



PHILIPS

Ultrasound

Quick guide

FAST exam

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The more you see, the more you know

The Focused Assessment with Sonography in Trauma (FAST) exam is a critical component of the initial evaluation for hemoperitoneum in unstable trauma patients. The FAST exam can be performed at the bedside, allowing the physician to rapidly determine if free intraperitoneal fluid or a pericardial effusion is present.^{1,2} The FAST exam is included in the Advanced Trauma Life Support (ATLS) protocol developed by the American College of Surgeons.

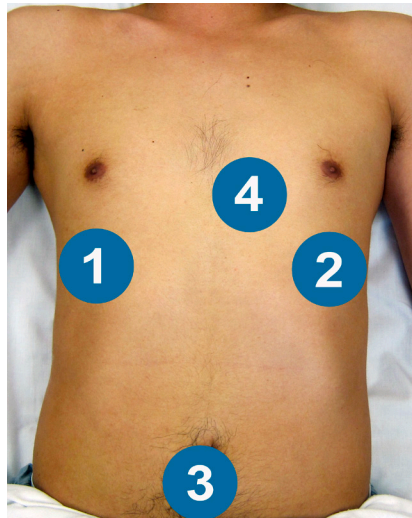
FAST exam

The basics of the FAST exam

Indications

Clinical indications for performing the FAST examination include

- Blunt torso trauma
- Penetrating torso trauma³
- Concern for ruptured ectopic pregnancy
- Undifferentiated hypotension
- Trauma in pregnancy



The Core FAST windows

Standard anatomic regions evaluated during the FAST exam include

- 1 Right upper quadrant (RUQ)
- 2 Left upper quadrant (LUQ)
- 3 Pelvis
- 4 Subcostal

In cases where an additional evaluation of the chest for pneumothorax and hemothorax is included, the examination is termed “E-FAST,” denoting it as an extended FAST exam. Detailed information on the use of ultrasound for thoracic assessment can be found in the [POC lung ultrasound](#) tutorial by Dr. Mike Stone.

Transducer selection

A low-frequency curvilinear array transducer can be used. Alternatively, a low-frequency phased array transducer can be used. Some clinicians find the phased array transducer particularly helpful for obtaining upper quadrant windows through the intercostal spaces.

Sequencing of the FAST exam

The FAST exam is typically performed during the circulatory assessment in the primary trauma survey, after assessment of airway and breathing. The FAST

windows can be performed in any order, and ensuring a complete evaluation of each potential space is far more important than proceeding in a predetermined sequence.

It is the authors’ practice to begin with a right upper quadrant window in cases of adult blunt trauma, a subcostal window in cases of penetrating thoraco-abdominal trauma, and a pelvic window in cases of pediatric blunt trauma.

FAST exam

Ultrasound technique – RUQ

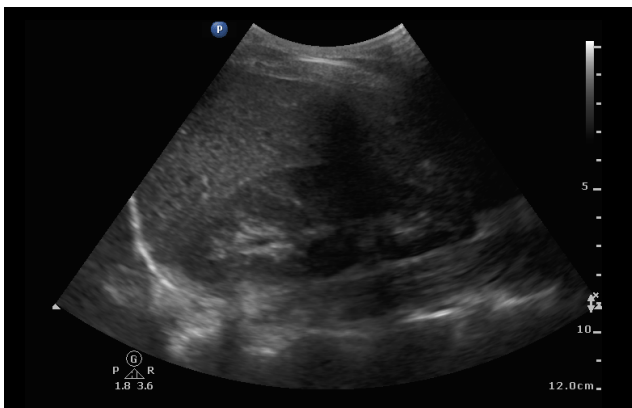
- The transducer is initially placed in the right mid-to-anterior axillary line at the level of the xiphoid process⁴ with the directional indicator oriented superiorly toward the patient's axilla.
- The transducer is then aimed so the ultrasound beam is directed downward, towards the patient's back, using the liver as an acoustic window to visualize Morison's pouch (the interface of the liver and right kidney).
- Morison's pouch is typically located between the 7th and 9th ribs. To obtain an ideal view the transducer may need to be rotated so it is parallel to the ribs.
- The RUQ view is only considered complete after visualization of the diaphragm, Morison's pouch, the inferior pole of the right kidney, and the inferior tip of the liver.
- FAST is **positive** if anechoic-free fluid is identified in Morison's pouch.
- Fluid cephalad to the diaphragm is in the thoracic cavity, and should raise concern for hemothorax in trauma.



