

# Abdominal Aorta and Inferior Vena Cava Ultrasound

## Workshop:

**Location:** SSOM, L71

## Watch:

- **Abdominal Aorta Ultrasound Scanning Protocol: (6:05)**  
<https://youtu.be/08fF1OUcecM>
- **Inferior Vena Cava Ultrasound Scanning Protocol: (4:59)**  
[https://www.youtube.com/watch?v=Q6VIG3kv28Y&list=PLGEKJJ3ekUkzFqY2SffAodP\\_NJUPV0qqF&index=2](https://www.youtube.com/watch?v=Q6VIG3kv28Y&list=PLGEKJJ3ekUkzFqY2SffAodP_NJUPV0qqF&index=2)

## ***LEARNING OBJECTIVES***

- Correlate anatomic structures identified during live-dissection with findings on ultrasound
- Describe normal ultrasound anatomy of the abdominal great vessels, including the aorta, inferior vena cava, its branches, as well as its relationship with surrounding structures
- Select the appropriate transducer and optimizing image capture by adjusting function keys

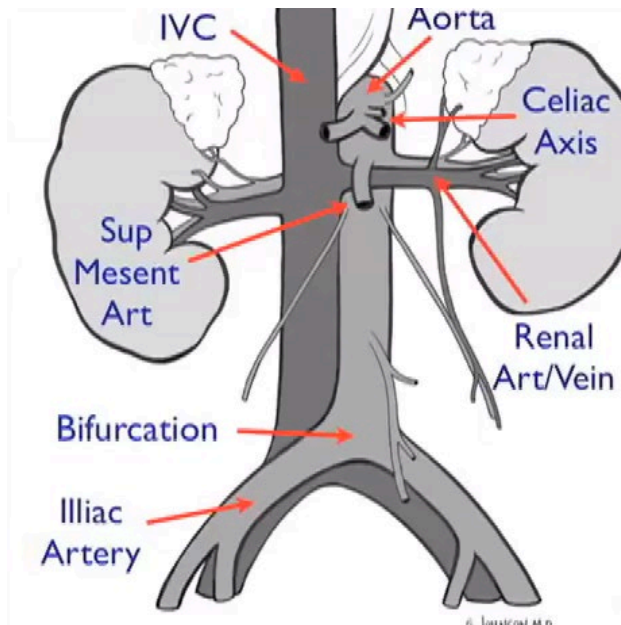
## ***HANDS-ON OBJECTIVES***

- **Identify Abdominal Aorta and Correlating Structures**

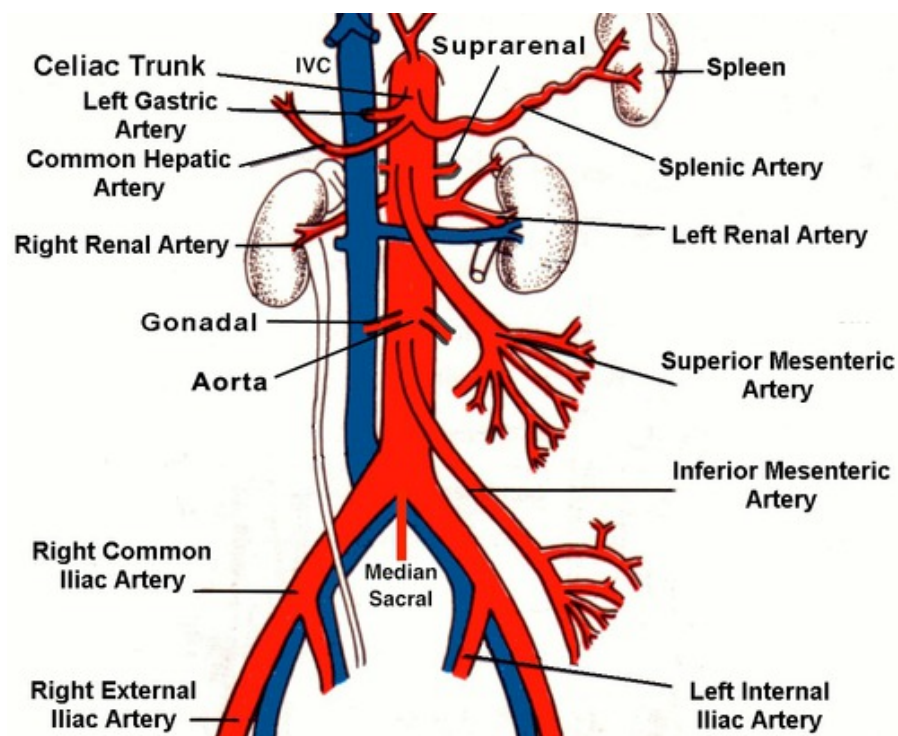
- Transverse View
  - Vertebral body with posterior shadow
  - Inferior vena cava
  - Aorta
  - Proximal aorta
    - Celiac trunk
    - Hepatic artery
    - Splenic artery
  - Mid aorta
    - Superior mesenteric artery
    - Splenic vein
    - Left renal vein
  - Distal aorta
    - Bifurcation into common iliac arteries
- Longitudinal View
  - Celiac trunk
  - Superior mesenteric artery
- Identify Inferior Vena Cava structures
  - Longitudinal View
    - Inferior vena cava
    - Right atrium
    - Hepatic vein (may not be visible)

## AORTA ULTRASOUND

### *Gross Anatomy*



Credit: <https://www.youtube.com/watch?v=uiTsFtanyzM>



