Abdominal Focused Assessment with Sonography for Trauma

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▲ The clock-face analogy, showing a dog's abdomen divided into 4 quadrants.

More than 10 years ago, a novel ultrasound protocol, abdominal focused assessment with sonography for trauma (aFAST), was described in veterinary literature[1] and has changed the way emergency patients are evaluated for intraabdominal trauma. One of the most common signs of abdominal trauma is detection of free fluid within the peritoneal space. Most frequently, this fluid is a result of hemorrhage from blunt force trauma to the spleen or liver, although rupture of the urinary bladder or gallbladder is also a source of abdominal fluid in emergency patients. Before the widespread use of ultrasonography, blind abdominocentesis and radiography were the most readily available techniques to assess patients for peritoneal fluid. However, radiography has been shown to be less sensitive than ultrasonography, with ultrasonography experimentally being up to twice as sensitive as radiography with relatively small amounts of fluid (up to 2 mL/lb).[2]

Although veterinary radiologists and trained ultrasonographers were detecting abdominal fluid long before the aFAST protocol was described, the goal of the initial study was to show that individuals without clinical ultrasonographic experience could identify free abdominal fluid with adequate accuracy.[1] Of the 100 aFAST examinations performed in the study, later review by a radiologist found only 2 instances in which the clinician made a diagnosis of "no fluid" when fluid was detected on the saved images (ie, false negative diagnosis).[1] However, the true number of false negatives may be higher as images were not rescanned by a skilled ultrasonographer. In reality, any additional

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CC = cysto–colic
DH = diaphragmatic–hepatic
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true negative diagnoses are likely due to less than 2 mL/lb of abdominal fluid, which are most likely clinically insignificant, and the aFAST examination is still a good point-of-care test.

The aFAST examination may be performed with the patient in lateral or dorsal recumbency. Traumatic wounds (eg, flail chest) may dictate which position to use. Right lateral recumbency is often the position of choice, as it facilitates examination of the heart when performed as part of a thoracic FAST (tFAST) examination.[3] Lateral recumbency generally eases respiratory effort compared with dorsal recumbency.

The aFAST examination divides the abdomen into 4 quadrants. A good way to perform the examination is to use a clock-face analogy and begin at the 12-o'clock position (***Clock-face***, previous page). The starting position, designated the diaphragmatic–hepatic (DH) position, is caudal to the xiphoid process; it is useful for finding fluid between liver lobes and the diaphragm. The next quadrant lies at the 3-o'clock position over the left flank and is designated the spleno–renal (SR) position. Both the spleen and left kidney should be visible within this region. At the 6-o'clock position over the caudal abdomen, the urinary bladder and colon can be seen, making this window the cysto–colic (CC) position. The final quadrant within the aFAST examination is over the right flank at the 9-o'clock position, designated the hepato–renal (HR) position. The right kidney and liver should be visible within this region.[1,4]

aFAST = abdominal focused assessment with sonography for trauma

AFS = abdominal fluid scoring

CC = cysto–colic

DH = diaphragmatic–hepatic

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SR = spleno–renal

tFAST = thoracic focused assessment with sonography for trauma

Conclusion

Applying the abdominal fluid scoring (AFS) system when evaluating each quadrant of the abdomen during the aFAST examination may be useful. The AFS is a 4-point scale that starts at 0 (negative for peritoneal fluid). One point is assigned for each quadrant in which fluid is identified, up to 4 points total. The *amount* of fluid in a particular quadrant *does not* affect the score (ie, any amount of fluid, minimal-to-severe, receives the same point value of 1). It is important to note that AFS scores are only validated in dogs when the examination is performed with the patient in right lateral recumbency. Dogs with AFS scores of 3 and 4 are more likely to require blood transfusions compared with dogs with AFS scores of 0 to 2.[4]

As with many skills in veterinary medicine, becoming proficient at the aFAST examination and maneuvering the ultrasound probe requires practice. The aFAST examination can be easy to learn and a good way to identify peritoneal fluid in patients with recent motor vehicle trauma. The aFAST examination also has applications in patients that present with an acute abdomen but no known trauma. With gained proficiency, clinicians may be able to diagnose other conditions (eg, splenic mass, gallbladder mucocele) that could require acute intervention.