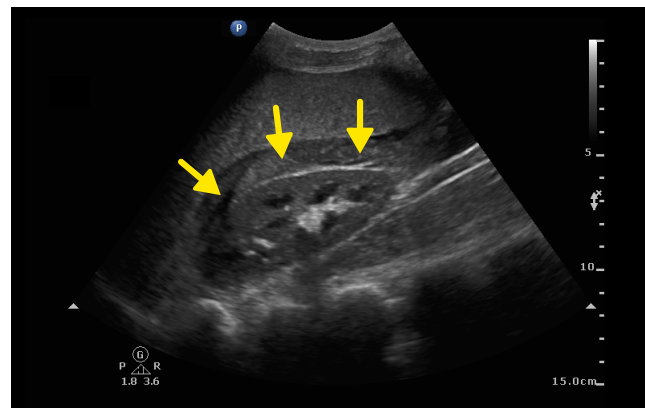
Initial transducer placement for the RUQ view



Angulation of the transducer to obtain the RUQ view



Normal RUQ



Positive RUQ. Complex fluid with internal echoes representing acute hemorrhage with associated clot filling Morison's pouch.

FAST exam

Ultrasound technique – LUQ

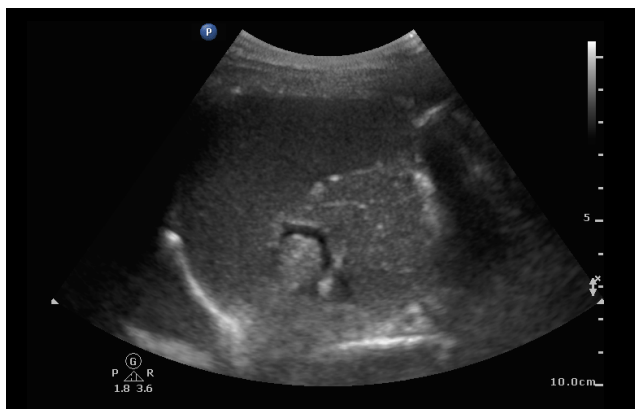
- The left upper quadrant view is often more technically challenging, as the spleen affords a much smaller acoustic window as compared to the liver.
- The transducer is placed in the left posterior axillary line, at the level of the xiphoid process, with the directional indicator oriented towards the patient's axilla.
- The transducer is then rotated clockwise to obtain an angle parallel to the ribs.
- A tilting motion should be used so that visualization of the subphrenic area, inferior tip of spleen, and splenorenal recess is achieved.
- Of note, due to the splenorenal ligaments, fluid will preferentially accumulate in the subphrenic space before spreading to the splenorenal recess.



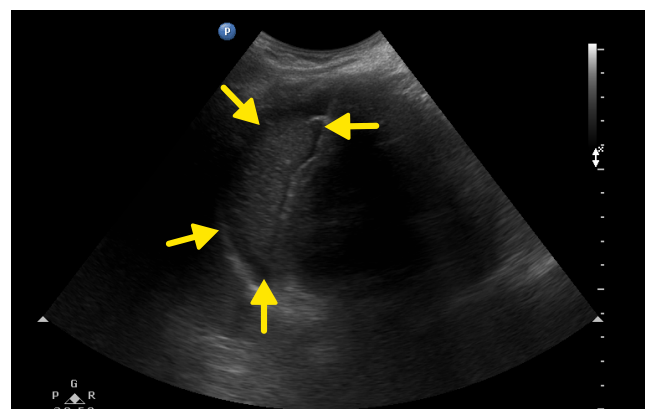
Initial transducer placement for the LUQ view



Angulation of the transducer to obtain the LUQ view



Normal LUQ



Positive LUQ. Anechoic fluid surrounding the spleen.

