



Case Report

The gastric fluid sign: an unrecognized false-positive finding during focused assessment for trauma examinations

Abstract

The FAST exam has become the current standard in the evaluation for free intraperitoneal fluid in most emergency departments. Knowledge of false negative and false positive findings is imperative to improve accuracy. We detail a case in which an important false positive findings previously not discussed in the medical literature was noted. The ability of the physician to recognize the “gastric fluid” sign and make the adjustments accordingly could improve the specificity of the FAST exam, preventing non-therapeutic laparotomies.

The focused assessment for trauma examination has become the current standard for free intraperitoneal fluid determination in most emergency departments. Knowledge of false-negative and false-positive findings is imperative to improve accuracy. We detail a case in which an important false-positive finding previously not discussed in the medical literature was noted. The ability of the physician to recognize the “gastric fluid” sign and make adjustments accordingly could improve the specificity of the focused assessment for trauma examination, preventing nontherapeutic laparotomies.

An intoxicated 45-year-old man was transported to the emergency department (ED) after a high-speed motor vehicle accident. The patient was an unrestrained driver. At the scene, the patient was awake, alert, and oriented but complained of diffuse abdominal and chest pain. The patient denied any past medical history.

On presentation to the ED, vital signs were as follows: heart rate (HR), 120 beats per minute; blood pressure (BP), 90/40 mm Hg; and respiration rate (RR), 16 breaths/min. Finger-stick blood glucose level was 120 mg/dL. Initial resuscitation was started with the patient’s airway, breathing, and circulation noted to be intact. Two large-bore intravenous lines were placed, and a 2-L normal saline bolus was infused. Initial portable chest and pelvis radiographs were unremarkable. A focused assessment for trauma (FAST) examination was performed by the emergency medicine resident, with a question of free fluid

noted in the left upper quadrant (Fig. 1). Measurement of BP was repeated with a reading of 104/60 mm Hg, and the decision to send the patient for a computed tomography (CT) of the abdomen and pelvis was reached by both the emergency medicine and trauma surgical attending.

Upon return from abdominal CT, the patient’s vital signs were noted to be as follows: HR, 110 beats per minute; BP, 105/60 mm Hg; and RR, 16. The CT was read by the radiology attending as negative for free fluid in the peritoneal cavity. The patient’s BP and HR normalized over the subsequent 4 hours. The patient had an uneventful hospital course.

The FAST examination has become the standard tool for rapid evaluation of patients with trauma presenting to an ED. The FAST examination is composed of 4 to 6 rapid, real-time views of the abdomen and pelvis, including, at a minimum, right upper quadrant, left upper quadrant, cardiac, and suprapubic views.

Studies published in the trauma literature have demonstrated that point-of-care, limited ultrasonography examinations are extremely accurate [1,2]. In one study, the FAST examination was 93.4% sensitive and 98.7% specific for the detection of hemoperitoneum and visceral injury [2]. Moreover, rapid ultrasound assessment of patients with trauma in the ED shortens the mean ED to operating room time, which has been shown to improve clinical outcomes [1,3].

Like all diagnostic tests, knowledge of the various false-positive findings can prevent inappropriate management of

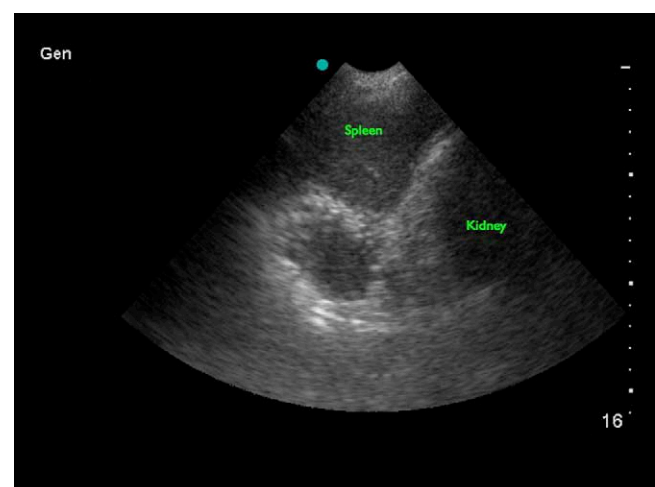


Fig. 1 Ultrasound image of the left upper quadrant.

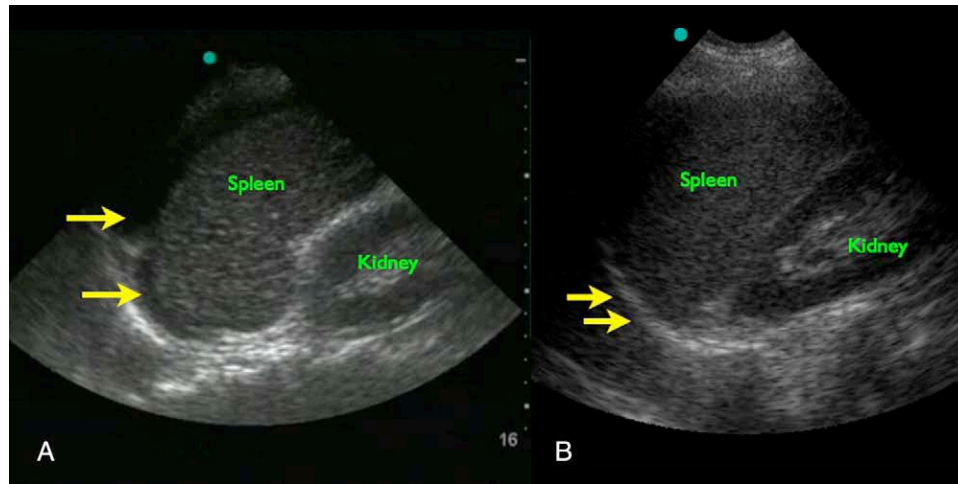


Fig. 2 A, Free intraperitoneal fluid between diaphragm and spleen. B, No fluid between diaphragm and spleen.

critically ill patients. Multiple false-positive findings during FAST examination have been detailed, such as hemothorax, perinephric fat pad, and pericardial fat pad. Knowledge of these false-positive findings can help the clinician using the FAST scan to accurately evaluate a patient, and prevent a nontherapeutic laparotomy.

