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Role of Fast in Acute Abdomen

Research submitted by

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2021

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اهداء الى روح من ربياني صغيرا, ابي وامي (رحمهم الله)

والى من ساندني ودعمني دائما زوجتي العزيزة

والى الروح المرحة, املي في الحياة ابنتي الحبيبة

Introduction

Over the last decade, there has been a remarkable increase in clinician-performed ultrasound in many specialties. Improvements in technology have led to improved image quality and smaller, simpler and more affordable machines. At the same time clinical research, improved education and increasing awareness of the many uses of ultrasound have enthused clinicians around the globe. Ultrasound does not have to compete with or replace other imaging and assessment modalities, but it complements them. It has a unique role in assisting the clinician in the trauma setting. Ultrasound is portable, can be immediately accessed, does not have to interrupt resuscitation, is safe, repeatable and gives dynamic information that yields a diverse range of diagnostic information and can guide procedures (1).

In trauma, ultrasound is now frequently used in the pre-hospital setting, in disaster situations, during patient retrieval and in the hospital setting from the emergency department through to operating theatres, intensive care units and the wards. It is used by pre-hospital medical staff, emer- gency physicians, trauma surgeons, anaesthetists, radiologists and sonographers (2).

In the early 1970s, several articles were published in the English literature describing the utility of ultrasound in defining solid-organ injury in trauma (3). In the 1980s, in Germany, the use of ultrasound in trauma assessment was being used and studied however, these studies were largely ignored in the United States (US), Britain and Australia, perhaps because of language barriers and simple lack of recognition. In the early 1990s, a flurry of interest in trauma ultrasound re- surfaced in the United States. A large amount of research and many publications recognising the role of ultrasound in assessing for haemoperitoneum in

the undifferentiated trauma patient were completed (3). The term focussed assessment with sonography for trauma (FAST) was coined by Rozycki in 1995 (4) and became a valuable tool in trauma management. In this article, we will discuss the background, the evolution of the technique, the indications, and its role in acute abdomen management.

Overview and evolution

Focused abdominal sonography for trauma (FAST) was one of the earliest applications of point of care ultrasound in the emergency department setting and remains one of the most common bedside studies performed with ultrasound. It is typically utilized in the trauma setting to help identify certain types of internal bleeding. Blood in the abdominal compartment (hemoperitoneum) or pericardial space (hemopericardium) appears anechoic or black on ultrasound The FAST exam is typically performed at the end of the primary survey (5).
It describes a limited (four-view) ultrasound assessment of the abdomen looking for hemoperitoneum, and of the heart looking for haemopericardium. The aim is to identify life-threatening intra-abdominal bleeding or cardiac tamponade with a view to expediting definitive surgical management. It does not aim to exclude abdominal or thoracic injury (4).

However, in 2004, it was proposed the current nomenclature and protocol of eFAST Exam or Extended Focused Assessment with Sonography in Trauma (6). The eFAST exam incorporates the evaluation of the lungs and heart in addition to the abdomen**.** This came as a result of several studies published in the 1990s and 2000s that demonstrated the effectiveness of using ultrasound to diagnose pneumothorax hemoperitoneum and pericardial effusions within the emergency department (7).

Feasibility and accuracy

The FAST examination can be performed in 3e4 min at the bedside. It avoids the risks associated with transport, does not involve the use of ionising radiation and may be repeated. Operator training and experience affect performance and the number of supervised examinations required to acquire competence is debated. In learning how to perform FAST, most errors occur in the first 10 examinations andthereafter accuracy improves (8).

Preparations

Patient lying supine with the exam table flat or in the Trendelenburg position. Machine preparation start with Transducer, Phased Array (or cardiac probe) can be used for the entirety of the exam. The 2 MHz to 5 MHz curvilinear (or abdominal) probe is used for the eFAST exam to eliminate delays when switching between transducers. Ultrasound Machine Placement on the patient's right side. This makes it possible to scan with the right hand and manipulate ultrasound controls with the left hand (9).

