# Speed is the Key: An Overview of FAST and eFAST Exam

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## Case

At midnight, you receive a patch from EMS that they are bringing a 47-year-old male involved in a motor vehicle collision to the Emergency Department. The patient is conscious and was driving 50 km/h when he collided with another vehicle turning left. Airbags were deployed and the patient was wearing a seatbelt. The patient is breathing spontaneously but is experiencing 7/10 chest pain and 5/10 abdominal pain with no signs of open lacerations or abrasions. Vitals are: heart rate 115bpm, blood pressure 113/84, respiratory rate 18, O2 saturation 97% and temperature 37.6°C.

On patient arrival the Trauma Team performs a primary assessment. As you are observing the Team Leader asks you to perform the Extended Focused Assessment with Sonography for Trauma (eFAST) on a patient.

## What is FAST and eFAST?

Point of care ultrasound has many advantages including bedside availability, ease of use, inexpensive cost, non-invasiveness, and reduction of patient's exposure to radiation[1]. FAST is one of many examination skills using point of care ultrasound to rapidly screen trauma patients for free fluids in the peritoneal cavity[2]. In the mid-2000s eFAST was introduced, a method which added examination of the lungs and heart to the traditional FAST examination to detect pneumothorax and pericardial effusion[3].

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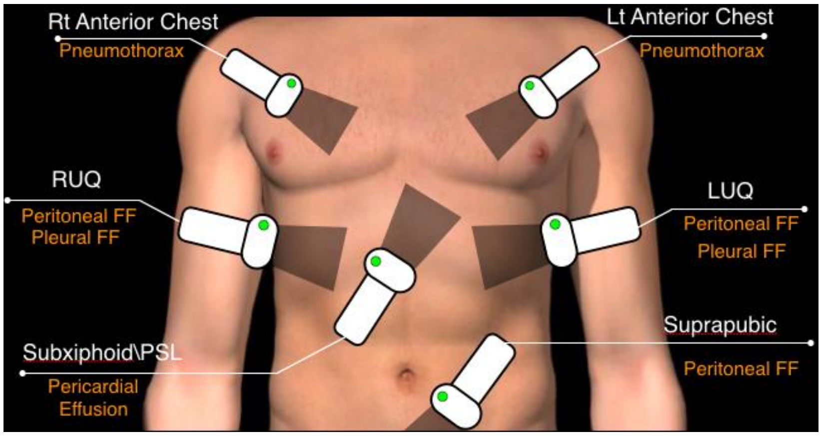

Figure 1: Five views of eFAST examination[4]: pericardial (subxiphoid/PSL), right flank (RUQ), left flank (LUQ), pelvic (suprapubic) and thoracic (right and left anterior chest) views. FF: Free fluid. PSL: Parasternal long

# Technique

The patient is positioned supine and a 2-5MHz curvilinear probe is used for all views to reduce the delays caused by switching between transducers.
The eFAST exam is comprised of five views:

**Pericardial view (subxiphoid view):**
The probe should be positioned just below the xiphoid process in the transverse orientation, angled towards the patient's left shoulder[1,4]. If there is pericardial effusion, a hypoechoic line will be present in between hyperechoic pericardium and the myocardium. To enhance the image the liver can be used as an acoustic window[1].

Figure 2: Subxiphoid ultrasound of the heart showing pericardial effusion[4].

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**Right flank view:**

In the right upper quadrant fluid most commonly collects in Morrison's pouch. Place the probe along the posterior to mid-axillary line between the 8th and 11th rib spaces and scan the area in a coronal view[1]. Moving the probe anteriorly and posteriorly will help evaluate the entire space of Morrison's pouch. It is also important to check the subphrenic area by moving the probe first cephalad and then caudally to check the liver tip, right paracolic gutter, and inferior pole of the kidney[1,2]. Rib shadowing can be minimized by asking the patient to take a deep breath or rotating the probe counter clockwise.

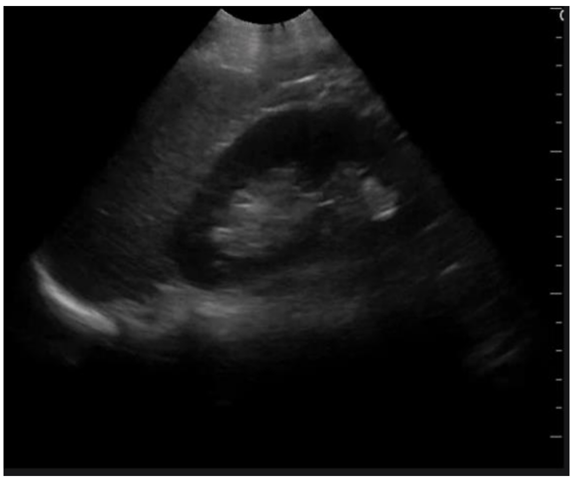

Figure 3: Right upper quadrant ultrasound with no free fluid[4].