Credit: <https://quizlet.com/14095296/anatomy-lab-1415-checklist-flash-cards/>

## ***Ultrasound Anatomy***

### **Probe Selection:**

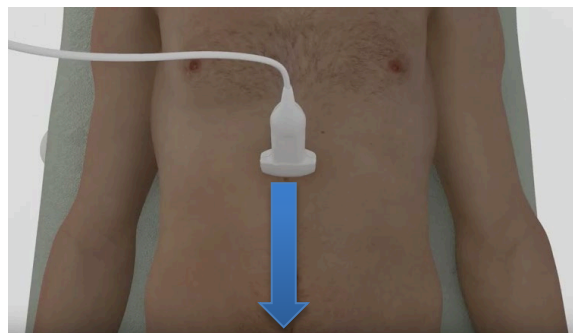
- Curvilinear
  - Phased array
- Low frequency probes,  
increased depth

### **Patient Positioning and Preparation:**

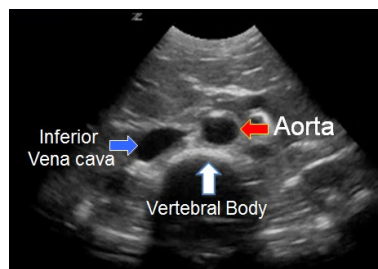
- Supine
- Ideally, fasting prior to exam (to avoid bowel gas, which causes air artifact and decreased visualization of the structures beneath)

#### **1. Technique for scanning the abdominal aorta:**

- Place probe in the subxiphoid region – transverse orientation, probe indicator oriented toward patient's right. Hold the probe perpendicular to the abdominal wall (aimed towards the patient's back).
- Identify the vertebral shadow, which is a hyper-echoic rim with a posterior shadow, that appears like an upside-down “U” or “horseshoe sign”. The aorta will be found anterior to vertebral body and appear circular and pulsatile. The inferior vena cava (IVC) in relation to the aorta will appear on the right side of the screen, as it is oriented in the left side of the patient's body. The IVC will also appear more ovoid and thin walled.
- Without removing the probe from the skin, continue to scan in the transverse orientation by sliding the probe towards the umbilicus. To facilitate scanning, apply a sufficient amount of gel from the subxiphoid region to the umbilicus.
- A complete exam of the abdominal aorta entails visualization of the proximal, mid, and distal aorta. Normal diameter of the aorta is 3 cm (measured outer wall to outer wall).
- The proximal and mid-aorta can also be evaluated in longitudinal orientation.



