



# The FAST-Concept

Focused Assessment with Sonography in Trauma



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## General Information

### The principle

- is used as evidence of free intraabdominal or intrathoracic fluid (e.g. blood) as well as of pericardial effusion on trauma patients
- examines the deepest points of the abdomen and thorax
- performed with the convex array probe or phased array probe at a frequency of 3,5 MHz

### When is FAST used?

The FAST examination was initially developed for the emergency trauma room. However, intraabdominal fluid (= positive FAST scan) can also be found in several other situations, e.g. ectopic pregnancy, ascites, ruptured ovarian cysts.

### What is the aim of FAST?

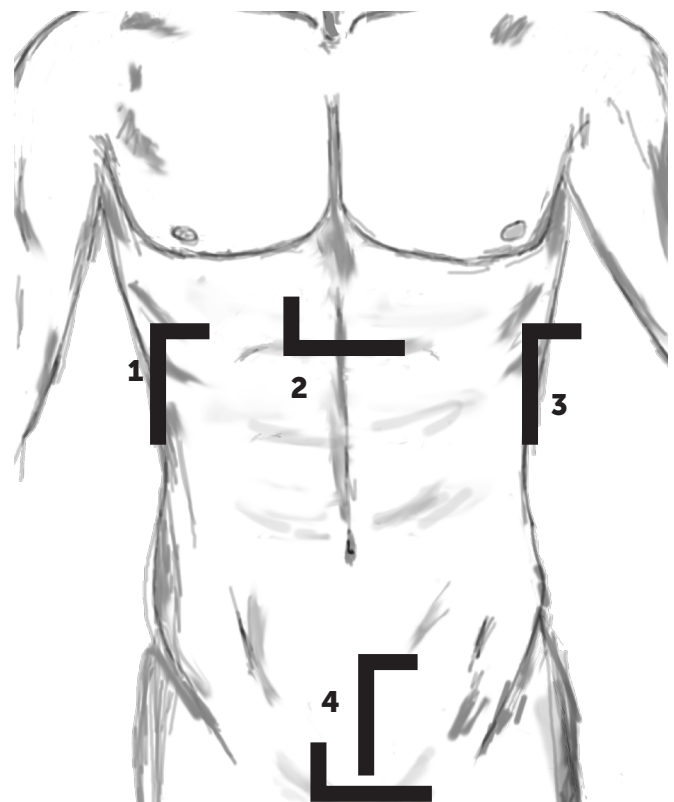
The FAST examination is limited to the exclusion or the verification of free fluid. The aim is not to exactly locate the injury since under time pressure this would not support the objective. Therefore, an evaluation of the parenchyma would not be reasonable. In case of an instable patient with a positive FAST scan, a surgical therapy can be applied without any loss of time (e.g. CT-scan instead means loss of time).

### How precise is FAST?

The precision of a FAST examination depends on the examiner's skills. An experienced examiner can reach a specificity of 98 to 100%. Even the smallest quantities (ca. 100 ml) of fluid can be detected.

## Overview of the scans

1. Hepatorenal recess (Morison's pouch)
2. Subxiphoidal scan of the pericardial cavity (Cavitas pericardialis)
3. Splenorenal recess
4. Recto-uterine excavation (Pouch of Douglas) or recto-vesicalis (Proust space)



### Hepatorenal recess (Morison pouch)

To scan the hepatorenal recess place the probe longitudinally in the midaxillary line at the patient's right flank, on a level with 8th – 11th ICS. You may rotate the probe in between the intercostal space (probe marker points cranially and dorsally) to avoid the rib shadows and get a better image.

In case of an intraabdominal bleeding the anechoic fluid can be seen between liver and kidney (and possibly between liver and diaphragm). By moving the probe up one ICS, the costodiaphragmatic recess will be visible. Physiologically the mirror image artifact appears (same echogenicity as the liver). In case of a haemothorax an anechoic space would be identifiable.

