

## Ultrasound in Emergency Medicine

### EMERGENCY BILIARY SONOGRAPHY: UTILITY OF COMMON BILE DUCT MEASUREMENT IN THE DIAGNOSIS OF CHOLECYSTITIS AND CHOLEDOCHOLITHIASIS

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**Abstract—Background:** Measurement of the common bile duct (CBD) has traditionally been considered an integral part of gallbladder sonography, but accurate identification of the CBD can be difficult for novice sonographers. **Objective:** To determine the prevalence of isolated sonographic CBD dilation in emergency department (ED) patients with cholecystitis or choledocholithiasis without laboratory abnormalities or other pathologic findings on biliary ultrasound. **Methods:** We conducted a retrospective chart review on two separate ED patient cohorts between June 2000 and June 2010. The first cohort comprised all ED patients undergoing a biliary ultrasound and subsequent cholecystectomy for presumed cholecystitis. The second cohort consisted of all ED patients receiving a biliary ultrasound who were ultimately diagnosed with choledocholithiasis. Ultrasound data and contemporaneous laboratory values were collected. Postoperative gallbladder pathology reports and endoscopic retrograde cholangiopancreatography (ERCP) reports were used as the criterion standard for final diagnosis. **Results:** Of 666 cases of cholecystitis, there were 251 (37.7%) with a dilated CBD > 6 mm and only 2 cases (0.3%; 95% confidence interval [CI] 0.0–0.7%) of

isolated CBD dilation with an otherwise negative ultrasound and normal laboratory values. Of 111 cases of choledocholithiasis, there were 80 (72.0%) with a dilated CBD and only 1 case (0.9%; 95% CI 0.0–2.7%) with an otherwise negative ultrasound and normal laboratory values. **Conclusion:** The prevalence of isolated sonographic CBD dilation in cholecystitis and choledocholithiasis is <1%. Omission of CBD measurement is unlikely to result in missed cholecystitis or choledocholithiasis in the setting of a routine ED evaluation with an otherwise normal ultrasound and normal laboratory values. © 2014 Elsevier Inc.

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#### INTRODUCTION

Right upper quadrant (RUQ) abdominal pain is common in patients in the emergency department (ED). The goal of ED evaluation is to identify clinically significant biliary pathology, such as cholecystitis and choledocholithiasis, that may merit prompt surgical consultation, operative intervention, or admission. These patients typically undergo serum laboratory testing and most often receive a RUQ ultrasound as the first-line imaging

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modality. Focused point-of-care (POC) biliary ultrasound has been shown to expedite the care of patients presenting with possible biliary disease and decrease duration of stay in the ED (1). POC biliary ultrasound typically includes sagittal and transverse views of the gallbladder to assess for the presence or absence of gallstones and sonographic evidence of cholecystitis, such as gallbladder wall thickening > 3 mm (GWT), pericholecystic fluid (PCF), and sonographic Murphy's sign (SMS). Views of the portal triad are also obtained and the common bile duct (CBD) diameter is measured (2,3). From our experience teaching emergency physicians, residents, and medical students, it is the proper and timely identification of the CBD that proves most difficult for the novice sonographer.

The typical presentation of cholecystitis includes sonographic cholelithiasis with variable combinations of SMS, GWT, PCF, and abnormalities in serum blood testing (2,4). CBD diameter is not generally included in the diagnostic criteria for cholecystitis, but there is a paucity of published data looking specifically at the prevalence of CBD dilation in the setting of acute cholecystitis (2). Conversely, CBD dilation has been a traditional diagnostic marker for possible choledocholithiasis; however, the literature suggests that a significant proportion of ductal stones occur without sonographic CBD dilation and a majority of choledocholithiasis cases have concurrent serum laboratory abnormalities (5–7). We sought to determine what unique information CBD diameter adds to the evaluation for cholecystitis and choledocholithiasis in ED patients.

### *Goals of This Investigation*

The aim of this study was to determine the prevalence of isolated sonographic CBD dilation in ED patients with cholecystitis or choledocholithiasis without laboratory abnormalities or other pathologic findings on biliary ultrasound.

## **METHODS**

### *Study Design and Setting*

This was a retrospective chart review performed at a single academic, tertiary care hospital with Emergency Medicine and Radiology residency programs. The research team comprised two emergency ultrasound fellows, one emergency medicine resident, one medical student, and four undergraduate research assistants.

After approval by the institutional review board, master patient lists were obtained via a medical records query using codes from the *International Classification of Diseases, 9th revision* (ICD-9). The results were filtered to

return only those patients with an index visit through the ED. Two patient cohorts were evaluated.

In the first cohort, ICD-9 codes for cholecystectomy (i.e., 51.21, 51.22, 51.23, and 51.24) identified all patients between July 2000 and June 2010 who were admitted from the ED and who underwent cholecystectomy during the same hospitalization. Patients with a preoperative biliary ultrasound performed in the radiology department during their ED course and a postoperative pathology report were included. Patients lacking an ultrasound performed in the radiology department, a sonographic CBD measurement, or a pathology report were excluded.

The second cohort evaluated all ED patients between July 2000 and June 2010 who received a diagnosis of choledocholithiasis during the index ED visit or the resulting admission. ICD-9 codes for choledocholithiasis (i.e., 574.5, 574.51, 574.9, and 574.91) were queried, and returned charts were limited to those without concurrent ICD-9 codes for cholecystitis (i.e., 574.3, 574.4, 574.7, and 574.8). This distinction was made to specifically examine cases of isolated choledocholithiasis for which CBD diameter might be the only sonographic evidence of pathology. Choledocholithiasis patients were included in the second cohort if they received a biliary ultrasound performed by the radiology department during their ED course and excluded if no ultrasound performed by the radiology department was conducted, CBD was not measured by ultrasound, or patients were postcholecystectomy.

The presence or absence of POC biliary ultrasound was not specifically considered for patient selection in either cohort. Obtaining an ultrasound performed by the radiology department, regardless of POC biliary ultrasound, was standard practice at the institution for the majority of the study period.

### *Data Collection and Processing*

All members of the research team participated in medical chart review after one-on-one training on the use of the electronic medical record and proper data collection. A standardized data collection sheet was used for chart review. Demographic information, preoperative ultrasound findings, and concurrent laboratory values were collected for each patient. Postoperative pathology findings and endoscopic retrograde cholangiopancreatography (ERCP) results were included in data collection for patients in the first and second cohorts, respectively. Formal interrater reliability analysis was not performed, but a 10% cross-sectional sample of each participant's data was reviewed by a study coresearcher and cross-referenced with patient charts to ensure accuracy.

All ultrasound data were obtained from finalized radiology reports from studies universally read by the

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