

# Ultrasound in Emergency Medicine



## EXTRABILIARY PATHOLOGY IDENTIFIED BY RIGHT UPPER QUADRANT ABDOMINAL ULTRASOUND IN EMERGENCY DEPARTMENT PATIENTS

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**Abstract—Background:** The effectiveness of point of care (POC) right upper quadrant ultrasound (RUQ US) in the diagnosis of biliary disease has been well studied. Extrabiliary pathology that might remain undetected in the course of typical, focused POC RUQ US has not been directly examined. **Objectives:** Our objective was to determine the prevalence and clinical significance of extrabiliary findings (EBFs) seen on radiology-performed, comprehensive RUQ US. **Methods:** We conducted a retrospective review of all adult patients undergoing radiology-performed RUQ US in the emergency department (ED) between January 2007 and April 2012. Ultrasound findings and contemporaneous laboratory values were collected. EBFs were identified and further classified by clinical significance. **Results:** A total of 1579 charts were included, demonstrating a total of 1030 EBFs, with 747 (47.3% [95% confidence interval {CI}, 44.8–49.8%]) patients demonstrating  $\geq 1$  EBF. Of these EBFs, 184 were classified as clinically significant (CSEBFs) and 150 (9.5% [95% CI, 8.1–11.0%]) patients had  $\geq 1$  CSEBF. A total of 50 unspecified masses were seen in 47 (3.0% [95% CI, 2.1–3.8%]) patients, with 8 (0.5%) representing a previously undiagnosed malignancy. **Conclusion:** CSEBFs were seen in  $< 10\%$  of ED patients

undergoing comprehensive RUQ US. Nonspecific masses were seen in 3% of patients, but  $< 1\%$  of patients were found to have a new malignancy. © 2016 Elsevier Inc.

**Keywords—**biliary; emergency department; extrabiliary; right upper quadrant; ultrasound

### INTRODUCTION

Gallbladder disease affects approximately 20 million people in the United States. It is estimated that one-third of these patients will develop biliary colic, and each year 1% will develop a potentially life-threatening complication (1,2). Patients with suspected biliary disease are common in the emergency department (ED), and right upper quadrant ultrasound (RUQ US) is typically the initial imaging modality of choice. Consequently, RUQ US is the most common sonographic study ordered in the ED (3). In an effort to improve patient care and ED flow, more emergency physicians (EPs) are directly performing point of care (POC) RUQ US at the bedside to evaluate patients with suspected gallbladder disease (1,2,4,5).

POC RUQ US is a focused, limited study for biliary pathology that concentrates on evaluation of the gallbladder and common bile duct (CBD). American College of Emergency Physician (ACEP) guidelines for POC

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RUQ US specifically include evaluation for the presence or absence of the following parameters: gallstones/sludge, gallbladder wall thickness, sonographic Murphy sign, pericholecystic fluid, and CBD diameter (5,6). In contrast, traditional RUQ US is a radiology-performed, comprehensive study evaluating the gallbladder, extra- and intrahepatic biliary tree, liver, pancreas, kidney, inferior vena cava (IVC), and other nearby anatomic structures (1,7).

Multiple studies have shown that EP-performed POC RUQ US performs comparably to radiology-performed studies in the diagnosis of biliary disease, and POC RUQ US has been shown to decrease patients' duration of ED stay (1,4,8). While the accuracy of POC RUQ US in the diagnosis of biliary disease has been well studied, its role in extrabiliary pathology is less certain. Questions persist regarding the clinical significance of extrabiliary pathology that might be missed with POC RUQ US alone. Anecdotally, concerns about missed diagnoses present a potential barrier to the more widespread use of POC RUQ US by EPs, especially those with less ultrasound experience. It is true that significant pathology, such as malignancy, may present without other clinical findings and might only be diagnosed by direct sonographic visualization; however, the extent of this risk is unknown. To our knowledge, there is no published study to date addressing the prevalence or incidence of extrabiliary findings (EBFs) identified by abdominal US.

This study aims to determine the prevalence and clinical significance of EBFs seen on radiology-performed, comprehensive RUQ US performed on ED patients.

## METHODS

### *Study Design and Setting*

This study is a single-center, retrospective chart review conducted at a university-affiliated community teaching hospital with an emergency medicine (EM) residency and an annual ED census of >75,000 patients. The research team was comprised of 2 EM attendings, 3 EM residents, and 1 clinical research assistant.

### *Study Protocol*

After approval by the institutional review board, a master patient list was obtained via an electronic medical record (EMR) query on dates between January 1, 2007 and April 30, 2012. Patients were included if they were  $\geq 18$  years of age and had received a radiology-performed RUQ US upon presentation to the ED. Patients were excluded if they were <18 years of age, if a RUQ US was not obtained at the initial ED

presentation, or if other advanced imaging, such as a computed tomography (CT) scan or cholescintigraphy, was performed before the RUQ US. Data were extracted from the EMR using a standardized closed-response data collection form. The majority of recorded elements were presented in a dichotomous manner, but the option to free-text "other" findings was included under each of the specific organ systems (i.e., biliary, hepatic, pancreatic, renal, adrenal, and IVC).

All physician members of the research team participated in chart review and data collection after one on one instruction by the principal investigator. Reviewers were blinded to which findings were considered clinically significant, but were not blinded to the overall objective of the study. Two different researchers dually extracted a portion of the charts, and interrater reliability was evaluated using the Cohen kappa coefficient or prevalence and bias-adjusted kappa (PABAK) for findings with a low prevalence (9,10). For the purposes of determining the final data, disagreements between reviewers were resolved by a reevaluation of the chart by the principal investigator.

All abnormal findings noted on the US radiology reports were recorded. Our institution does not have a radiology residency, and all RUQ US were formally interpreted and dictated by board-certified attending radiologists.

Abnormal US findings were classified as biliary or EBF. Findings were considered "biliary" if they specifically involved the gallbladder or the CBD because these organ structures are typically evaluated in a POC RUQ US. Abnormal findings involving other anatomic structures were considered EBFs. Of note, the EBF group did include findings that are technically biliary by anatomic location but that have the potential to be missed by focused POC RUQ US, such as intrahepatic ductal dilation and pneumobilia.

An EBF was further classified as clinically significant (CSEBF) if further workup or imaging was recommended within the radiology report or if the finding suggested an acute etiology for the patient's symptoms. Findings corresponding to the latter definition were determined a priori on the basis of their potential to affect clinical management.

Age, sex, and laboratory values obtained during the ED visit were also collected, including aspartate aminotransferase (AST; normal range, 13–39 IU/L), alanine aminotransferase (ALT; normal range, 7–52 IU/L), alkaline phosphatase (AP; normal range, 34–104 IU/L), lipase (LIP; normal range, 11–82 U/L), and total bilirubin (TB; normal range, 0.3–1.0 mg/dL).

The primary outcome of the study was the prevalence of CSEBFs identified on radiology-performed RUQ US.

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