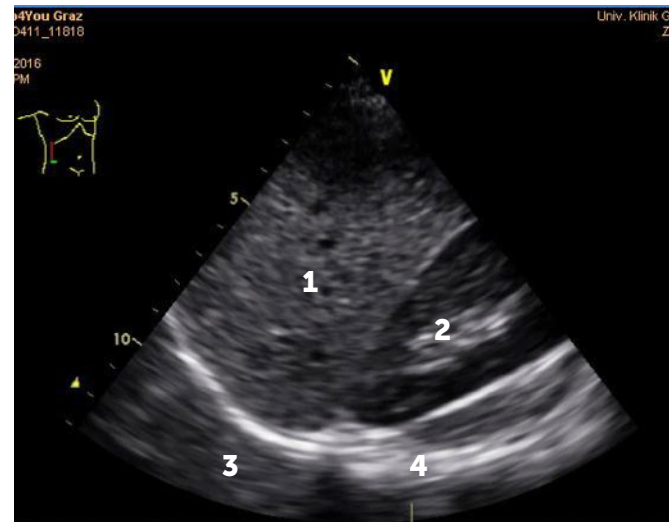


Fig. 1: Hepatorenal recess (Morison Pouch), 1: liver, 2: right kidney, 3: right recessus costodiaphragmaticus, 4: spine

### Subxiphoidal scan (Cavitas pericardialis)

Press the probe at a flat angle (between 5-10°) in the middle of the upper abdomen. The liver is used as the acoustic window. The probe marker points to the patient's right side, you may need to preposition the probe towards the patient's heart.

The pericardium appears as a hyperechoic layer surrounding the heart.

In case of an effusion or a tamponade an anechoic layer between both structures is identifiable.

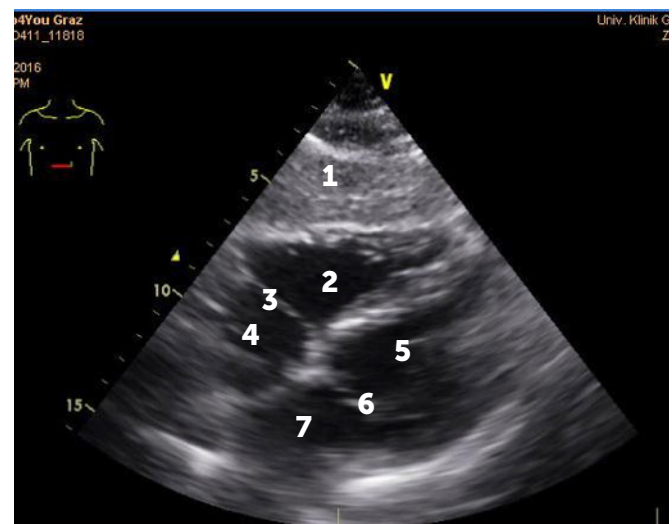


Fig. 2: Subxiphoidal scan. 1: liver, 2: right ventricle, 3: tricuspid valve, 4: right atrium 5: left ventricle, 6: mitral valve, 7: left atrium

### Splenorenal recess

To outline the splenorenal recess on the patient's left side, the probe must be positioned more cranially and more dorsally in comparison to the hepatorenal recess scan.

Furthermore, getting a clear image here is more difficult as the spleen provides a smaller acoustic window than the liver does.

Free fluid would be expected as an anechoic perisplenic hem between spleen and diaphragm and/or spleen and kidney.

Within the eFAST you evaluate the costodiaphragmatic recess for a possible haemothorax, as well.