Performance

Right upper quadrant view

In the RUQ view, the perihepatic area and the potential space between the liver and kidney, otherwise known as Morison's pouch, are assessed using the liver as the sonographic window. It is the most sensitive view for free intraperitoneal fluid, as dependent fluid tends to distribute here in the supine pa- tient, and thus should be the first view obtained in blunt trauma. Trendelenburg positioning can further enhance the detection of FF. The probe should be placed in a longitudinal orientation anterior to the right mid-axillary line between the seventh and eighth intercostal spaces and used to fan through the

entire interface of the liver and right kidney. Small fluid collections start near the caudal tip of the liver, which is the beginning of the right paracolic gutter, and should not be missed (10). Fig1 show the typical findings in the RUQ view.

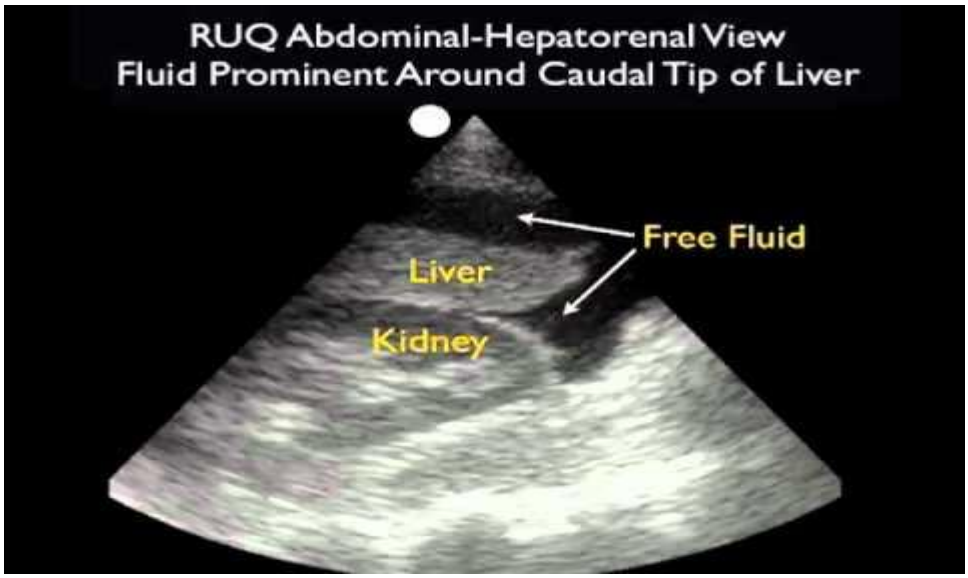

Figure 1

Left upper quadrant view

The perisplenic and the potential space between the spleen and kidney are assessed using the spleen as the sonographic window. The probe should be placed in a longitudinal orientation near the left posterior axillary line between the seventh and eighth intercostal spaces. Moving the probe to a more posterior and superior approach means that gas in the stomach and colon is not encountered, which can otherwise obscure the view. Interference from the rib shadows can be avoided by turning the probe into a more oblique orientation parallel to the ribs. Compared to the RUQ, fluid flows differently in the LUQ, as the phrenicocolic liga- ment limits the passage of fluid down the left paracolic gutter. Small fluid collections may be found superior to the spleen and the

interfaces between the diaphragm, spleen and kidney should be seen (10).

