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## **Ultrasound in Emergency Medicine**

### **DIAGNOSIS OF DIVERTICULITIS BY BEDSIDE ULTRASOUND IN THE EMERGENCY DEPARTMENT**

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□ **Abstract**—This case report describes a potential novel indication for the use of bedside ultrasound in the Emergency Department. The patient in this case had some of the signs and symptoms of diverticulitis. The “pseudo-kidney” sign, which was thought to represent acute diverticulitis, was appreciated on a rapid, bedside ultrasound and confirmed by computed tomography. Knowledge of the sonographic appearance of diverticulitis may aid emergency physicians in making this diagnosis promptly, and facilitate the appropriate disposition. © 2006 Elsevier Inc.

□ **Keywords**—ultrasound; diverticulitis; novel indications; pseudo-kidney sign; dome sign

cholecystitis, and to establish an intrauterine pregnancy in the pregnant patient (1). However, new indications for the use of bedside US may arise as emergency physicians gain more experience with it. In this report, we describe the use of US by an EP to facilitate the diagnosis of acute diverticulitis in a patient with abdominal pain. The sonographic findings of acute diverticulitis are reviewed and the potential role of bedside goal-directed US examination by the EP for patients with left lower-quadrant pain is discussed.

#### **CASE REPORT**

#### **INTRODUCTION**

Bedside ultrasound (US) is becoming an important diagnostic tool for the practicing emergency physician (1,2). Emergency physicians frequently use goal-directed bedside US to identify specific findings that facilitate patient management in various clinical scenarios, rather than as a formal diagnostic study. In the patient who presents with abdominal pain, the specific goals of the US examination by the emergency physician (EP) are currently limited to evaluation of the following: abdominal aorta for aneurysmal dilatation, kidneys for hydronephrosis, gallbladder for the presence of gallstones and signs of

A previously healthy 62-year-old woman presented to the OB/Gyn assessment area with a history of lower abdominal pain for 3 days. The pain was described as cramping in nature with pain greater on the left side and radiating to the back. The patient had a fever at home and nausea but had not vomited, and had never had this pain before. There was no diarrhea, bright red blood per rectum, dysuria, nor gross hematuria. The transvaginal ultrasound by the gynecology resident showed a physiologic amount of free fluid in the rectouterine pouch but no adnexal masses or other abnormalities were noted. The patient was referred to the Emergency Department

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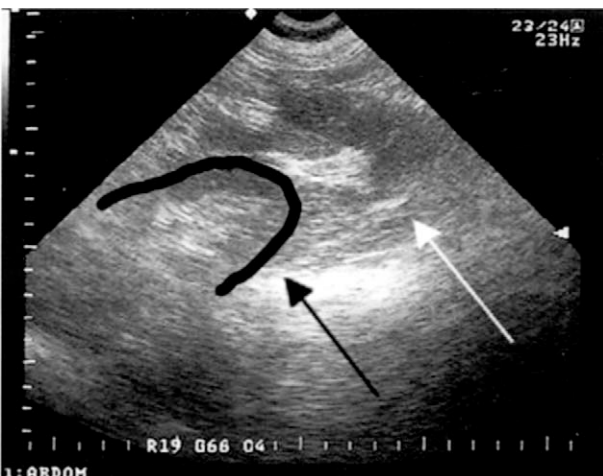
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(ED) at LAC+USC Medical Center with a provisional diagnosis of nephrolithiasis.

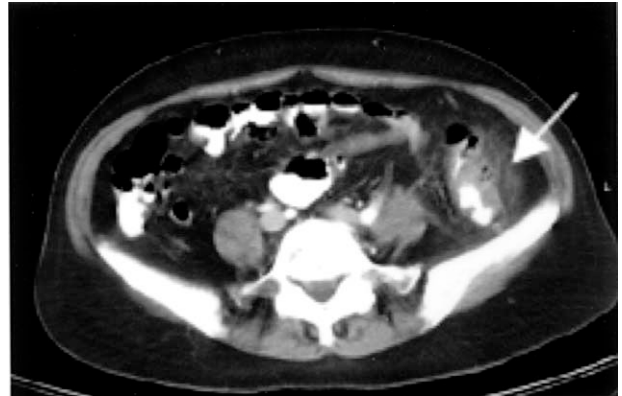
In the ED, the patient's initial vital signs were a blood pressure of 134/57 mm Hg, heart rate of 73 beats/min, respiratory rate of 20 breaths/min, and temperature of 36.1°C (97.0°F). The patient was alert, cooperative, and in no apparent distress during the examination. The head, neck, chest, cardiovascular and back examinations were unremarkable. On abdominal examination, there was marked tenderness to palpation in the left lower quadrant but bowel sounds were present, the abdomen was otherwise non-tender, and there was no rebound tenderness or involuntary guarding. The rectal examination was normal and a stool sample was negative for occult blood. The neurological, musculoskeletal, and skin examinations were likewise unremarkable.