**Left flank view:**

Place the probe along the posterior axillary line between the 6th and 9th rib spaces in the coronal orientation[1]. Fanning the probe anteriorly and posteriorly will scan the splenorenal and perisplenic spaces. It is also important to move the probes cranially and caudally to check for fluids in subphrenic space and left paracolic gutter respectively. Rib shadowing can be minimized by rotating the probe clockwise in this view.


Figure 4: Left upper quadrant ultrasound with no free fluid visualized[4].

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**Pelvic (suprapubic) view:**
The probe should be placed just above the pubic symphysis in transverse orientation to scan the rectovesical space (Pouch of Douglas) in men and the rectouterine and vesicouterine pouches in women[1,2]. It is important to fan through the entirety of the bladder in both sagittal and transverse orientations to complete the examination of the pelvic peritoneum[2,4].

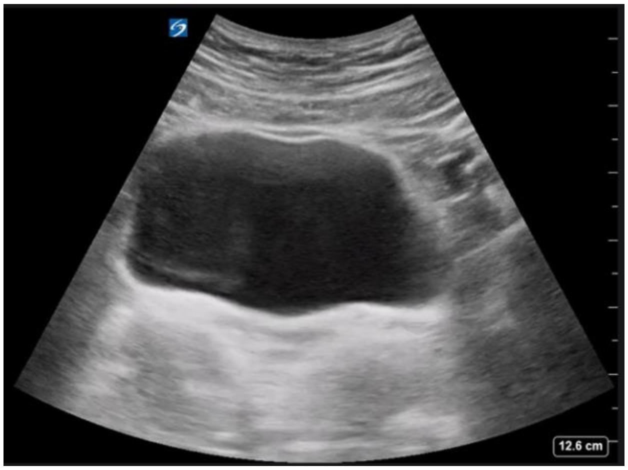

Figure 5: Suprapubic ultrasound through the bladder in transverse orientation with no free fluid visualized[4].

**Thoracic view:**
For the thoracic view, the probe may be changed to a linear transducer (5 to 10MHz) for optimal visualization of the visceral and parietal pleura of the lung[2].The probe should be placed in longitudinal orientation along the midclavicular line at the third to fourth intercostal space where free air usually accumulates in the case of pneumothorax. Under normal lung conditions, the visceral and parietal pleurae slide against one another, creating what is called the "ants marching" sign. Absence of this sign indicates the presence of pneumothorax[4].
Check the "ants marching" sign here[5]!

# How effective is eFAST?

Ultrasound specificity and sensitivity depends significantly on the user. However, numerous studies showed that the sensitivities of the FAST exam were between 85% to 96% and specificities were over 99%[1]. For eFAST, the sensitivity of finding pneumothorax was 91% and the specificity was 99%[2]. Considering that experienced users can perform a FAST exam in less than 5 minutes, and that the exam can decrease time to surgical intervention, length of hospital stay, and number of CT scans and diagnostic peritoneal lavages (DPL) performed, FAST is a very effective exam in trauma situations[1].

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# What are the limitations of FAST and eFAST?

Limitations of the FAST and eFAST exams include varying levels of operator training and high false negative and positive rates in certain situations.
Most errors made by an operator occurred during their first ten FAST exams. Accuracy improved steadily thereafter, until plateauing after 25-50 exams performed. Some of the common causes of error included inadequate gain and/or depth settings and incomplete anatomic interrogations[3].
False negatives are also a significant limitation of FAST and eFAST exams. The sensitivity of the peritoneal exam was 85% when the free fluid was less than 150 cc to 200 cc. Serial FAST exams can minimize false negatives but factors such as obesity, clotted blood and subcutaneous emphysema remain a challenge to identifying free fluids using ultrasound[1,6].
As for false positives, pre-existing ascites or pleural and pericardial effusions due to medical conditions may be misidentified as hemorrhage in emergency situations when there is a lack of time to investigate patients' medical records in detail[6]. Other causes of false positives include pericardial cysts, seminal vesicles, epicardial fat pads and the descending aorta being misidentified as an effusion[6].

# Future directions of FAST and eFAST exams

Prehospital use of FAST has become more widespread, especially in the setting of medical transport. Helicopter paramedics performing eFAST showed 46% sensitivity and 94.1% specificity for detection of hemoperitoneum and 18.7% sensitivity and 99.5% specificity for detection of pneumothorax[3].
The role of contrast-enhanced ultrasound for detection of parenchymal organ intra-abdominal injury is currently being studied. The use of contrast-enhanced ultrasound could potentially reduce radiation exposure for patients, especially children and female patients who are pregnant or of child-bearing age[3].

# Cast Conclusion:


Figure 6: Ultrasound showing pericardial cyst[7]

Upon performing the eFAST exam, you report to the Team Leader that the scan is negative for peritoneal fluid and pneumothorax but positive for a pericardial effusion. The Team Leader re-examines the pericardium and notes a correction: the patient has a pericardial cyst, not effusion[7]. After the eFAST exam is complete and the patient has been stabilized, he is sent to the ward for close observation.

## References:


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