Is There a Role for Routine Preoperative Endoscopic Retrograde Cholangiopancreatography for Suspected Choledocholithiasis in Children?

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Hypothesis: Endoscopic retrograde cholangiopancreatography (ERCP) is frequently used preoperatively in adult patients with suspected choledocholithiasis. Cholelithiasis occurs much less often in children, and the indications for ERCP are not established. We hypothesized that the natural history of choledocholithiasis in children is spontaneous passage of stones through the papilla and that these children can be managed without routine preoperative ERCP.

Design: Retrospective analysis of patients treated over a 10-year period.

Setting: Tertiary care children’s hospital.

Patients: All patients with cholecystectomy for biliary disease.

Interventions: Cholecystectomy; intraoperative cholangiography for suspected choledocholithiasis: hyperbilirubinemia, gallstone pancreatitis; and ultrasonographic evidence of common bile duct dilatation or common bile duct stones; and postoperative ERCP for symptomatic choledocholithiasis: pain and jaundice.

Main Outcome Measures: Incidence and complications of choledocholithiasis and frequency of ERCP.

Results: One hundred patients (63 females) were studied. Indications included acute cholecystitis (10%), chronic cholecystitis (59%), gallstone pancreatitis (26%), and choledocholithiasis (5%). An intraoperative cholangiography was performed in 45 patients, and common bile duct stones were identified in 13. Expectant management of asymptomatic common bile duct stones was associated with sonographic resolution within 1 week. One patient with intraoperative cholangiography–proven choledocholithiasis required ERCP for symptoms 24 hours after operation. One additional patient, who did not undergo intraoperative cholangiography, developed symptomatic choledocholithiasis and required ERCP. There were no choledocholithiasis- or ERCP-related complications.

Conclusions: This study suggests that choledocholithiasis occurs frequently in children and that spontaneous passage of common bile duct stones is common. This could explain the relatively high incidence of gallstone pancreatitis. Conservative management of choledocholithiasis is successful in the majority of patients. Routine preoperative or postoperative ERCP is usually not indicated.

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Although still rare, pediatric cholelithiasis appears to have been on the rise since the early 1970s.1 The causes of this increase are multifactorial and include an improved ability to detect gallstones as well as an actual increased incidence.2 Laparoscopic cholecystectomy has become the procedure of choice for children and adults, and open cholecystectomy is now performed only rarely.3 There has been a concomitant change in the management of common bile duct (CBD) stones. In adults, CBD exploration at the time of the initial operation has been replaced, for the most part, by preoperative or postoperative endoscopic retrograde cholangiopancreatography (ERCP). The best approach for CBD stones in children is even less well defined. The role of intraoperative cholangiography (IOC) and the indications and timing of ERCP remain unclear.4,5 The purpose of this study was to examine the natural history of choledocholithiasis in children undergoing laparoscopic cholecystectomy, in an attempt to provide guidelines for the use of ERCP.

METHODS

This study is a retrospective evaluation of patients younger than 18 years who underwent...
Cholecystectomy between 1994 and 2003 at Hasbro Children's Hospital in Providence, RI, a tertiary pediatric care center. Patient data collection included age, sex, admitting diagnosis, associated medical diagnoses, preoperative and postoperative biliary tract symptoms, white blood cell count, serum total bilirubin, sonographic findings, operative data, complications, and adjunctive procedures such as ERCP. Although not a prospective study, this review reflects a standard of care for calculous disease based on a selective, rather than routine, use of ERCP.6

The operative technique was either a standard 4-trocar laparoscopic or an open cholecystectomy.1 Intraoperative cholangiography was performed for 1 or more of the following indications: (1) diagnosis of gallstone pancreatitis, (2) hyperbilirubinemia (total bilirubin >1.3 mg/dL), and (3) dilated CBD (diameter ≥6 mm) or presence of choledocholithiasis by preoperative ultrasonography.

Referral for ERCP was limited to patients with postoperative jaundice, abdominal pain, and nausea or vomiting that lasted more than 24 hours and who had choledocholithiasis by postoperative ultrasonography. In these patients, liver function tests were also performed. They underwent ERCP with sphincterotomy and stone extraction under general anesthesia. Patients with IOC-proven choledocholithiasis who remained asymptomatic were evaluated within 1 week after cholecystectomy with surveillance ultrasonography and liver function tests.

One hundred children underwent a cholecystectomy (n = 10), chronic cholecystitis (n = 59), choledocholithiasis (n = 5), and gallstone pancreatitis (n = 26). Of these, 63 patients were girls and 37 were boys. The study group included 22 children (<12 years of age; median, 8.4 years) and 78 adolescents (≥12 years of age; median, 16.2 years), with an age range from 3 to 18 years. The open cholecystectomy rate was 8%. Hemolytic disorders associated with biliary disease were identified in 17 patients. Patients who underwent gallbladder removal as part of either liver resection or Kasai portoenterostomy were not included.

Forty-five patients underwent an IOC for 1 or more of the following criteria: gallstone pancreatitis (n = 26), hyperbilirubinemia (n = 21), and preoperative ultrasonographic evidence of CBD stones (n = 18). In 51%, only 1 criterion applied; in 43%, 2; and in 6%, 3.