The complete blood cell count showed a white blood cell (WBC) count of 10.1 K/cumm with a normal differential, hemoglobin of 11.2 g/dL, hematocrit 33.2%, and platelets of 254 K/cumm. The basic serum chemistry panel was unremarkable. The microscopic urinalysis revealed 5–10 RBC/HPF and 1–3 WBC/HPF but no bacteria.

A bedside ultrasound examination was performed by one of the authors (J.B.), an emergency physician. Standard ultrasound evaluations of the aorta, right upper quadrant and kidneys were unremarkable. In a departure from the standard protocols of goal-directed ultrasound for emergency physicians, the transducer was subsequently placed directly over the area of abdominal tenderness in the left lower-quadrant. A mass with a kidney-like appearance was observed at this location, which was



**Figure 1.** The “pseudo-kidney” sign. The black arrow shows the left kidney, which is demarcated by the black line. The white arrow shows the sonographic appearance of acute diverticulitis, which is described as the “pseudo-kidney” sign.



**Figure 2.** CT scan appearance of acute diverticulitis, indicated by the white arrow.

believed to be thickened bowel (Figure 1). The patient expressed mild discomfort at the probe site, which increased with pressure. Diverticulitis was suspected by clinical and sonographic findings and was confirmed by a computed tomography (CT) scan of the abdomen (Figure 2). The patient was admitted to the general medicine service for intravenous antibiotics, intravenous fluids, and bowel rest. She was discharged the following day on oral antibiotics after tolerating a liquid diet and was instructed to advance to a high fiber diet as tolerated.

## DISCUSSION

Since 1985, several authors have described the sonographic findings of acute colonic diverticulitis. Parulekar was the first to describe the sonographic appearance of acute diverticulitis as a hypoechoic mass with a central echogenic focus, which he coined the “pseudo-kidney” sign (3). Another author recently referred to the same appearance as the “dome” sign (4). Other sonographic findings consistent with acute diverticulitis include the presence of multiple round or oval foci of varying echogenicity protruding from the colon in both the transverse and longitudinal planes, localized hypoechoic bowel wall thickening > 4 mm, air-containing diverticulae, abscesses, and fluid filled loops (5–7). Focal left lower-quadrant tenderness that increases with pressure is a helpful finding to determine the optimal site for sonographic examination.

Since its initial description, multiple studies have shown that ultrasound is both sensitive and specific in diagnosing diverticulitis (5,8–10). Although the majority of studies are from the radiology literature, a 1997 study in the *British Journal of Surgery* showed that surgery residents with limited training in ultrasound were able to use bedside US to diagnose diverticulitis with an accu-

racy of 88% (9). Computed tomography scan is often the preferred diagnostic study for evaluating acute diverticulitis; however, one prospective comparison of CT scan and US for acute diverticulitis showed a similar performance of the two modalities. In that study, which utilized traditional ultrasound performed by radiologists, both CT scan and US had a diagnostic accuracy of 84%, with no statistically significant differences in sensitivity or specificity (10).

Goal-directed bedside US has been shown to have a significant impact on real-time decision-making in the ED for patients with accepted indications for abdominal ultrasound (2). We recommend the development of a new protocol for the goal-directed use of bedside US to diagnose acute diverticulitis in patients with localized left lower quadrant tenderness. If, with further experience, it can be demonstrated that EPs can perform bedside US for this indication with sufficient accuracy, it may eventually facilitate diagnosis, direct management, and expedite disposition in clinically suggestive cases. It may also ultimately reduce the need for CT scan, enabling patients to avoid exposure to significant doses of ionizing radiation. Ultrasound may eventually reduce the time spent in making the diagnosis of diverticulitis.

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