FAST exam

Ultrasound technique – pelvis

- Place transducer just cephalad to the pubic symphysis.
- Obtain both a transverse view (directional indicator oriented to the patient's right) and longitudinal view (directional indicator oriented to the patient's head).
- The transducer must be tilted caudal to look down over the pelvic brim and into the area of the bladder and surrounding structures.
- In males, the vesicorectal space is evaluated, just cephalad to the prostate and seminal vesicles, deep to the bladder.
- In females, the rectouterine space (pouch of Douglas) is evaluated, just deep to the uterus.

- Tilt the transducer to thoroughly investigate the area in the transverse and longitudinal planes.
- Ideally, this view is performed before catheterization and decompression of the bladder.

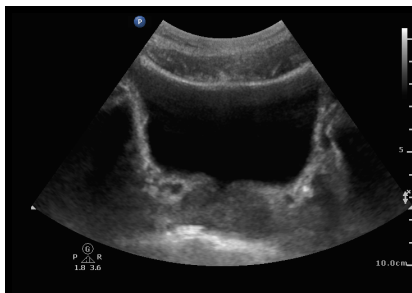


Transducer placement for transverse view

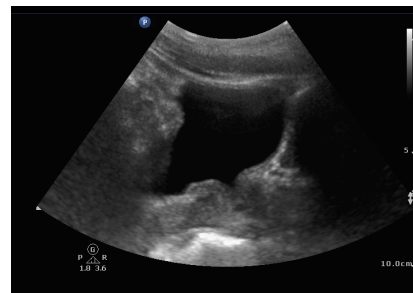


Transducer placement for longitudinal view

Normal male pelvic transverse view



Normal male pelvic longitudinal view



Normal female pelvic transverse view



Normal female pelvic longitudinal view



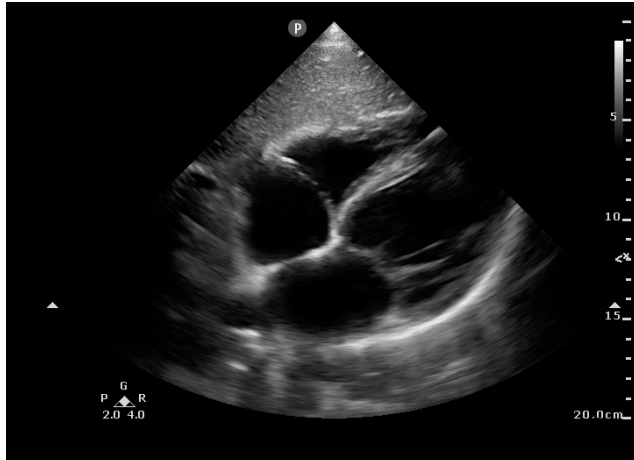
FAST exam

Ultrasound technique – subcostal

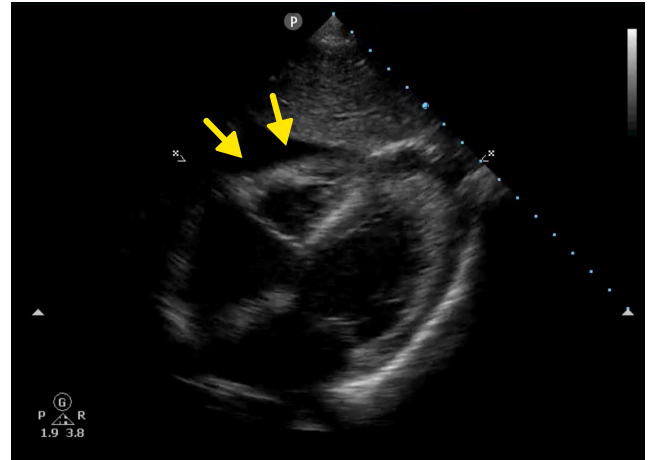
- The subcostal view optimally evaluates the dependent regions of the pericardial space.
- The transducer is placed immediately caudad to the xiphoid process, with the directional indicator oriented to the patient's right.
- Hold the transducer with an overhand grip to help depress it into the abdomen. The plane of the transducer should be kept as parallel as possible to the abdominal wall.



Transducer placement for subcostal view



Normal subcostal view



Positive subcostal view. Anechoic fluid in the pericardial space, most visible in the near field adjacent to the right ventricular free wall.

Note: the parasternal view is an alternative to the subcostal view. Detailed information on how to obtain the parasternal view can be found in the [Intro to POC echo](#) quick guide by Dr. Anne-Sophie Beraud.

