

# Imaging of bowel lesion

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# Objectives

- To know the common key findings in abdominal imaging such as pneumoperitoneum, ascites, bowel dilatation and fat stranding.
- To know the causes and radiological appearance of these key findings.
- To know the definition and advantages of FAST.

# Key findings in abdominal radiography

- **Pneumoperitoneum:** describes gas within peritoneal cavity and is often indicating a critical illness, often perforation of a hollow viscous.
- **Causes:**
  1. Perforated hollow viscous: most common (perforated peptic ulcer disease, diverticulitis, trauma), except the perforated appendix which seldom causes pneumoperitoneum.
  2. Post operative .free peritoneal gas : for seven days.
  3. Peritoneal dialysis.
  4. mechanical ventilation.
  5. Pneumomediastinum and pneumothorax.

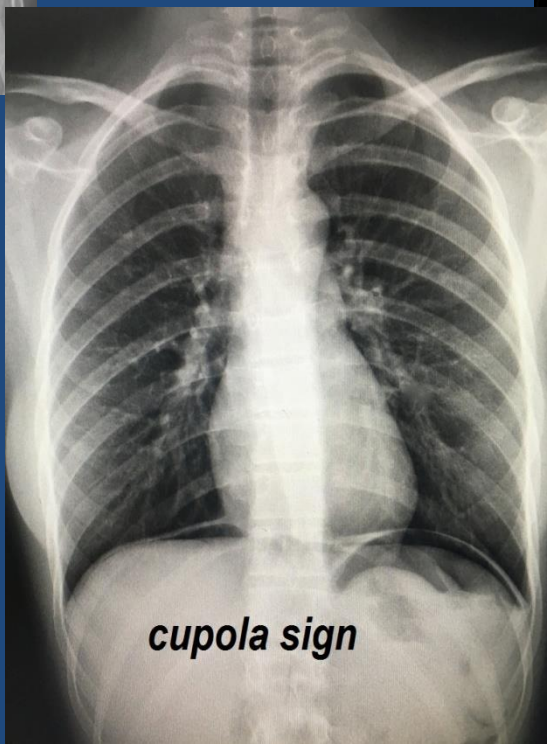
# Investigations

- Erect chest X ray.
- Can be detected on an abdominal X ray.
- CT scan much more sensitive than any plain radiograph.

# Radiographic features:

## I - Erect CXR:

- An erect chest x-ray is probably the most sensitive plain radiograph for the detection of free intra peritoneal gas. If a large volume pneumoperitoneum is present, it may be superimposed over a normally aerated lung with normal lung markings.
- Usually performed after sitting erect for 10 minutes.
- Sub diaphragmatic free air.
- Cupola sign (on supine film)
- Continuous diaphragm sign.



- **2- Abdominal x ray:** performed supine .gas can be seen when it outlines certain structures. the most apparent is often when gas within the peritoneum lies adjacent to a bowel loop full of gas making the bowel wall appear particularly prominent – **Riglers sign.**



falciform lig sign



Rigler sign



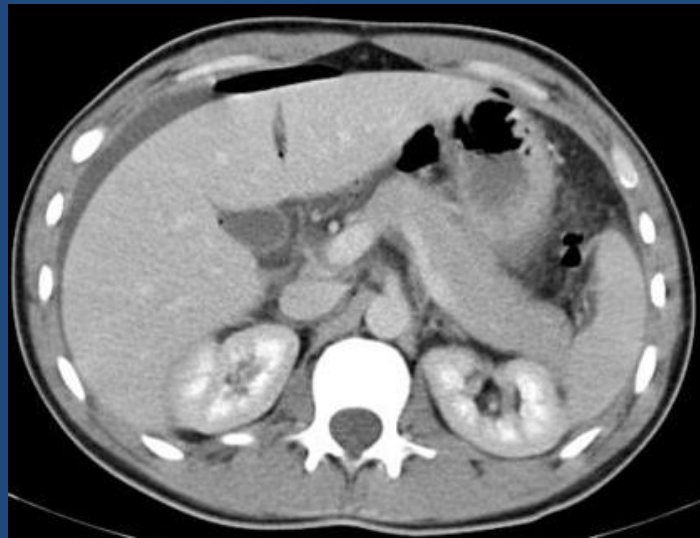
football sign



triangle sign



- **3- CT scan of the abdomen:**
- much more sensitive than plain film. It can identify even tiny amounts of free gas. Look for low density gas out the bowel , particularly anteriorly in the abdomen ( almost all patients will be scanned supine).