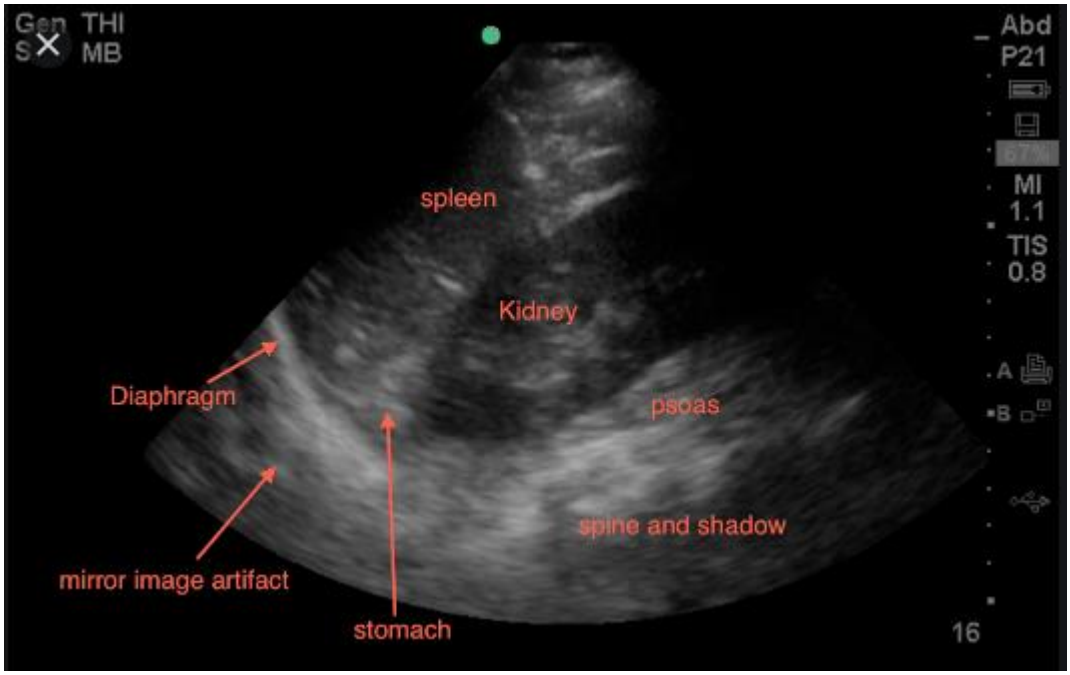

Fig. 2: LUQ view in FAST exam

Pelvic view

The assessment is made for FF using the bladder as the sonographic window. Reverse Trendelenburg positioning and the presence of a fluid-filled bladder can further enhance the detection of fluid. If the bladder is emptied consequent to the insertion of a urinary catheter, the detection of fluid can be compromised. The probe should be placed just above the pubic symphysis and angled inferiorly towards the feet to fan through the bladder in both longitudinal and transverse orientations (Fig. 3). In males, FF is usually seen in the retrovesical space whilst in females, FF will first be visualised posterior to the uterus and then anterior to it as well once enough fluid collects. Clinical correlation is needed as, in female patients of reproductive age; FF of up to 50 ml is

physiological in the pouch of Douglas between the rectum and the uterus (9, 10).

