

2022

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Margarita S. Popova
George Washington University

Khai-El Johnson
George Washington University

Daniel R. King
George Washington University

Megan T. Quintana
George Washington University

Kendarius Talton
George Washington University

See next page for additional authors
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APA Citation

Popova, M. S., Johnson, K., King, D. R., Quintana, M. T., Talton, K., & Boniface, K. S. (2022). Bedside diagnosis of hemoperitoneum by characteristics of fluid visualized on focused assessment with sonography in trauma exam in a patient in non-traumatic shock. *World Journal of Emergency Medicine*, 13 (2). <http://dx.doi.org/10.5847/wjem.j.1920-8642.2022.018>

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Authors

Margarita S. Popova, Khai-El Johnson, Daniel R. King, Megan T. Quintana, Kendarius Talton, and Keith S. Boniface

Case Letter

Bedside diagnosis of hemoperitoneum by characteristics of fluid visualized on focused assessment with sonography in trauma exam in a patient in non-traumatic shock

Margarita S. Popova¹, Khai-El Johnson², Daniel R. King³, Megan T. Quintana⁴, Kendarius Talton³, Keith S. Boniface¹

¹ Department of Emergency Medicine, George Washington University, Washington, DC 20037, USA

² Department of Family Medicine, George Washington University, Washington, DC 20037, USA

³ Department of Anesthesia and Critical Care Medicine, George Washington University, Washington, DC 20037, USA

⁴ Center for Trauma and Critical Care, Department of Surgery, George Washington University, Washington, DC 20037, USA

Corresponding Author: Keith S. Boniface, Email: kboniface@mfa.gwu.edu

World J Emerg Med 2022;13(2):000–000

DOI: 10.5847/wjem.j.1920-8642.2022.018

Dear editor,

Focused Assessment with Sonography in Trauma (FAST) enables clinicians to identify injury at the bedside in patients who are too unstable for computed tomography (CT). FAST is most commonly used for the evaluation of trauma, but is also essential to evaluate undifferentiated shock, as in the Rapid Ultrasound for Shock and Hypotension (RUSH) exam.^[1]

FAST is a core skill for clinicians who evaluate trauma patients.^[2] Over 96% of trauma centers incorporate FAST in trauma, and Advanced Trauma Life Support (ATLS) guidelines recommend FAST for evaluation of trauma patients.^[3] As a result, FAST has replaced diagnostic peritoneal lavage (DPL) for assessment of traumatic intraperitoneal bleeding.

One limitation of FAST is that it is difficult to distinguish the etiology of the fluid - whether it is blood, ascites, bowel contents, or fluid from cyst rupture. We present a case in which the ultrasound characteristics of fluid identified on FAST in a persistently hypotensive patient led to a diagnostic procedure, changing the patient's clinical course.

CASE

A 61-year-old man with cirrhosis and alcohol use came to the hospital by ambulance after being found

unresponsive after syncope at home. On arrival, the patient was hypotensive with a Glasgow Coma Scale of 3, and was intubated for airway protection. Initial labs demonstrated a pH of 7.2, ammonia of 30 $\mu\text{mol/L}$, hemoglobin of 8.8 g/dL, and lactate of 12 mmol/L. In the emergency department (ED), he lost pulses twice for 2 minutes each, both times requiring one round of cardiopulmonary resuscitation and 1 mg of epinephrine prior to return of pulses. The patient was hypotensive but fluid responsive, receiving 4 L of crystalloid in the ED.

In the intensive care unit (ICU), he again became hypotensive and vasopressors were started. Point-of-care echocardiography showed an under-filled left ventricle and flat inferior vena cava. FAST showed anechoic free fluid in the left upper quadrant (Figure 1), with echogenicity adherent to the spleen suggesting hemorrhage and clotted blood just cephalad to the anechoic fluid of Figure 1 (Figure 2). A video of free fluid in the left upper quadrant can be found in the supplementary files of this paper (Supplemental Video). There was no pleural or pericardial fluid.

Ultrasound-guided paracentesis was immediately performed, withdrawing blood (Supplemental Figure 1). Repeat hemoglobin was 4.3 g/dL, and patient was transfused four units of red blood cells and four units of plasma. The patient underwent CT of the abdomen/

pelvis, and trauma surgery was consulted.

The CT revealed a liver mass with contrast extravasation, likely a ruptured hepatocellular carcinoma (Supplemental Figure 2). The patient went to interventional radiology for embolization and his hemodynamics improved. Unfortunately, postoperatively his hemodynamics deteriorated, his family changed the patient's code status to comfort care, and he passed away.

