed. Data collected included patient demographics, laboratory values, ultrasound results, comorbidities, length of hospital stay, complications, presenting symptoms, and any ERCP results. Patients were then separated into two groups: 1) patients who had LC and IOC with no preoperative studies (LC + IOC group) such as ERCP or magnetic resonance cholangiopancreatography (MRCP) and 2) patients who had a preoperative ERCP before cholecystectomy (pre-op ERCP group).

A literature review was performed to examine current management algorithms for suspected CBD stones. A query using the MD Consult database with the keywords "common bile duct stones" and/or "choledocholithiasis" was performed. Studies that examined preoperative risk factors, diagnostic modalities, treatment options, and management algorithms for patients with suspected CBD stones were then captured and reviewed. A total of 42 studies were reviewed.1-42

Results

Thirty-two patients were identified as being at high risk for CBD stones. Fourteen patients (44%) had no preoperative ERCP before LC with IOC and 18 patients (56%) had a preoperative ERCP before LC. Patient demographics and inclusion criteria for both groups are shown in Table 1.

In the LC + IOC group (n = 14), the average age was 53 years. Twelve patients presented with symptoms of nausea and vomiting, and 11 patients presented with abdominal pain. Suscission CBD stones was based on: CBD dilation on ultrasound (four), gallstone pancreatitis (three), elevated liver function test results (three), elevated bilirubin (two), jaundice (one), and choledocholithiasis on ultrasound (one).

Outcomes of the LC + IOC group are depicted in Fig. 1. Of these 14 patients five (36%) did not have choledocholithiasis (negative IOC) and did not require further treatment. Nine patients (64%) had a positive IOC: two patients had a successful LCBE, two had failed attempts at LCBE followed by postoperative ERCP, three patients had conversion to an OCBDE, and the other two had no attempts at surgical removal of the CBD stones and went on to have postoperative ERCP. The average hospital stay for the LC + IOC group was 7.6 days.

In the pre-op ERCP group the average age of these patients was 44 years. Ten patients presented with symptoms of nausea and vomiting, and all 18 patients presented with abdominal pain. Cholecholithiasis was suspected because of jaundice (five), choledocholithiasis on ultrasound (five), elevated bilirubin (three), gallstone pancreatitis (three), elevated liver function test results (one), and CBD dilation on ultrasound (one).

The outcomes in these 18 patients are shown in Fig. 2. Five patients (28%) had no CBD stones found on ERCP. Cholecholithiasis was found in 13 patients. Endoscopic stone removal was successful in nine patients and failed in four. These four patients had subsequent cholecystectomy and open common bile duct exploration (OCBDE). The average hospital stay for the pre-op ERCP group was 8.3 days.

The literature review was performed to examine the management of CBD stones. There is discord in the literature regarding the value of preoperative markers for choledocholithiasis,9, 12-17, 22, 27-29, 32 In 12 articles addressing this issue three authors concluded that preoperative markers were good predictors for CBD stones,15, 17, 22 whereas four authors concluded that the clinical, biochemical, and sonographic data were poor predictors for CBD stones.9, 28, 29, 32

Five studies evaluated the use of alternative confirmatory tests for choledocholithiasis.20, 21, 23, 25, 26 Three authors favored the use of endoscopic ultrasound (EUS) for making the diagnosis of choledocholithiasis,21, 25, 26 one favored the use of MRCP to reduce the incidence of negative ERCP,20 and
one recommended unenhanced spiral CT over ultrasound as an alternative to ERCP.\textsuperscript{23} Spiral CT, EUS, and MRCP all had sensitivities ranging from 88 to 95 per cent and specificities greater than 90 per cent.\textsuperscript{20, 21, 23, 25, 26}

Two authors established that the incidence of a negative ERCP is high in patients with suspected choledocholithiasis and recommended that the indications for preoperative ERCP should be "stricter."\textsuperscript{29} The incidence of negative preoperative ERCP ranged from 14 to 68 per cent. The cost of performing preoperative ERCP versus going directly to LC with IOC was examined in two studies; both concluded that preoperative ERCP should be forgone in favor of LC with IOC followed by LCBDE.\textsuperscript{2, 8}

### Discussion

Management of choledocholithiasis in the era of open cholecystectomy was fairly straightforward: OCBDE was performed at the same time as cholecystectomy. With the widespread acceptance of LC and a concomitant desire to avoid an open procedure the management of suspected CBD stones has become more complex. Options now include ERCP and both laparoscopic and open CBD exploration. There is no universally accepted algorithm for the appropriate management of CBD stones, and physicians often determine their management based on previous training and bias rather than on evidence-based medicine.\textsuperscript{27} Level of comfort and expertise with LCBDE, availability and expertise of the endoscopist performing an ERCP, and previous experience are often the basis for management decisions.