Clinical pearls

- Each window of the FAST exam is associated with specific pitfalls that may lead to false positive interpretations.
 - In the RUQ, perinephric fat may be mistaken for free fluid or organizing hematoma. Perinephric fat tends to have uniform thickness with a characteristic echotexture of linear hyperechoic foci. In contrast, organizing hematoma is typically associated with areas of free fluid. If in doubt, log-roll the patient and repeat the exam, observing for a change in the appearance of the area of interest that would suggest movement of clot and fluid (perinephric fat should appear unchanged).
 - In the LUQ, be cautious not to confuse the splenic hilum or gastric contents for free fluid.
 - In the pelvic view, the seminal vesicles are hypoechoic and located posterior to the bladder, and may be mistaken for free fluid. However, they have smooth, curved borders, are symmetrical, and predictably located just cephalad to the prostate
 - When obtaining the pelvic view, it is often necessary to decrease the far-field gain as the bladder allows intense “through transmission” of the ultrasound waves (an artifact known as posterior acoustic enhancement). If uncorrected, this may result in an excessively high gain deep to the bladder, which can obscure the presence of free fluid.
- Depth and gain often need adjustment while moving between the different views.
- The exact minimal volume of free intraperitoneal fluid required for detection using ultrasound is unknown, with reports ranging from 100 to over 600 mL.
- Although scoring systems have been developed to help quantify the amount of free fluid visualized in hopes of predicting patients who will require a therapeutic laparotomy,⁵ these lack external validation and the overall clinical context remains the most accurate guide to patient management decisions.
- In stable patients, small to moderate amounts of free fluid are often managed after further evaluation with CT imaging, especially given the growing popularity of non-operative management for solid organ injury.
 - However, unstable patients with positive FAST exams are likely to benefit from laparotomy, with larger volumes of free fluid predicting more severe intra-abdominal hemorrhage.
- Importantly, the retroperitoneum is not reliably evaluated during the FAST exam, and retroperitoneal hemorrhage remains a possibility in the setting of a negative FAST.

Clinical pearls

- Pericardial effusions in trauma can accumulate rapidly and result in cardiac tamponade despite relatively small volumes.
- Beck's triad (low blood pressure, distended neck veins, and distant muffled heart sounds) occurs late and inconsistently, and the detection of any significant pericardial fluid in a patient with penetrating chest trauma should raise concern for hemopericardium.
- Penetrating cardiac injuries with significant lacerations to the pericardial sac may result in decompression of bleeding into the thoracic cavity, and the absence of detectable pericardial fluid on ultrasound evaluation, despite the presence of a cardiac injury.⁶
- Remember that the FAST exam detects free intraperitoneal fluid, but does not differentiate ascites from peritonitis from hemorrhage. As always, the clinical context remains the most important tool for differentiation between these entities. In patients with known or suspected cirrhosis and a positive FAST exam in the setting of trauma, diagnostic paracentesis may be performed if the patient is unstable or clinical suspicion for hemoperitoneum is high.
- The small amount of free fluid associated with bowel perforation is often insufficient to allow detection during the FAST exam, and patients with suspected intestinal injury may benefit from serial FAST exams in addition to other imaging modalities.

References

1. Rozycki GS, Ballard RB, Feliciano DV, Schmidt JA, Pennington SD. Surgeon-performed ultrasound for the assessment of truncal injuries: lessons learned from 1540 patients. *Ann Surg*. 1998 Oct;228(4):557-67.
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3. Rozycki G, Feliciano D, Ochsner MG, et al. The Role of Ultrasound in Patients with Possible Penetrating Cardiac Wounds: A Prospective Multicenter Study. *J Trauma*. 1999 46(4):543-552.
4. Shokoohi H, Boniface KS, Siegel A. Horizontal subxiphoid landmark optimizes probe placement during the Focused Assessment with Sonography for Trauma ultrasound exam. *Eur J Emerg Med*. 2012 Oct;19(5):333-7.
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6. Ball CG, Williams BH, Wyrzykowski AD, Nicholas JM, Rozycki GS, Feliciano DV. A caveat to the performance of pericardial ultrasound in patients with penetrating cardiac wounds. *J Trauma*. 2009 Nov;67(5):1123-4.

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