# Bowel dilatation

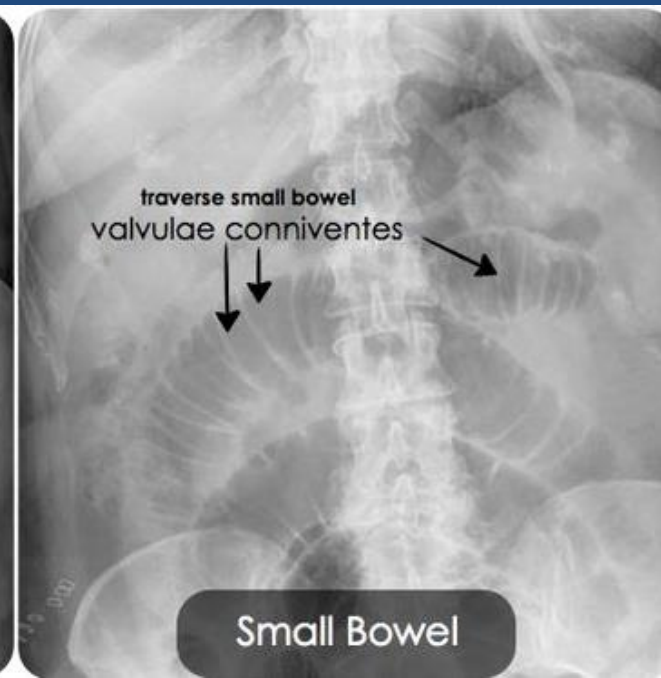
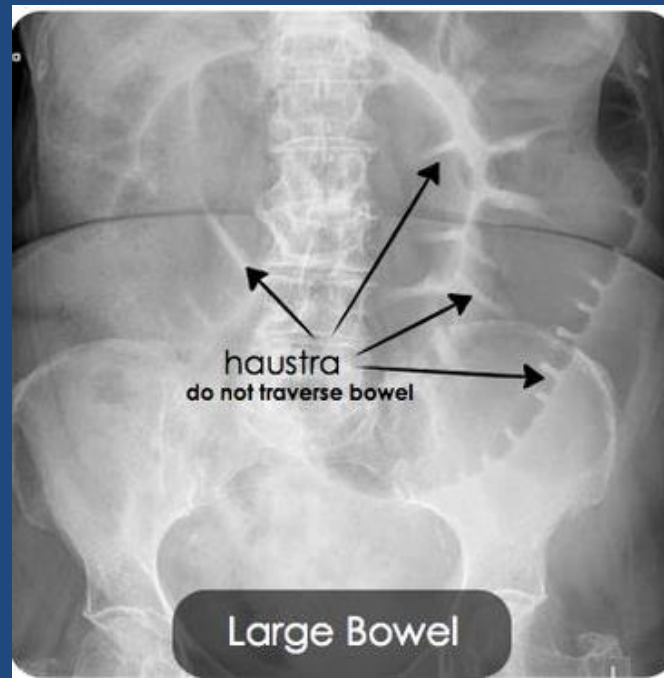
- **Bowel dilatation** is a relatively non-specific sign than can be seen on most imaging modalities. In bowel obstruction, dilatation may be demonstrated on a plain radiograph providing the bowel is filled with gas.
- **Causes:**
- small bowel
  - mechanical small bowel obstruction.
  - ileus (e.g. post-operative)
- large bowel
  - mechanical large bowel obstruction.
  - pseudo-obstruction
  - toxic mega colon

# Investigation

1. x-ray can show bowel dilatation when bowel is gas-filled
  2. CT is more sensitive
  3. US can identify fluid-filled loops of bowel
  4. MRI can also identify gas- and fluid-filled loops of bowel.
- Bowel dilatation can be seen on most modalities to a greater or lesser extent. Normal bowel caliber can be remembered using the 3-6-9 rule:
  - small bowel: <3 cm
  - large bowel: <6 cm
  - cecum/sigmoid: <9 cm

# Plain radiograph

- Abdominal radiographs are often performed as an initial imaging test in patients with abdominal pain and distension. Bowel dilatation is only visible when the bowel contains gas.