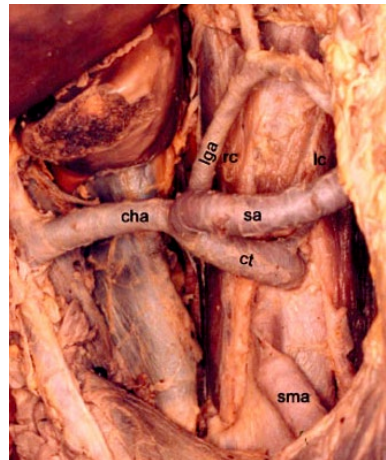
Credit: [https://www.youtube.com/watch?v=8EB0Au314AM&index=1&list=PLGEKJJ3ekUkzFqY2SFfAodP\\_NJUPV0qqF](https://www.youtube.com/watch?v=8EB0Au314AM&index=1&list=PLGEKJJ3ekUkzFqY2SFfAodP_NJUPV0qqF)



Credit: reference.medscape.com

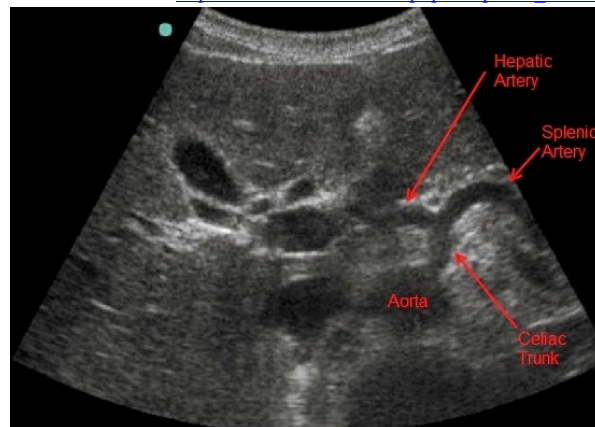
Proximal abdominal aorta (below the diaphragm in subxiphoid region)

- The celiac trunk is the 1st major branch of the abdominal aorta.
- Look for the “seagull sign” – the wings are the hepatic (screen left) and splenic (screen right) arteries.
- The left gastric artery, the third component of the celiac trunk is usually not visualized on ultrasound.

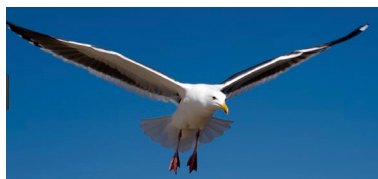


ct = celiac trunk  
cha = common hepatic artery  
sa = splenic artery  
lga = left gastric artery  
sma = superior mesenteric artery

Credit: [http://www.scielo.cl/scielo.php?script=sci\\_arttext&pid=S0717-95022007000200002&lng=en&](http://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0717-95022007000200002&lng=en&)



Credit: <http://radiology-anatomy.blogspot.com/2014/03/ceciac-trunk-ultrasound-anatomy.html>

