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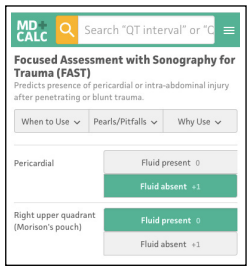

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Focused Assessment With Sonography for Trauma (FAST)

Introduction: Focused Assessment with Sonography for Trauma (FAST) predicts the presence of pericardial or intra-abdominal injury after penetrating or blunt trauma.

Points & Pearls

- Focused Assessment with Sonography for Trauma (FAST) assesses for fluid in the pericardium or abdomen (hemopericardium or hemoperitoneum, respectively).
- The traditional 4 views consist of a subxiphoid view of the heart and pericardium, right and left upper quadrant windows, and the pelvis.
- More recently, the extended FAST (eFAST) has entered into clinical practice with the addition of bilateral thoracic views to assess for pneumothoraces and hemothoraces.
- **Negative FAST does not exclude injury.** Ultrasound is user dependent; therefore, clinicians should be cautious in interpretation of negative FAST. Sensitivities of abdominal and suprapubic views in FAST vary widely, with ranges of 22% to 98% reported in recent literature (Richards 2017, Carter 2015).
- In penetrating thoracic trauma, pericardial view sensitivity approaches 100% (Matsushima 2017, Ball 2009, Rozycki 1999), but cardiac injury can be missed if there is concomitant pericardial laceration allowing decompression into the left chest (Ball 2009).
- If clinical suspicion for injury persists despite negative FAST, FAST should be repeated, additional investigations should be performed, or intervention should be pursued, depending on the patient's clinical condition.

Advice

- Most clinicians use the low-frequency phased array ultrasound probe (cardiac probe) to obtain all windows in FAST.
- **Pericardial:** Place the probe in the subxiphoid area and orient toward the patient's left shoulder. Apply downward pressure to look under the costal margin and toward the heart. The heart and pericardium will come into view, allowing inspection for hemopericardium and ultrasound findings of cardiac tamponade.
- **Right upper quadrant:** Place the probe in the right anterior to midaxillary line (between the eleventh and twelfth ribs). Visualization of the hepatorenal recess (Morison's pouch) allows the assessment for hemoperitoneum in the right upper quadrant. Blood most likely accumulates here if hemoperitoneum is present.
- **Left upper quadrant:** Apply the transducer firmly onto the skin in the left posterior axillary line (between the ninth and tenth ribs) to visualize the splenorenal and subphrenic spaces.
- In practice, it is important to remember that the right and left upper quadrant views are often more posterior than anticipated. It can

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Why to Use
FAST is a rapid, noninvasive, and repeatable imaging modality that can guide the surgeon in the decision to operate. It is performed in the trauma bay, and does not require patient transport out of the emergency department, which is risky for unstable patients.

When to Use
- FAST should be used liberally in the evaluation of trauma patients.
- It is especially useful in patients with penetrating thoracic trauma and in unstable patients after blunt abdominal trauma.

Next Steps
FAST results alone should not determine the decision to operate. However, FAST can be a helpful adjunct in clinical decision-making, particularly in an unstable blunt trauma patient, in order to rapidly assess the chest and abdomen for potential causes of hypotension.

Suggested Management
The clinician must consider additional clinical information including hemodynamic stability and clinical suspicion for injury.

Pericardial FAST (penetrating thoracic trauma)
- **Positive:** Emergent surgical intervention is recommended. Median sternotomy is preferred if the patient is stable; otherwise, use left anterolateral thoracotomy.
- **Equivocal:** Pericardial window or formal TTE is recommended.
- **Negative:** Close clinical monitoring or discharge are recommended, according to clinical suspicion for injury.

Abdominal FAST (blunt abdominal trauma)
- **Positive:** In the unstable patient, emergent exploratory laparotomy is recommended. In the stable patient, cross-sectional imaging (CT scan) is recommended.
- **Equivocal:** In the unstable patient, DPA is recommended. In the stable patient, cross-sectional imaging (CT scan) is recommended.
- **Negative:** In the unstable patient, DPA is recommended if clinical suspicion for intra-abdominal bleeding exists. In the stable patient, CT scan, close clinical monitoring, or discharge are recommended, according to clinical suspicion for injury.

Abbreviations: CT, computed tomography; DPA, diagnostic peritoneal aspiration; TTE, transthoracic echocardiography.

be helpful to bring the probe all the way down to the stretcher in order to best visualize these windows.
- **Suprapubic:** Place the transducer superior to the pubic symphysis and fan the probe inferiorly to visualize the bladder.

Critical Actions
Repeating FAST while preparing to perform diagnostic peritoneal aspiration is useful to quickly reassess unstable patients with blunt abdominal trauma who have an initially negative FAST. Intra-abdominal hemorrhage may not be significant enough on presentation to be FAST-positive initially.

Be cautious if pericardial FAST is negative in patients with penetrating thoracic trauma, especially if unstable. Cardiac injuries can decompress through the injured pericardium, most commonly into the left hemithorax, resulting in negative pericardial FAST (Ball 2009). Therefore, unstable patients with this mechanism of injury and FAST finding should undergo a chest x-ray. If the x-ray reveals a hemothorax, a chest tube must be placed. Ongoing or high-volume chest tube output in this clinical context may be from cardiac injury.

Evidence Appraisal
The original study conducted by Rozycki et al in 1993 utilized FAST in patients aged ≥ 16 years, after blunt or penetrating trauma (n = 476). When compared to gold standards of computed tomography scan, diagnostic peritoneal lavage, and/or operative findings, FAST had a sensitivity of 79% and specificity of 96%. FAST was further validated in 1998 in a much larger study (n = 1540) by the same group. This showed that FAST is most sensitive and specific in patients with penetrating precordial wounds (sensitivity 100%, specificity 99%) and in hypoten-

sive patients after blunt abdominal trauma (sensitivity 100%, specificity 100%). Rozycki et al (1998) concluded that the accuracy of FAST in these clinical scenarios justified surgical intervention on the basis of the FAST findings in these trauma patients. With the application of FAST outside of study protocols by nonexperts and nonradiologists, the contemporary diagnostic yield of FAST ranges more broadly. Recent studies quote a sensitivity of 22% to 98% for FAST in the detection of hemoperitoneum (Richards 2017, Carter 2015).

More recently, thoracic views have been added to the FAST exam and termed eFAST. These windows assess the chest bilaterally for pneumothoraces and hemothoraces. In some series, the reported sensitivities of eFAST (86%-100%) are superior to that of chest x-ray (27%-83%) in the detection of pneumothoraces (Governatori 2015, Nandipati 2011, Wilkerson 2010).

Important

FAST results alone should not determine the decision to operate.

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Calculator Creator

Grace Rozycki, MD, MBA
Click here to read more about Dr. Rozycki.

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