# CT

- Bowel dilatation is much more clearly demonstrated on CT. The degree of dilatation can be assessed independent of whether the bowel is filled with fluid or gas. In addition, the bowel wall and other structures can be interrogated.



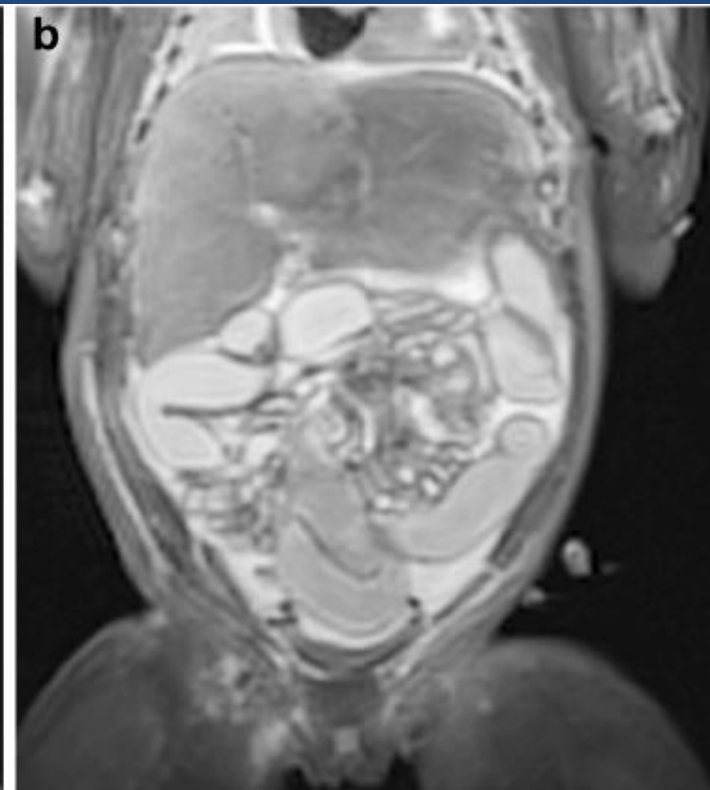
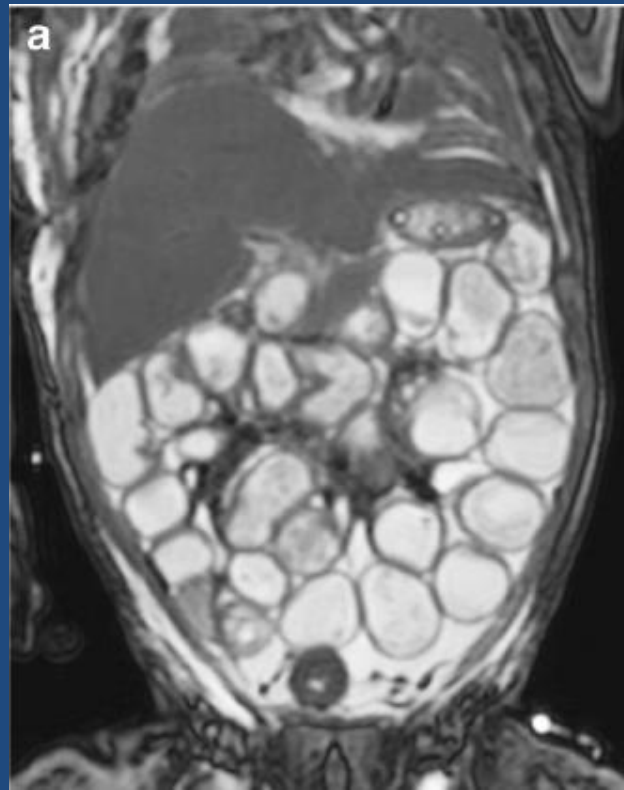
# Ultrasound

- Bowel dilatation can be seen on ultrasound, but this is usually dependant on the bowel being fluid-filled and there being no gas-filled bowel anteriorly.