STEP-BY-STEP
ABDOMINAL FOCUSED ASSESSMENT WITH SONOGRAPHY FOR TRAUMA

WHAT YOU WILL NEED

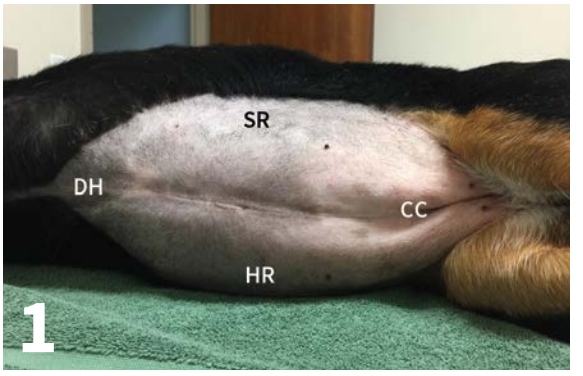
- Ultrasound machine
- Ultrasound transducer (probe)
- Coupling gel
- Alcohol
- Clippers

Author Insight

With an average examination time of 6 minutes or less, aFAST can be performed quickly and while other diagnostics or stabilizing procedures are performed by additional team members.

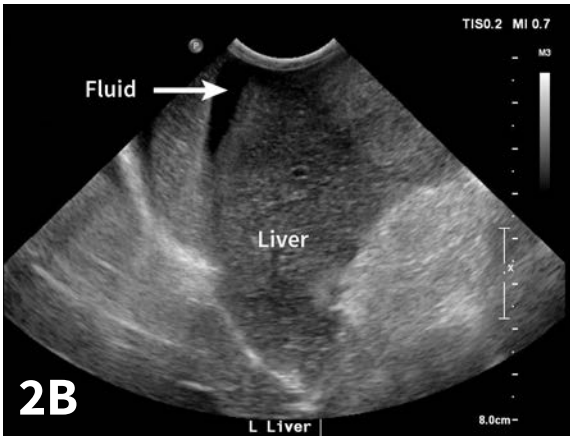
STEP 1

Place the patient in right lateral recumbency (unless traumatic injuries dictate otherwise). Use clippers to remove fur (at least a 4- to 5-cm square) from the 4 quadrants to be examined. Apply coupling gel to the ultrasound probe or liberally use isopropyl alcohol to wet the skin.



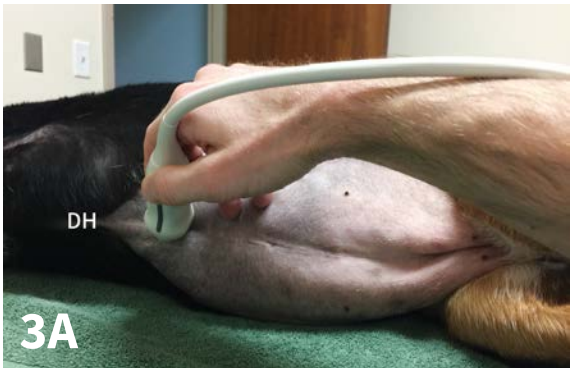
STEP 2

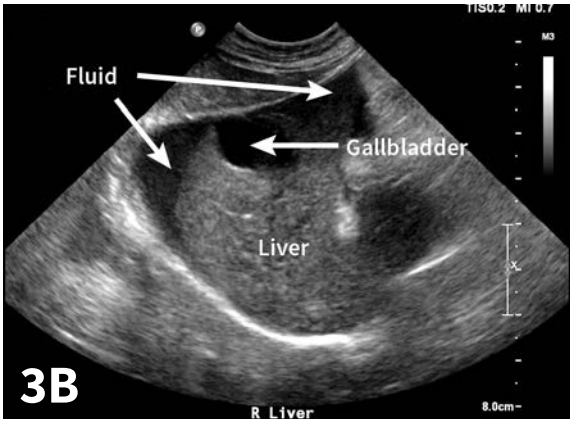
Start at the DH position by placing the ultrasound probe just caudal to the xiphoid process, with the marker on the transducer pointing cranially. This creates a sagittal image of the liver. If the stomach is full, keep the transducer in the same spot, but angle it farther cranially (toward the heart) to better visualize the liver. Once the liver is identified, fan the transducer to the left and right while keeping the probe in the same spot (caudal to the xiphoid). Explore the perimeter of the shaved region with the probe before saving or printing an image for the medical record.