DISCUSSION

Many cases illustrate the utility of FAST for undifferentiated shock,^[4-6] but this case demonstrates the importance of characterizing the fluid identified on ultrasound. A significant limitation of the FAST is that identified fluid in the abdomen is not necessarily intra-abdominal blood but could represent ascites, perforated viscus, or pus. In cirrhotic ascites, the liver may have

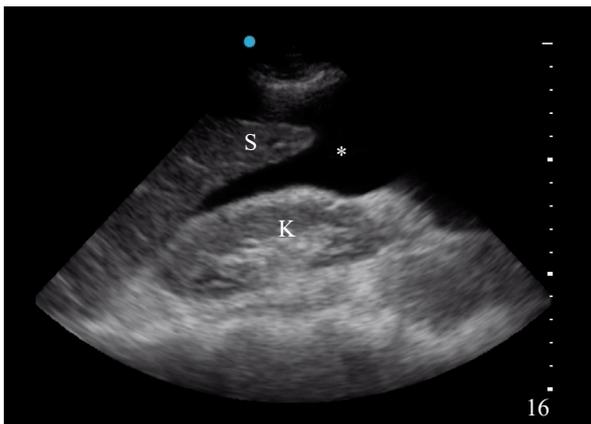


Figure 1. The left upper quadrant view of the FAST exam showing anechoic free fluid (*) in the space between the spleen (S) and the left kidney (K), or the splenorenal space.

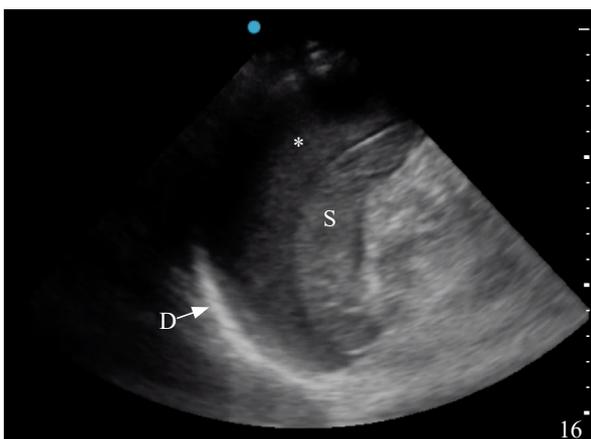


Figure 2. The left upper quadrant view of the FAST exam showing the spleen (S), diaphragm (D), and echogenic free fluid (*) with a layering density along the posterior diaphragm suggested that this free fluid was a combination of both active bleeding and clotted blood.

increased echogenicity, an irregular border, and decreased size, and the ascitic fluid tends to be anechoic.^[4] In perforated viscus, the fluid appears as non-homogenous (“dirty fluid”) and pneumoperitoneum may be seen.^[7] In hemorrhagic conditions such as in this case, blood can be anechoic if fresh or can have a mixed appearance, with blood clot appearing as echogenic areas.^[1]

In this case, the echogenic perisplenic fluid suggested clotted blood, and the characterization of the actual fluid was critical to differentiate hemoperitoneum from ascites or infection, with their markedly different treatments. Notably, while CT revealed the origin of the bleeding to be the right upper quadrant, the FAST free fluid was in the left upper quadrant, highlighting the importance of keeping the differential broad and not localizing pathology to the area imaged on ultrasound.

The aspiration of fluid to determine its origin has its roots in the DPL, but the identification of blood in a patient with a positive FAST does not require DPL. A 10 mL syringe and a 21 gauge needle are all that is needed.^[8] The procedure can be done rapidly and streamlines clinical decision-making at the bedside of the critically ill, whether in the ED or ICU.

CONCLUSIONS

FAST is indicated for evaluation of shock and is an integral part of the emergency physicians' toolkit. The ultrasound characteristics of clotted blood may help physicians diagnose the cause of a positive FAST, resulting in expedited definitive care. A rapid sampling of fluid using a needle and syringe can provide information at the bedside to guide management.

Funding: This project did not receive any funding. The authors have no financial or other conflicts of interest.

Ethical approval: GW Institutional Review Board confirms that case series of 3 patients or less are exempt from IRB review.

Conflicts of interests: The authors declare no conflicts of interest regarding the publication of this paper.

Contributors: All authors meet ICMJE definition of authorship. The manuscript has been read and approved by all the authors, the requirements for authorship have been met, and each author believes that the manuscript represents honest work.

All the supplementary files in this paper are available at <http://wjem.com.cn>.

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Received June 04, 2021

Accepted after revision October 20, 2021