This study reviewed our experience with CBD stones in a non-university-based teaching program. We found that overall fully one-third of patients with suspected CBD stones do not have choledocholithiasis. Thus preoperative markers such as abnormal liver function tests, abnormal CBD ultrasound, and presenting symptoms are not completely accurate in predicting common bile duct stones.\textsuperscript{13} Liu et al.\textsuperscript{22} stratified
patients on the basis of these risk factors into four groups. Group one patients (high risk) were those with CBD diameter of 5 mm or more, liver enzyme elevation, and no evidence of gallstone pancreatitis or cholecystitis. Group two patients (intermediate risk) were those with CBD diameter of 5 mm or more, liver enzyme elevation, and biliary pancreatitis or cholecystitis. Group three patients (low risk) were those with CBD less than 5 mm and liver enzyme elevation. Group four patients (very low risk) were those with CBD less than 5 mm and normal liver enzymes. They found that patients who fell into the highest-risk group had an incidence of CBD stones of 92.6 per cent. Patients who fell into the two groups with lower risk had incidences of CBD stones of 3.8 and 0.9 per cent, respectively. They concluded that the probability of CBD stones could accurately be assessed on the basis of information from the initial noninvasive evaluation. Tham et al. however, reviewed 1847 consecutive laparoscopic cholecystectomies and found a different result. One hundred thirty-five patients were found to be in a high-risk group for choledocholithiasis and underwent preoperative ERCP. Only 43 (32%) patients had CBD stones on ERCP. Thus they found that the diagnostic yield of a preoperative ERCP even in these high-risk patients was low.

In our series 28 per cent underwent a preoperative ERCP that was negative, which is consistent with reported results. Similarly 36 per cent of patients undergoing LC with IOC with suspected choledocholithiasis had a negative intraoperative cholangiogram. As a means of detecting CBD stones the morbidity of a negative ERCP must be considered against the lesser morbidity of a negative intraoperative cholangiogram in any management algorithm. Multiple studies reiterate these findings and suggest that laparoscopic cholecystectomy with intraoperative cholangiogram with no preoperative confirmatory study should be performed in patients with suspected choledocholithiasis.

In our series once detected the CBD stones were treated by ERCP, LCBDE, and OCBDE. OCBDE successfully cleared the duct in all cases in which it was used, including the cases of four patients after failed endoscopic removal. For us it was the most reliable way of clearing the CBD.

We found that preoperative ERCP was successful 69 per cent of the time and that postoperative ERCP was successful 75 per cent of the time. The overall 29 per cent failure rate of therapeutic ERCP was surprising and greater than that seen in the literature.

LCBDE was successful in two of four cases. Reported factors associated with decreased success include lack of experience, technical ability, large CBD stones, and a small cystic duct or CBD. In our two failures the procedure was abandoned early for postoperative ERCP because of inadequate experience and small cystic ducts. The success rate of LCBDE varies greatly but has been reported to be as high as 90 per cent in centers where this procedure is done routinely. Heili et al. in 1999 compared patients who underwent LCBDE with patients who underwent ERCP with sphincterotomy. The LCBDE group had a significantly shorter hospital stay, fewer complications, and lower cost than the ERCP group. They concluded that LCBDE when feasible should be considered the gold standard for the management of choledocholithiasis.

Ng and Amaral in 1999 compared patients who underwent preoperative ERCP with those who underwent LC + IOC with postoperative ERCP. They found that the patients in the preoperative ERCP group had a longer hospital stay and higher hospital cost. The rate of a negative preoperative ERCP was 43 per cent. They concluded that suspected choledocholithiasis could successfully be managed with LC with IOC while reserving ERCP for patients with a positive

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**Fig. 3. Suggested algorithm.**
Cholangiogram. In our series the LC + IOC group did not enjoy a shorter hospital stay. This may have been due to a long delay in obtaining postoperative ERCP at our institution.

Conclusion

Cholelithiasis is a condition managed by both surgeons and endoscopists, and it requires a team approach for successful management. The definitive algorithm for managing these patients has not been established and is often based on anecdotal experience and the skill and expertise of both the surgeon and the available endoscopist. Our results in this retrospective review confirm the general findings in the literature review. CBD stones are often suspected but frequently not present. We suggest laparoscopic cholecystectomy and intraoperative cholangiography with no preoperative ERCP (Fig. 3). If stones are present a LCBDT should be performed. If this is unsuccessful or the expertise to perform this advanced procedure is not available then a postoperative ERCP or OCBDE should be performed depending on available resources. The routine use of preoperative ERCP in patients with suspected cholelithiasis is not supported by the results of this study nor in the literature review.

REFERENCES