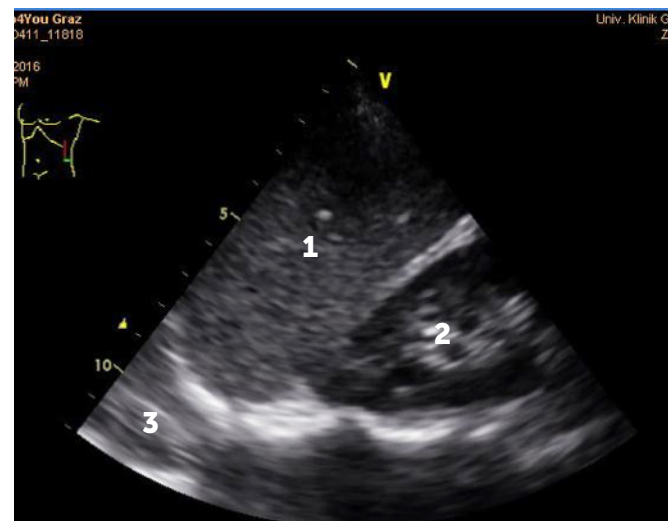


Fig. 3: Splenorenal recess. 1: spleen, 2: left kidney, 3: left recessus costodiaphragmaticus

## Pouch of Douglas (recto-uterine excavation) or Proust space (recto-vesical excavation)

This region is examined in the longitudinal and transversal section.

Firstly, place the probe sagittally just above the symphysis, then move it cranially.

Check the entire region for free fluid by angulating the probe to both lateral sides.

Subsequently rotate the probe 90° anti-clockwise and check again by angulating the probe cranially and caudally.

In females the free fluid is accumulated dorsally to the uterus, in males dorsally to the urinary bladder.

This section also can be used for the diagnosis of an ectopic pregnancy.

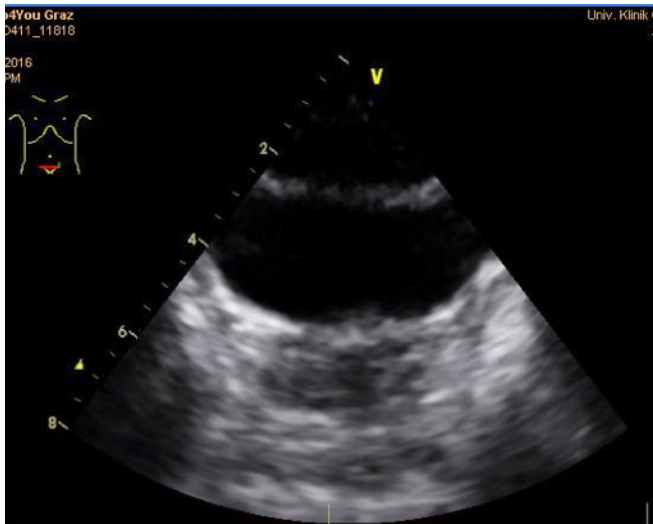


Fig. 4: Pouch of Douglas (transversal section).

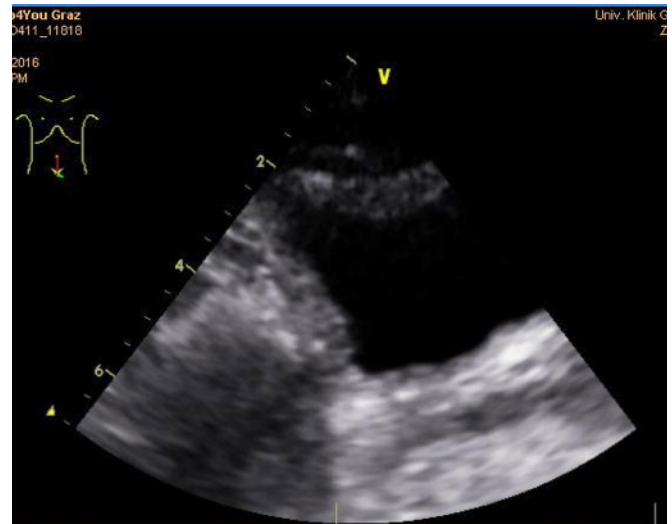


Fig.5: Pouch of Douglas (longitudinal section).

## eFAST

The extended FAST examination contains the search for a haemothorax or a pneumothorax.

The examination for a haemothorax is already made in the flank sections (hepatorenal and splenorenal recess).