# MRI

- Bowel caliber can be assessed on MRI. With fluid-filled loops of bowel, this is most clearly demonstrated on T2 weighted sequences.



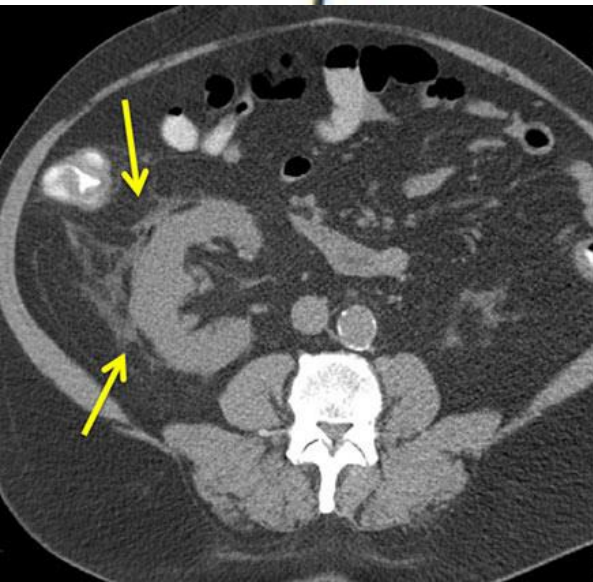
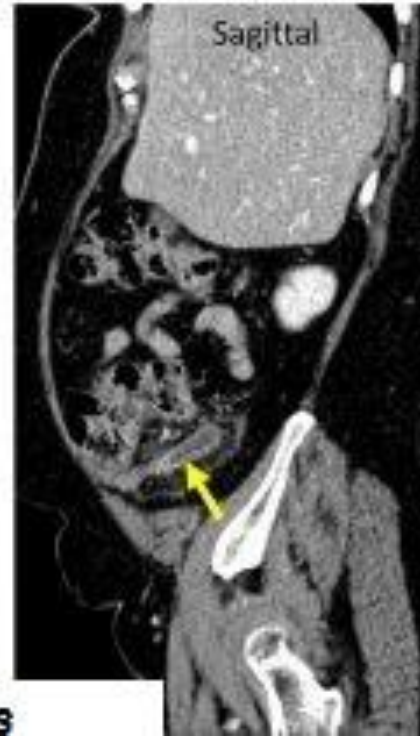
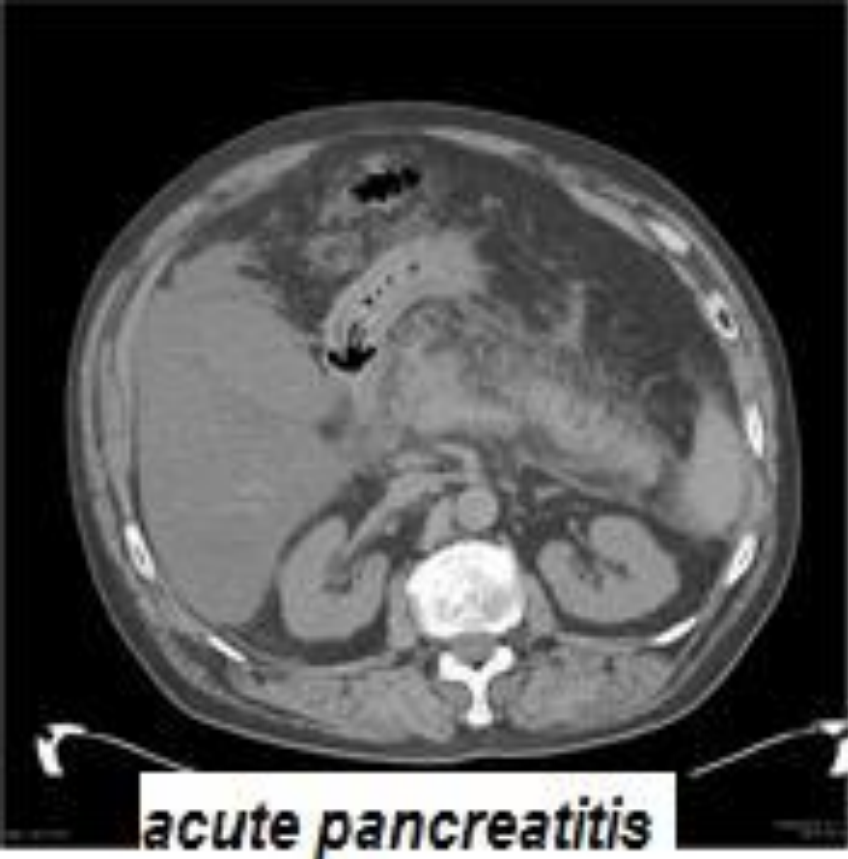
# Fat stranding