Twelve of these 45 patients were found to have choledocholithiasis by IOC. No intraoperative intervention was performed to clear the duct. Eleven patients were asymptomatic on the first postoperative day and remained so for the following week. Results from surveillance ultrasonography and liver function tests between the fifth and seventh postoperative days were normal. These patients remained asymptomatic at the first follow-up office visit. One patient underwent ultrasonography and laboratory evaluation on the second postoperative day for abdominal pain. She had persistent choledocholithiasis and underwent ERCP with sphincterotomy and successful stone extraction. She became asymptomatic immediately after the procedure and was still asymptomatic at the first follow-up office visit.

Five of the 55 children who did not meet the criteria for an IOC remained symptomatic after the first postoperative day. They underwent surveillance ultrasonography and liver function tests on the second postoperative day; in 4 patients, the results were normal and their symptoms resolved within 5 days to 2 months. The fifth patient was diagnosed as having impacted CBD stones and was managed with ERCP.

The Figure summarizes the preoperative, intraoperative, and postoperative findings by initial diagnosis. Common bile duct stones were found in 19% of patients with gallstone pancreatitis (5/26) and in 80% of patients with ultrasonographic evidence of choledocholithiasis (4/5). The classic indicators of choledocholithiasis (hyperbilirubinemia, CBD dilatation, ultrasonographic evidence of choledocholithiasis, and gallstone pancreatitis) did not reliably predict the risk of symptomatic choledocholithiasis postoperatively: only 1 of 45 patients undergoing an IOC had a retained CBD stone (44 false positive, 1 true positive), while 1 of 55 patients without indication of choledocholithiasis had a retained stone postoperatively (54 true negative, 1 false negative). Consequently, the classic indicators of choledocholithiasis had a sensitivity of 2%, a specificity of 55%, a positive predictive value of 2%, and a negative predictive value of 2% for the need for postoperative ERCP.

**RESULTS**

Cholelithiasis, although still rare, has become a more frequent diagnosis in children.3 Its incidence has tripled during the last decade.2 Currently, it is reported to occur in 0.1% to 0.22% of children.8 The availability of ultrasonography for abdominal evaluation, the high teenage pregnancy rates, and the increased prevalence of childhood obesity may all contribute to this trend. By comparison, cholelithiasis is recognized in approximately 10% of adults.9

**COMMENT**
Choledocholithiasis occurs in 11% of children who are diagnosed as having cholelithiasis. This was confirmed in our series, where 13% of children had evidence of CBD stones. This incidence is similar to the 15% incidence reported for adult patients younger than 60 years (15%). Cholelithiasis occurs in only 3% of children with a low-suspicion diagnosis (acute or chronic calculous cholecystitis). Its incidence is almost 20% in children with gallstone pancreatitis (high-suspicion diagnosis), similar to reports in adults.

Although CBD stones were found intraoperatively (by IOC) in almost 30% of patients with 1 or more preoperative indicators of choledocholithiasis, only 1 of these children became symptomatic in the postoperative period. This very low incidence of retained CBD stones limited the need for postoperative ERCP and does not justify the routine use of preoperative ERCP. An additional patient, who lacked any of the classic indicators of choledocholithiasis, required a postoperative ERCP for retained stones. Thus, neither the classic criteria for suspected CBD stones nor a positive IOC result could predict the presence of retained CBD stones in the postoperative period.

The optimal management of suspected or confirmed choledocholithiasis in children is unclear, and the natural history of this condition is not yet fully elucidated. In the pediatric population, there is no consensus on whether the suspicion of CBD stones warrants a preoperative ERCP or whether an IOC should be performed routinely. Holcomb et al, in their first 100 pediatric laparoscopic cholecystectomies, found 6 children with preoperative ultrasonographic evidence of choledocholithiasis. These 6 children underwent preoperative ERCP to clear the duct, and interestingly, CBD stones were confirmed in only 2.

There is also a lack of consensus regarding the management of CBD stones seen by IOC. Routine CBD exploration or choledochoscopy, whether open or laparoscopic, is generally deemed too invasive, particularly in children. Postoperative ERCP seems a reasonable alternative and is advocated by many. However, the present report indicates that only a small percentage of patients with intraoperative documentation of choledocholithiasis will have retained stones postoperatively. Liu et al reiterate this conclusion, with their data showing a 50% negative ERCP for documenting CBD stones in at-risk patients. Moreover, ERCP, besides its well-documented morbidity (especially in cases of gallstone pancreatitis), carries the additional risk of general anesthesia and the unknown long-term effects of sphincterotomy in children. Prasii et al cite a 33% incidence of ERCP complications in children. In their study of 21 pediatric ERCP, 7 of the children developed pancreatitis or bleeding. This complication rate is much higher than the adult percentage of 5.4% cited in the multicenter trial of 2769 consecutive patients by Loperfido et al. This difference in the literature between adult and pediatric ERCP is probably a function of the technical difficulty of ERCP in children.

The relatively high incidence of gallstone pancreatitis (26% of all children with calculous disease) suggests that choledocholithiasis is more common in children than is generally recognized. The fact that 80% of the stones passed preoperatively and that the remaining 20% passed perioperatively suggests that the natural history of CBD stones in children differs from that in adults. A competent sphincter of Oddi and the absence of scarring may reduce the risk of stone impaction. The absence of upward effects of retained CBD stones in our series further suggests that an expectant attitude is preferable for choledocholithiasis and that ERCP should be reserved only for the rare cases of retained CBD stones in the postoperative period.

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REFERENCES