Common bile duct stones frequently accompany gallstones and can be identified by a variety of imaging modalities. Little is known about the time course of dilatation of the common bile duct after acute obstruction or of normalization after spontaneous passage of an obstructing stone. We describe a case showing rapid fluctuations in common bile duct diameter during 72 hours in a patient presenting with epigastric pain and vomiting. Initial emergency bedside ultrasonography revealed a distended gallbladder, a dilated common bile duct (17 mm), and an obstructing stone. Five hours later, ultrasonography performed in the radiology suite showed a normal common bile duct diameter (4 mm) and no obstructing stone. The patient was admitted, and during the course of hospitalization different imaging modalities reported fluctuations in common bile duct measurements, ranging from 4 mm on computed tomography to 14 mm on endoscopic retrograde cholangiopancreatography. This case demonstrates disappearance of an obstructing stone with normalization of a highly distended common bile duct during 5 hours, highlighting that gallstone disease may be highly dynamic, with the possibility of rapid changes of common bile duct diameter. Emergency physicians, who frequently depend on ultrasonography to diagnose biliary disease, should be wary of the potential for rapid changes of sonographic findings in these patients. [Ann Emerg Med. 2013;62:176-179.]

INTRODUCTION

Acute manifestations of gallstone disease are a common cause of emergency department (ED) visits. Biliary colic and acute cholecystitis are often the primary concern; however, choledocholithiasis is also present in up to 15% of cases. Early studies evaluating the accuracy of ED bedside ultrasonography to assess biliary disease were limited to evaluation of the gallbladder without concurrent evaluation of the biliary tract. Subsequent studies have shown ED bedside ultrasonography to have a high degree of specificity for the diagnosis of common bile duct dilatation, with a wide range of sensitivities, from 0% to 60%. Currently, depending on operator experience and training, evaluation of the common bile duct may be performed as a part of the ED bedside ultrasonographic assessment of the right upper quadrant. However, it is not a standard part of the examination as promulgated in the American College of Emergency Physicians' 2008 guidelines.

Choledocholithiasis is a dynamic disease process. Spontaneous migration of stones from a dilated common bile duct to the small intestine can occur, and normalization of the common bile duct diameter has been documented during periods of 24 to 72 hours. As such, measurements of common bile duct diameter may vary, depending on the time that the common bile duct is measured. This fact may impede the evaluation of acute choledocholithiasis in several ways. Some patients with biliary obstruction may pass a common bile duct stone before they receive diagnostic imaging; others with multiple small stones in the gallbladder may pass an obstructing stone into the common bile duct after an apparently normal imaging study result.

We present a case in which common bile duct measurement was a critical part of the ED bedside ultrasonographic evaluation of a patient with biliary colic who subsequently underwent a variety of diagnostic imaging tests of the right upper quadrant that revealed rapidly fluctuating common bile duct findings before definitive surgical care.

CASE REPORT

An 18-year-old otherwise healthy woman presented at approximately 8 AM with epigastric and right upper quadrant pain that woke her from sleep at 5 AM the previous morning. The pain was described as severe, stabbing, and nonradiating. It had a waxing and waning pattern that was aggravated by deep inspiration and movement but not by food intake. Acetaminophen had provided minimal relief. The patient had had 3 episodes of emesis of partially digested food, with no blood. She denied fever, chills, or any change in bowel habits. Medical and surgical history was unremarkable. She denied tobacco, alcohol, or illicit substance use. On physical examination, the patient had a blood pressure of 132/70 mm Hg, a pulse rate of 71 beats/min, a respiratory rate of 13 breaths/min, an oral temperature of 36.2°C (97.2°F), and oxygen saturation of 99% on room air. She was uncomfortable because of pain. Examination result of the heart and lungs was normal. She had mild epigastric tenderness, more severe on the right, with no rebound, guarding, palpable masses, or signs of
peritoneal irritation. Murphy’s sign was negative. Physical examination was otherwise noncontributory.

According to the clinical findings, ED bedside ultrasonography of the right upper quadrant was performed by the treating physician at 11:30 AM. The gallbladder was found to be distended, with multiple small stones, a thickened wall (3.3 mm), and a questionable small amount of pericholecystic edema. There was no sonographic Murphy’s sign. The common bile duct was 17 mm in diameter, with central intrahepatic cholestasis (Figure 1A, see Video E1, available online at http://www.annemergmed.com). An obstructing stone was observed in the pancreatic head that measured approximately 4 mm in diameter (Figure 1B, see Video E2, available online at http://www.annemergmed.com). Laboratory evaluation revealed a WBC count of $6 \times 10^3$ (normal = 4.0 to $11.0 \times 10^3$/L) and hemoglobin of 11.7 g/dL (normal = 12 to 16 g/dL), with normal electrolyte, serum amylase, and lipase levels. Hepatobiliary function test results were elevated, with alkaline phosphatase 118 units/L (normal = 32 to 91 units/L), aspartate aminotransferase 489 units/L (normal = 15 to 41 units/L), alanine aminotransferase 469 units/L (normal = 14 to 54 units/L), total bilirubin 3.0 mg/dL (normal = 0.3 to 1.2 mg/dL), and direct bilirubin 1.7 mg/dL (normal = 0.1 to 0.5 mg/dL).