- It is a sign that is seen on CT scan. it describe the changes in the density of fat around an inflamed structure and is a very helpful sign for intra abdominal pathology.
- it is most commonly seen in abdomen/pelvis, but can also be seen in retroperitoneum, thorax, neck and subcutaneous tissues. It can be helpful in localizing both acute and chronic pathology.
- Fat stranding is a non-specific sign in itself and can be seen in infectious, inflammatory, malignant, or traumatic conditions.



# Common Causes:

1. inflammatory: pancreatitis, appendicitis, cholecystitis, diverticulitis.
  2. Trauma.
  3. Ischemia.
  4. Tumors.
- **investigation:**
  - fat stranding is primarily seen in CT scan, inflammatory fat may be seen on US and MRI.
- CT** : usually fat is dark grey, but when there is edema in the fat , the density increases and in become progressively closer to the color of muscle.

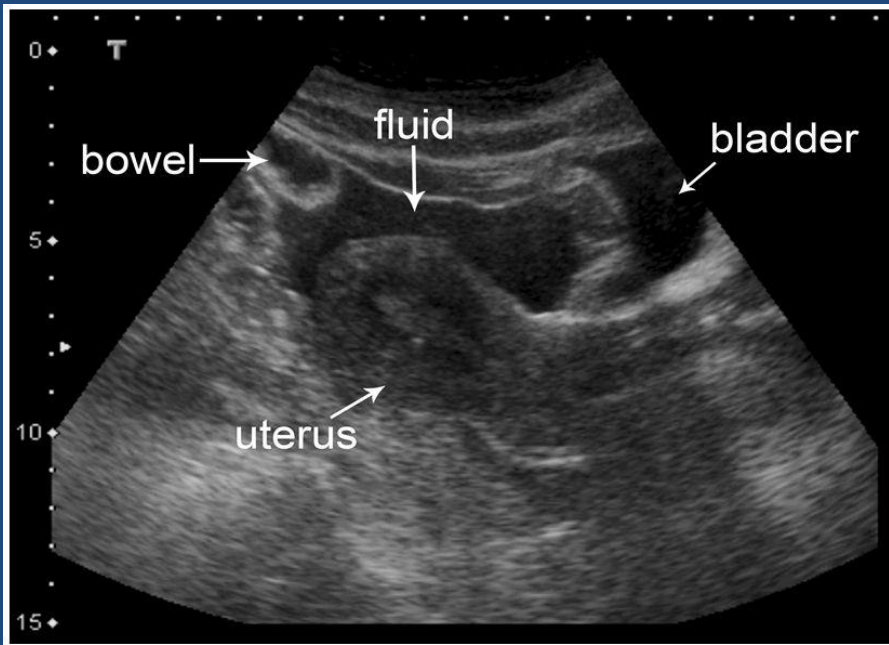


# Free intra peritoneal fluid

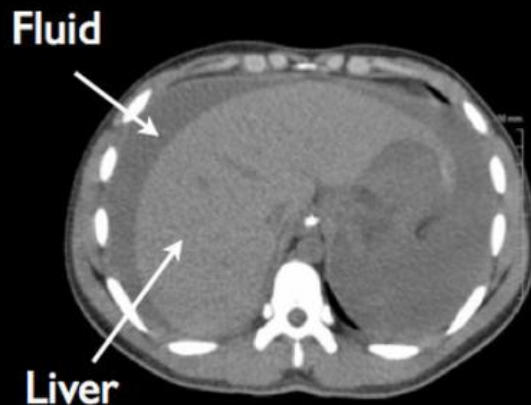
- **Free intra peritoneal fluid** may be termed **free fluid** or (less correctly) **free intra-abdominal fluid**. It may be