In this case, we detail a false-positive finding not previously described in the literature. This finding, noted in a patient with trauma during a FAST examination, was the result of the imaging of the proximal gastric flexure as it lay against the spleen, the “gastric fluid” sign. With increasing numbers of emergency medicine physicians becoming proficient in using the FAST scan to make clinical decisions in patients with trauma, we hope to detail this false-positive sign and demonstrate how it can be distinguished from true intraperitoneal fluid.

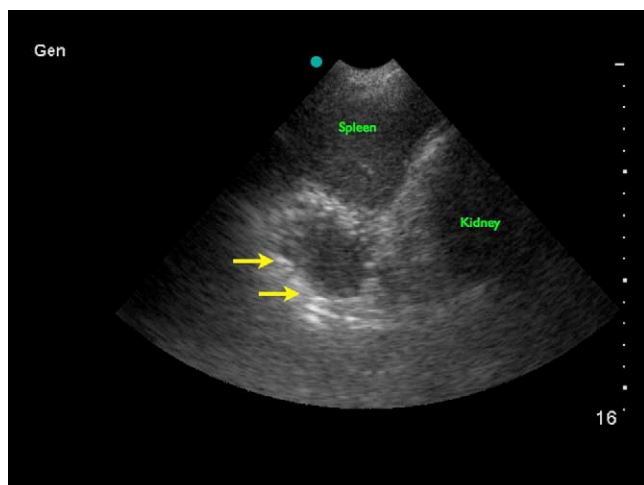


Fig. 3 Gastric fluid ultrasound with arrow delineating round walls of gastric flexure.

During a FAST examination, there are 2 key methods to distinguish the normal fluid-filled gastric flexure abutting the spleen from true perisplenic fluid. First, free fluid lies in a dependent portion of the perisplenic region in between the spleen and diaphragm or the spleen and kidney, forming an anechoic “stripe” (Fig. 2), whereas gastric fluid is oval and surrounded by a hyperechoic covering (Fig. 3). Second, during the FAST examination, the physician can fan the probe in a more dependent manner to demonstrate the space between the spleen and the diaphragm in the posterior aspect of the peritoneal cavity. Anatomically, the gastric flexure is located in the anterior peritoneum, whereas free intraperitoneal fluid would accumulate in the posterior dependent region in between the diaphragm

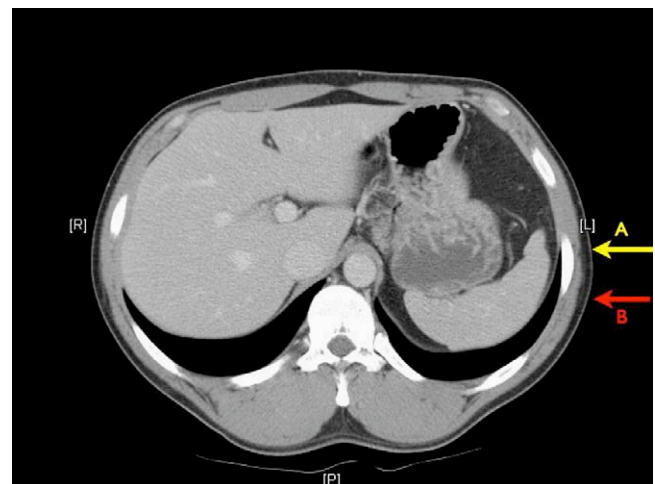


Fig. 4 Computed tomographic image of patient. A, Anterior ultrasound probe position may show gastric flexure/gastric fluid sign on ultrasound. B, Posterior ultrasound position allows for imaging in a more dependent position and reduces the chances of visualizing the gastric flexure/gastric fluid sign.

and the spleen. By fanning the probe in a more posterior position, the physician can adequately demonstrate a perisplenic space that does not contain free intraperitoneal fluid (Fig. 4).

Since noting this false positive finding, we have detected a few more cases of gastric fluid sign. Because of ultrasonographic pattern recognition and movement of the probe to a more posterior/dependent portion of the spleno-phrenic area, we have been able to reduce false-positive FAST interpretations. We understand that experienced ED sonographers may have seen this false-positive interpretation multiple times during years of scanning, but with an increasing number of inexperienced physicians incorporating the FAST examination into clinical practice, delineation of this never-described false-positive finding is necessary. We hope that recognition of this finding and description of a method to differentiate from a true false-positive finding will prevent erroneous FAST interpretations and inadvertent nontherapeutic laparotomies.

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References

- [1] Melniker LA, Leibner E, McKenney MG, et al. Randomized controlled clinical trial of point-of-care, limited ultrasonography for trauma in the emergency department: the first sonography outcomes assessment program trial. *Ann Emerg Med* 2006;48:227-35.
- [2] Rozycki GS, Shackford SR. Ultrasonography: what every trauma surgeon should know. *J Trauma* 1996;40:1-4.
- [3] Clarke JR, Trooskin SZ, Doshi PJ, et al. Time to laparotomy for intra-abdominal bleeding from the trauma does affect survival for delays up to 90 minutes. *J Trauma* 2002;53:420-5.