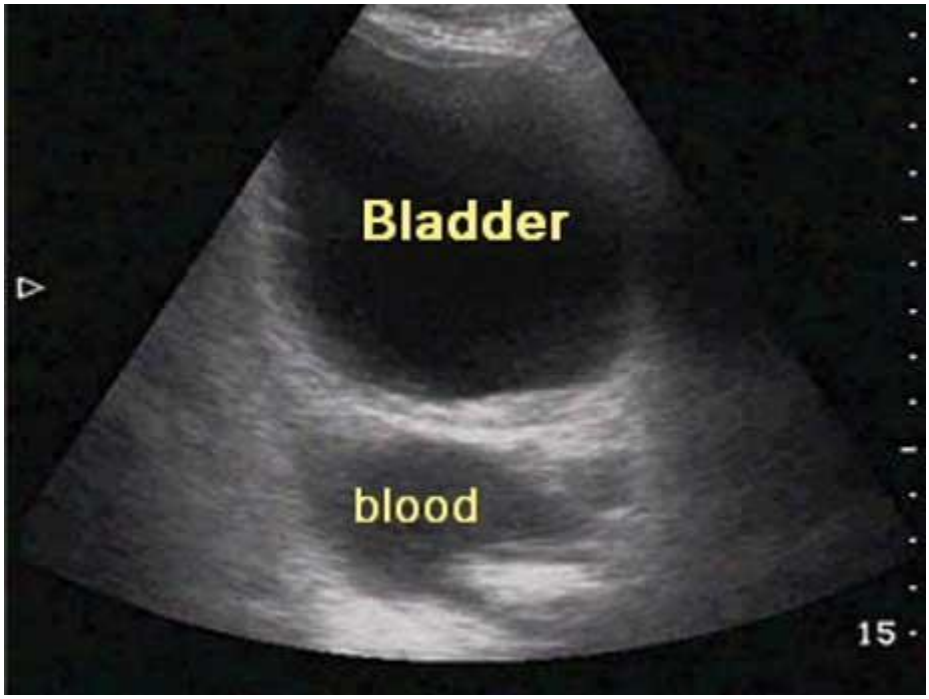

Fig. 3

Cardiac view

The view is made for FF within the pericardium to evaluate for effusion and tamponade. The probe should be placed in a transverse orientation just inferior to the xiphoid process and angled towards the left shoulder. If this subxiphoid view is difficult to obtain because of body habitus or pain, the PLAX view can be used. The probe should be placed between the second and fourth intercostal spaces on the anterior chest wall just to the left of the sternum. For this window, the marker is orientated towards the left hip rather than the right shoulder, as would usually be the case in standard emergency imaging, in order to obtain an image that is consistent with the reversed echocardiographic convention performed by cardiologists. It is essential that all of the

heart is visualised as pericardial effusions can start at the posterior aspect of the pericardium (Fig. 4). This can be achieved by asking the patient to breathe in deeply in the case of the subxiphoid view, or increasing the depth on the US machine for both views. If a substantial amount of fluid is found in the pericardial space, cardiac tamponade is likely if collapse is present in any chamber during the cardiac cycle.