STEP 3

With the transducer remaining in the same DH position (just caudal to the xiphoid), rotate the probe 90º to the left (counterclockwise) to create a transverse image of the liver (marker on the transducer should be facing the patient's right side). The gallbladder should be visible on the left side of the screen. As before, fan the transducer cranially toward the diaphragm and then caudally toward the stomach. Save or print an appropriate image.



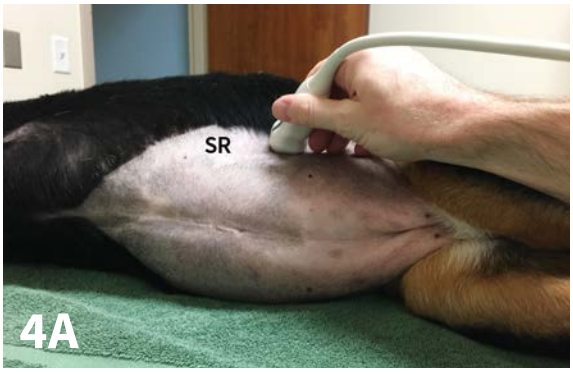


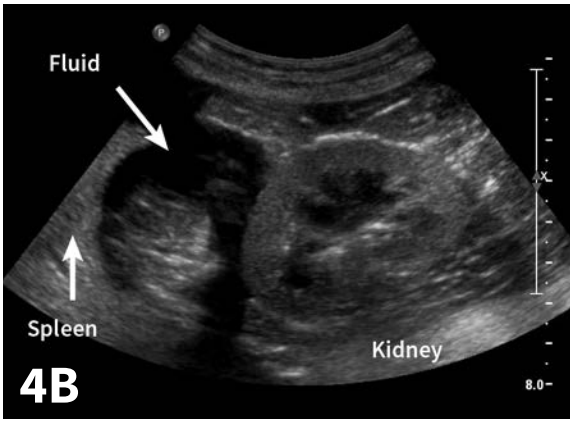
Author Insight

The DH position is the most common quadrant in which peritoneal fluid is detected when the patient is in right lateral recumbency.

STEP 4

Move to the SR position over the left flank (near 3 o'clock using the clock-face analogy). A portion of the spleen and left kidney should be visible. As before, start by imaging in the sagittal plane (marker on the probe facing cranially) and fan the transducer to the right (down) and left (up). Save an image before rotating the probe 90º to the left to create a transverse image. Fan the probe cranially and caudally to search for fluid between the spleen and left kidney. Save or print an appropriate image.





Author Insight

Abdominal hemorrhage may appear anechoic (completely black) or mildly-to-moderately echoic (like a snow globe). Urine and bile are almost always anechoic unless they are accompanied by pus, urinary crystals, or sludge.

STEP 5

Move to the CC position over the caudal abdomen just cranial to the pelvis (6-o'clock position). The urinary bladder and colon should be visible. Begin by imaging in the sagittal plane, remembering to fan the probe to the left and right. Then rotate the probe 90º to the left to image in the transverse plane. Fan the probe cranially and caudally. Save an image in both sagittal and transverse planes.

Author Insight

When peritoneal fluid is near the apex of the urinary bladder, a hole may appear to be present in the bladder wall. This is an artifact and should not be diagnosed as a bladder rupture.

STEP 6

Move to the HR position over the right flank (9-o'clock position). As this position is dependent against the examination table (assuming the patient is in right lateral recumbency), examining this region can sometimes be difficult in obese patients, and locating the right kidney and liver may be challenging. Even if these organs are not identified, the goal of examining this quadrant is still to search for peritoneal fluid. As before, begin by imaging in the sagittal plane (marker on the probe facing cranially) and fan the probe to the left (up) and right (down). Save an image before rotating the probe to the transverse plane and fanning the probe cranially and caudally. Finish the examination by saving a transverse image.

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See page 87 for references.