A surgical consultation was obtained. The consultant requested radiology ultrasonography. At 4:15 PM, the radiology ultrasonographic result revealed gallstones, a mildly thickened gallbladder wall, at 4 mm, and associated pericholecystic fluid. The common bile duct was measured at 4 mm, with minimally dilated intrahepatic ducts (Figure 2A). The ultrasonographic technologist reported the presence of a sonographic Murphy’s sign. The consultants requested further delineation of the findings with a contrast-enhanced computed tomography (CT).
The natural history of common bile duct stone migration and associated changes in common bile duct diameter are poorly understood. The physiology of the smooth muscle wall of the extrahepatic biliary tract and how it changes after stone passage is not well characterized. In patients with surgical intervention, a minimum of a 35% decrease of the common bile duct diameter 5 days after endoscopic retrograde cholangiopancreatography and stone extraction is expected, and many have normalization of the common bile duct. In a study of patients with an episode of acute jaundice associated with gallstones, patients with a normal common bile duct on preoperative ultrasonography were found to have a common bile duct stone on intraoperative cholangiography 30% of the time. Conversely, patients with visible common bile duct stones or dilatation had no identified intraoperative stone in 36% of cases. In a study evaluating common bile duct diameters with several imaging modalities, including intraoperative cholangiography, Mueller et al documented similar variations to those described in the current article during periods of 1 to 7 days. They also described 1 case in which iatrogenic cystostomy tube contrast injections resulted in simultaneous dilatation of the common bile duct. To our knowledge, no previous study has demonstrated noniatrogenic variations in common bile duct diameter in periods as brief as those described in the current case.

As with our patient, various imaging modalities, including CT, MRI, and endoscopic retrograde cholangiopancreatography, may be used to measure the diameter of the common bile duct. The correlation between such measurements and ultrasonography has been studied before. Although good correlation between CT and ultrasonography has been reported, the actual CT measurements may be higher by 1.7 mm. Similarly, MRI measurements of extrahepatic bile ducts are on average 0.5 mm higher compared with those from ultrasonography. Wachsberg et al found that endoscopic retrograde cholangiography measurements were 1.7 to 1.9 mm higher than those obtained with ultrasonography. Other studies have found that cholangiographic techniques also tend to result in larger measurements of the common bile duct than ultrasonography does. The variability in measurements of the common bile duct in our case could have arisen from different imaging modalities. However, considering the consistently higher measurements obtained by other imaging modalities in comparison to ultrasonography, the finding of a maximum diameter by ultrasonography in our case makes this unlikely. Furthermore, the large changes observed in this case (varying from 17 to 6 to 4 to 14 mm) far exceed those found in studies comparing the imaging modalities.

Visualization of common bile duct stones may not be always feasible. Therefore, the common bile duct diameter measurement has been used to predict the presence of stones. In one large study, common bile duct dilatation made the presence of choledocholithiasis 10 times more likely. Nonvisualization of gallstones on endoscopic retrograde cholangiopancreatography is not uncommon. Sotoudehmanesh
et al.\textsuperscript{10} attributed the absence of sonographically identified common bile duct stones during endoscopic retrograde cholangiopancreatography to spontaneous passage, with a reported incidence of 18\% when the 2 procedures were separated by 6 hours to 3 days. Differences between endoscopic retrograde cholangiopancreatography and ultrasonographic measurements of the common bile duct can also be attributed to technique because contrast medium is injected under pressure into the common bile duct.\textsuperscript{11} It is therefore possible that the dilatation of the common bile duct that was documented on endoscopic retrograde cholangiopancreatography in our patient could have been due to artifactual iatrogenic factors.

CONCLUSION

We present a case demonstrating rapid fluctuations in common bile duct diameter during the clinical course of choledocholithiasis. Resolution of severe dilatation within 5 hours after ED bedside ultrasonography demonstrated this finding. Choledocholithiasis is a dynamic disease process. Emergency physicians should be wary of excluding biliary obstruction in patients with gallstone disease and a normal common bile duct measurement or of discounting abnormal findings on ED bedside ultrasonography that are not subsequently identified on other imaging modalities.

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