  - 1-physiological female patients, usually maximal around ovulation ,and in some healthy young men..
  - 2-Inflammation in the abdomen
  - 3-intra-abdominal sepsis
  - 4-hemorrhage in trauma.
- When free fluid is present in large amounts it is usually called ascites.

# investigation

- **US** is variably sensitive depending on the size of the patient and the operator. In thin patient, relatively small volume of fluid can be found, clear fluid without internal echoes is likely to be reactive.
- Low volume free fluid in the pouch of Douglas is often seen in females patients of child bearing age and is often physiological and of no clinical significance.



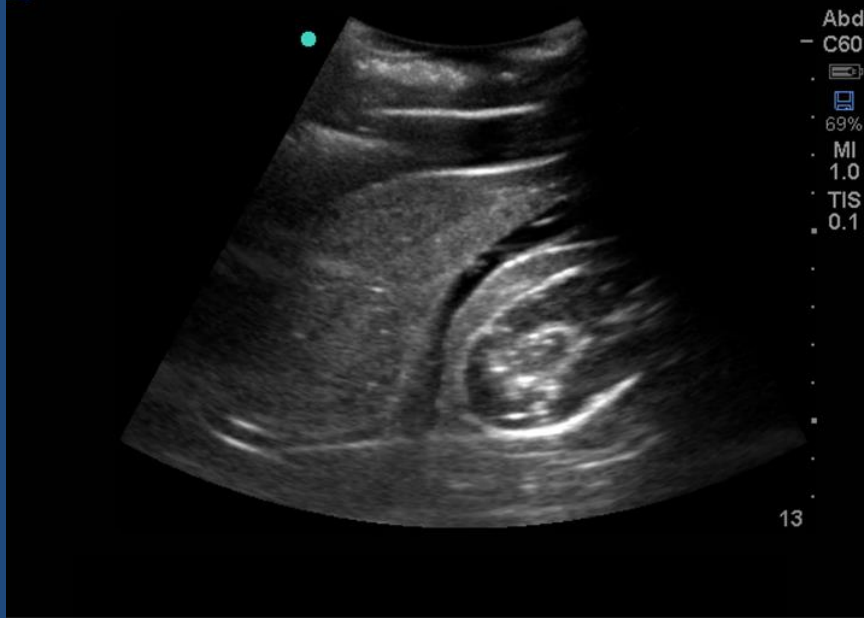
- **CT scan** : is more sensitive for generalized free- fluid, useful for assessing location, associated findings may narrow differential, fat stranding in inflammation.
- Fluid in CT scan is relatively hypo dense( dark),It can compared to fluid in the gall bladder or stomach. Dense fluid may suggest haemoperitoneum, especially in the context of trauma. Fluid may sit within the peritoneal space or paracolic gutters, or may be interposed between bowel loops or around solid organs eg, the liver.