### Pneumothorax

The pneumothorax detection is performed by placing the probe in a sagittal orientation on the highest point of the thorax in the midclavicular line (lying patient approximately ICS 3-4). Thereby the depth is set at a maximum of 4 cm.

The focus of interest appears as a seemingly flickering hyperechoic stripe in between or under the ribs. This flickering is the physiological pleural sliding.

Furthermore, comet tails artefacts can be found (= exclusion of a pneumothorax).

In case of a pneumothorax the pleural sliding is missing, but the static images appear the same.

Besides the absence of the pleural sliding, the lung point is an important indication for a pneumothorax. This is the point in which the normal lung merges into the pneumothorax.

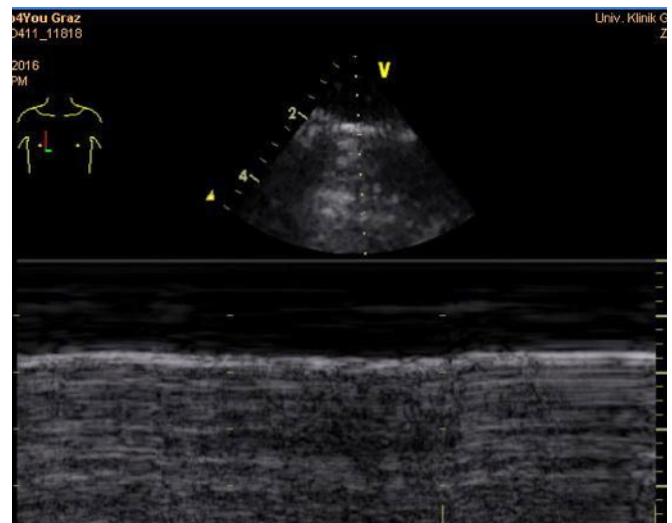


Fig.6: M-Mode, seashore sign.

## eFAST Pitfalls

Please note, that the FAST examination contains some sources of error, which should be considered during the evaluation.

Fluids starting from a quantity of 100 to 150 ml are detectable. If the trauma only happened recently, a false negative FAST result is possible. Therefore a strict inspection, especially in the first four hours after the trauma, is of high importance.

The pouch of Douglas is the most sensitive space for free fluid. However, the highest sensitivity is only reached by considering all sections.

Injuries, which are not bleeding into the abdomen, are not detectable. These include e.g. damages of solid organs without any capsular injuries or retroperitoneal bleedings, which can be found with pelvic injuries.

An existing ascites or physiological anatomic structures (gall bladder, renal cysts, fluid-filled intestinal loops) can be misinterpreted as well.

During the evaluation of the lungs a pneumothorax can wrongly be assumed if there are pleural adhesions due to illnesses.

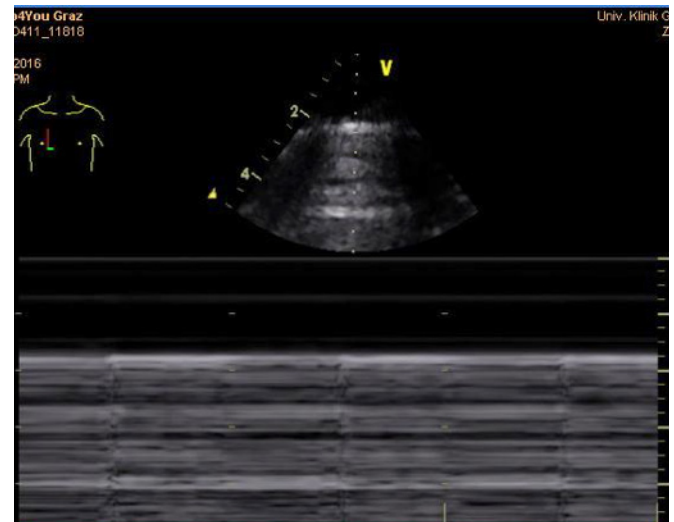


Fig.7: M-Mode, barcode sign.

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