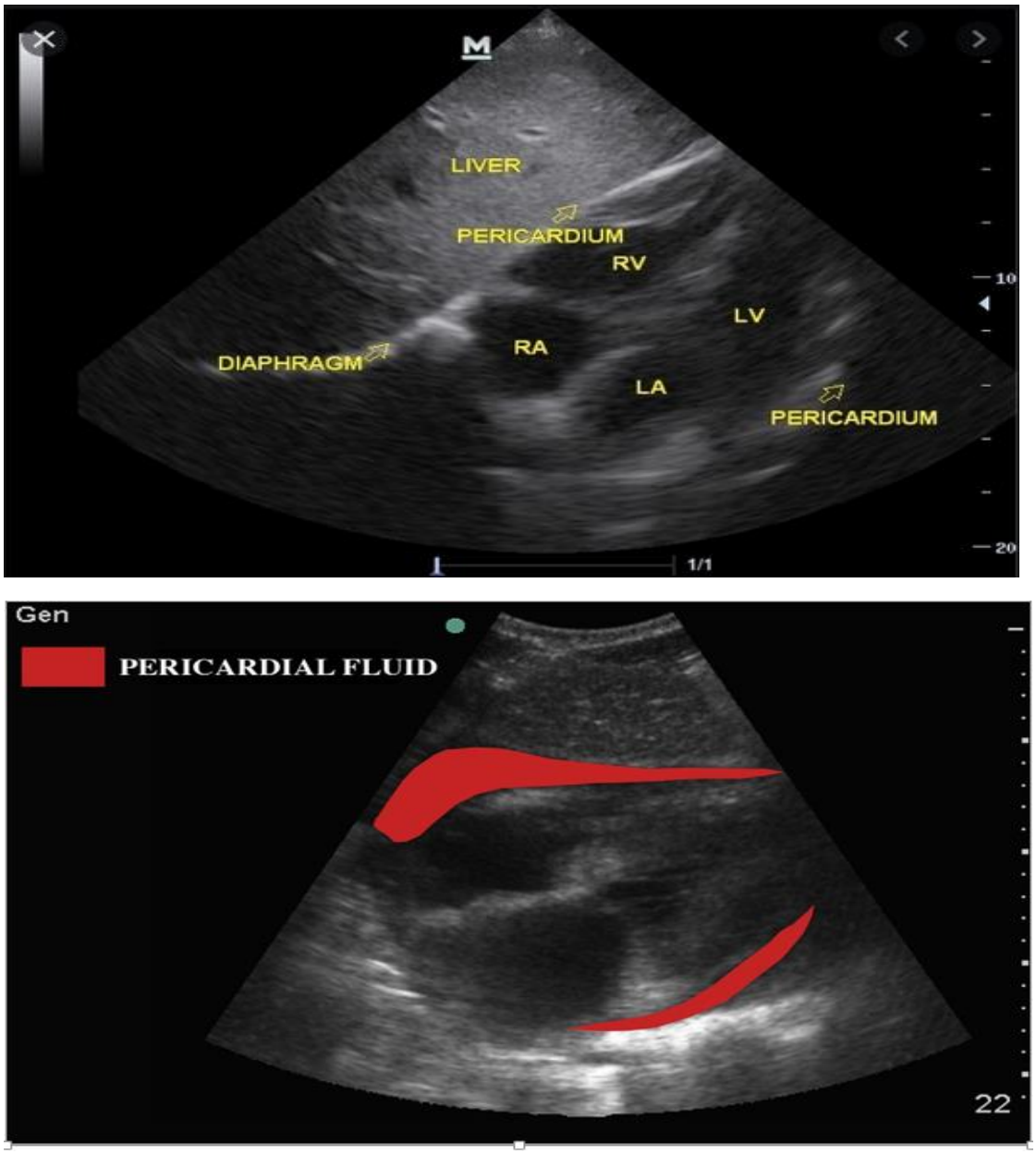

Figure 4 shows the cardiac vie

Indications

The FAST exam is indicated for any blunt trauma affecting the thorax, abdomen and pelvis. It's also indicated for hypotensive patient(shock) not to exclude the injury but to detect the internal hemorrhage (negative view does not rule out the surgical intervention if there is symptoms of free fluids). There is no absolute contraindication for the exam unless there is delay in the resuscitation of the patient (14).

Limitations

FAST cannot reliably grade solid organ injuries that do not result in significant haemoperitoneum. For the FAST examination to be positive, a critical volume of fluid should be present. The mean minimum volume of fluid needed for US detection is 668 ml when supine and 444 ml when Trendelenburg in the RUQ view and 157 ml in the pelvic view19 compared to 100e250 ml with CT. Because of this, FAST cannot be used as a diagnostic test to exclude small amounts of intraperitoneal hemorrhage (12).

It has been noted to have poor accuracy in the early post-injury phase when sufficient haemoperitoneum has not yet accumulated, leading to a false negative FAST. Delayed presentation after trauma is a further risk factor for a false-negative result as when blood begins to clot it can be difficult to differentiate from the sur- rounding tissue. Retroperitoneal haemorrhage, which can be secondary to a pelvic fracture or an injury to the aorta, inferior vena cava (IVC), or kidneys, is not well visualised on US unless it flows into the abdominal or pelvic compartments. Full US visualisation can be obstructed by bowel gas, obesity, and subcutaneous emphysema (13).

The role of FAST in acute abdomen

Acute abdomen

Acute abdomen is a condition that demands urgent attention and treatment. The acute abdomen may be caused by an infection, inflammation, vascular occlusion, or obstruction. The patient will usually present with sudden onset of abdominal pain with associated nausea or vomiting. Most patients with an acute abdomen appear ill.

The approach to a patient with an acute abdomen should include a thorough history and physical exam. The location of pain is critical as it may signal a localized process. However, in patients with free air, it may present with diffuse abdominal pain (15).

Rapid initial diagnosis and treatment of the acute abdomen are crucial, evaluation and treatment should be simultaneous. Diagnostic imaging has advanced rapidly in the past three decades. A bedside ultrasound in the Emergency Department can diagnose cholecystitis, hydronephrosis, hemoperitoneum, and the presence of an abdominal aortic aneurysm in a less than 5 minutes. Diagnostic ultrasound is the preferred modality for cholecystitis, pediatric appendicitis, ruptured ectopic, and ovarian torsion (16).

In non-traumatic acute abdomen, the role of FAST is minimal because rarely there is a free fluid in abdominal regions. However, the ultrasonography has developed tremendously and become a very valuable diagnostic tool to detect the most common causes of acute abdomen. It can diagnose the acute appendicitis, appendiciel mass, crohns disease and overian torsion (17).

In traumatic acute abdomen, the FAST can detect any free fluids, especially blood (it's extremely irritant to the peritoneum), which drain into the peritoneal paracolic gutters. The right and left upper quadrant

views can give a clear image the fluid in these regions. FAST alone cannot decide the surgery because there may be a false negative result (17).

Conclusion

The FAST exam is a simple useful technique can detect the free accumulated fluid in the human potential spaces. Its benefit is clear in detecting blood and other fluids in abdomen, pelvis and pericardium.

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