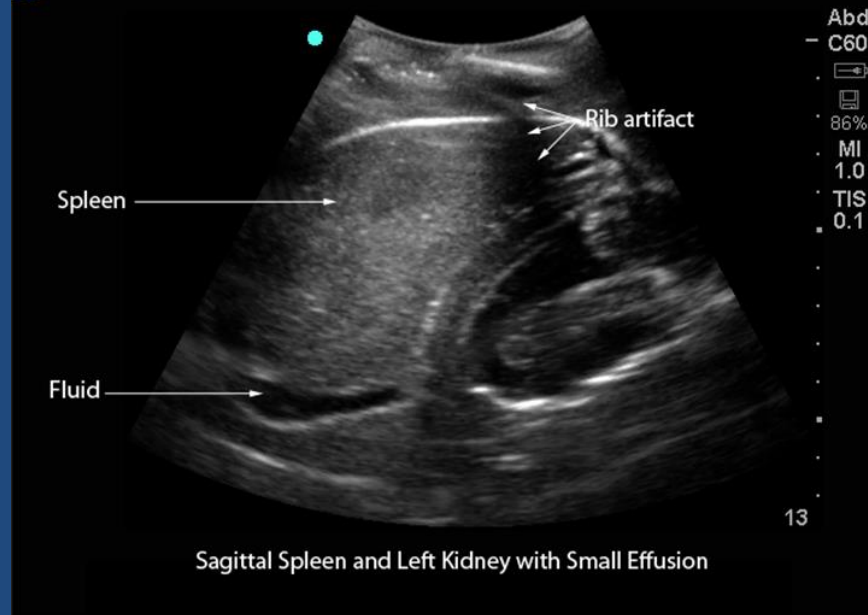
# FAST

- Focused assessment with sonography in trauma (FAST) is rapid bedside ultrasound examination performed by surgeons , emergency physicians and certain paramedics as screening test for blood around the heart ( pericardial effusion,) or abdominal organs ( hemoperitoneum) after trauma.
- The four classic areas that are examined for free fluid are:
  1. The perihepatic space( also called Morison pouch or the hepatorenal recess)
  2. The perisplenic space.
  3. The pericardium.
  4. The pelvis.
- with this technique it is possible to indentify the presence of intraperitoneal or pericardial free fluid. in the context of traumatic injury , this fluid will usually be due to bleeding.

BLUE PHANTOM FAST



BLUE PHANTOM FAST

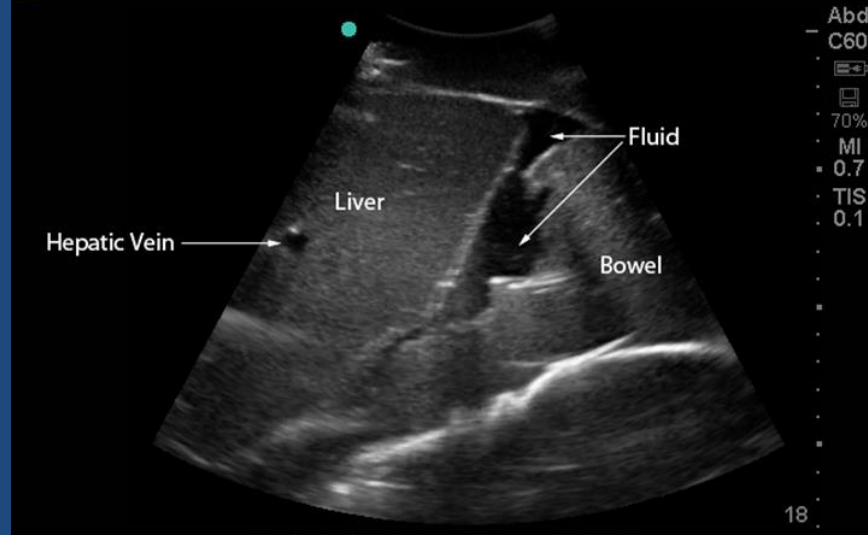


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Subcostal 4 Chamber with Effusion & RA Collapse

BLUE PHANTOM FAST



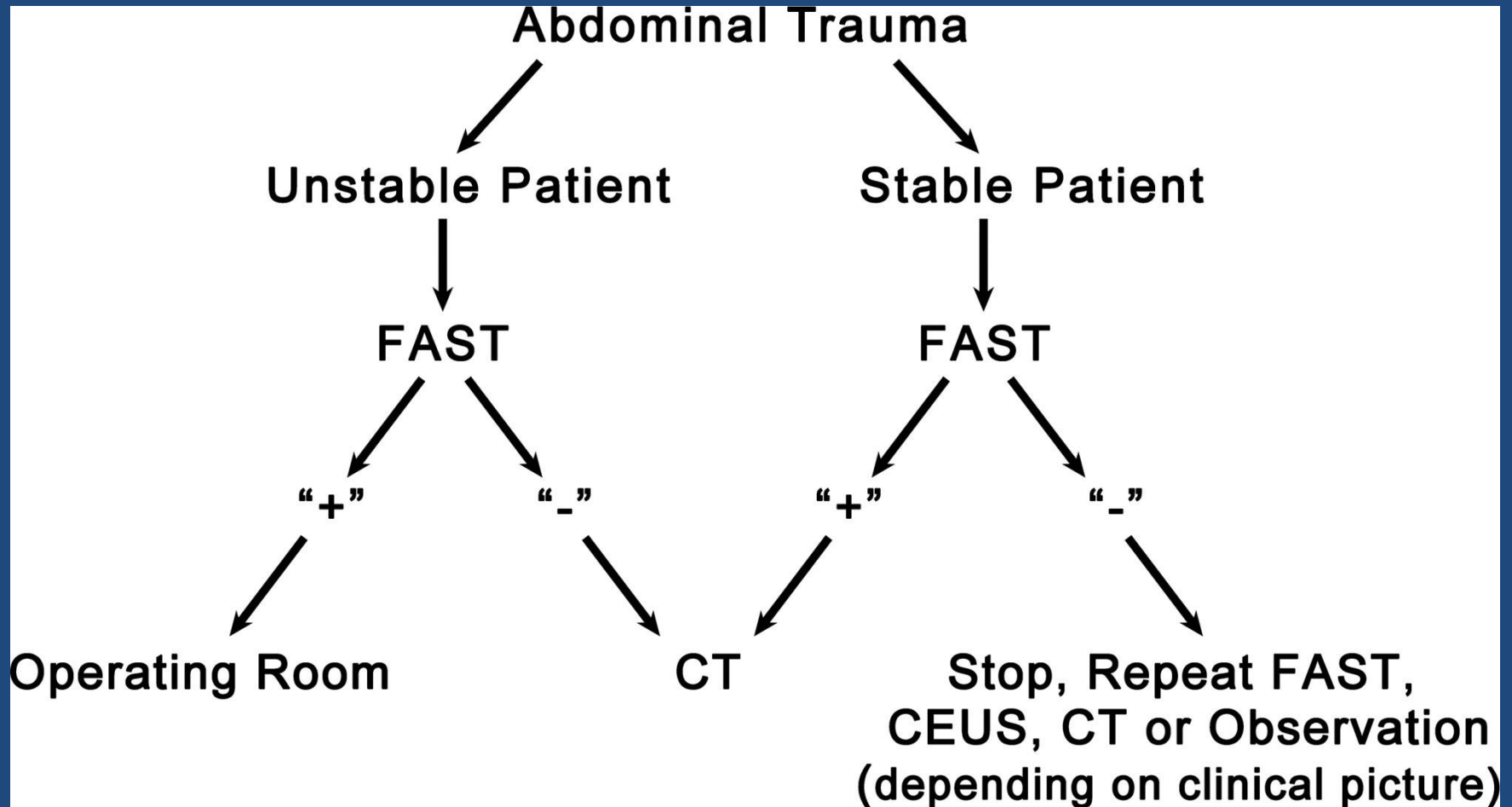
Sagittal Right Lobe of Liver with Effusion

# Advantages of FAST

- FAST is less invasive than diagnostic peritoneal lavage, involves no exposure to radiation and is cheaper compared to CT scan, but achieves similar accuracy.
- Numerous studies have shown FAST is useful in evaluating trauma patients. It also appears to make emergency department care faster and better.
- A good quality FAST can probably reliably detect about 200 ml of free intra peritoneal fluid.
- Overall, the FAST exam is about 90% sensitive for detecting any amount of intra peritoneal free fluid.



# Interpretation of FAST:



- Diagnostic algorithm for the use of FAST for triage of trauma patients. *CEUS* = contrast-enhanced US.

A bouquet of vibrant pink roses with green leaves is positioned in the top right corner of the image. The background consists of vertical wooden planks with a light, weathered finish.

Thank  
you