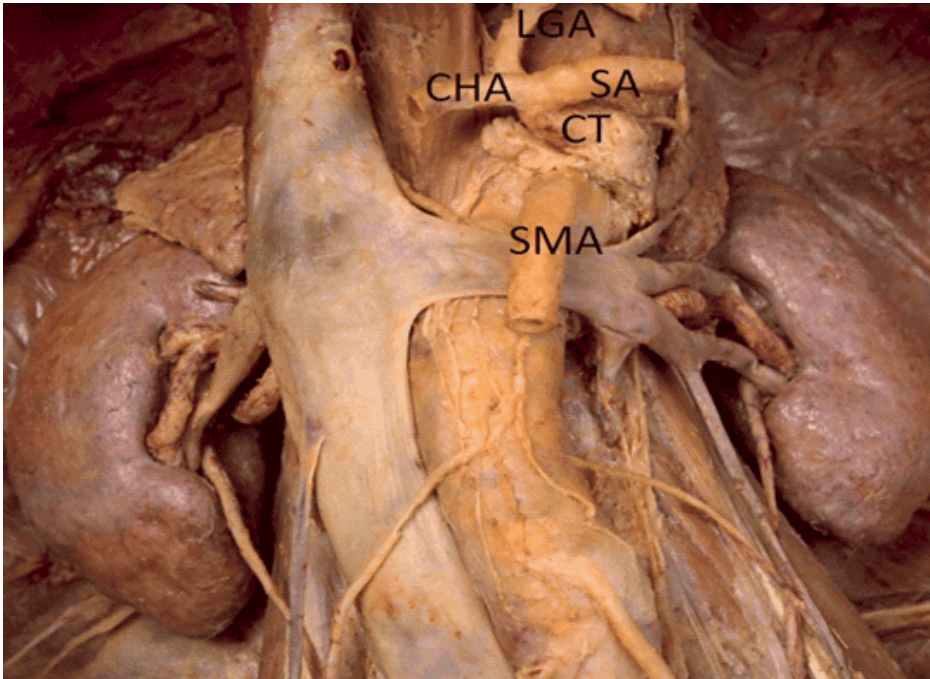


Credit: <https://vimeo.com/41791516>

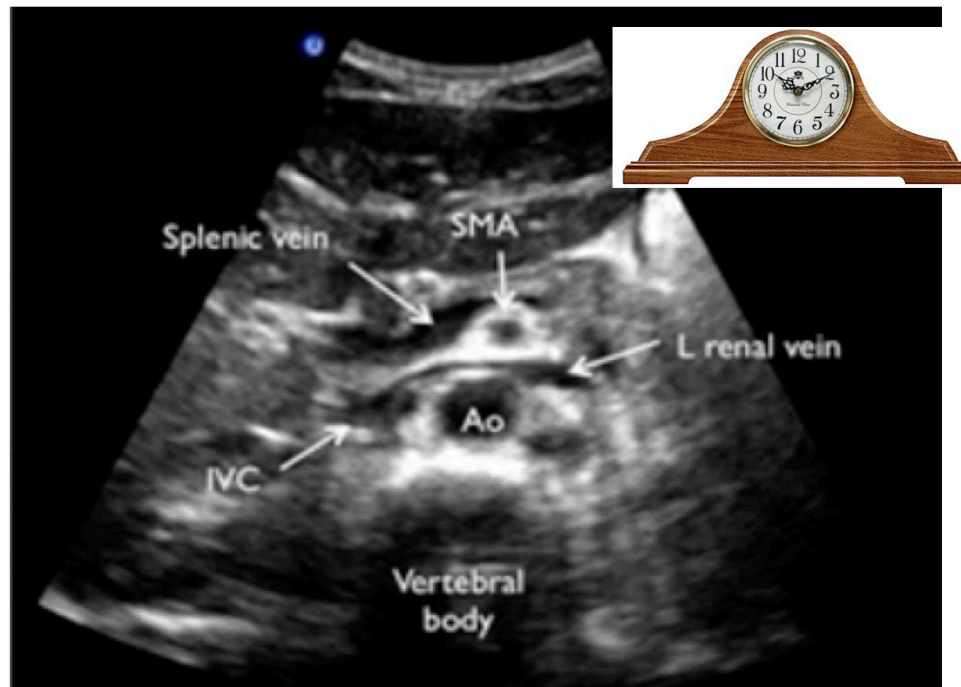


Mid abdominal aorta (near the level of the renal arteries)

- The superior mesenteric artery (SMA) is the second major branch of the abdominal aorta.
- The splenic vein passes anterior and the left renal vein runs posterior to the SMA.
- The SMA view has been called the “mantle clock” sign given its resemblance to one.



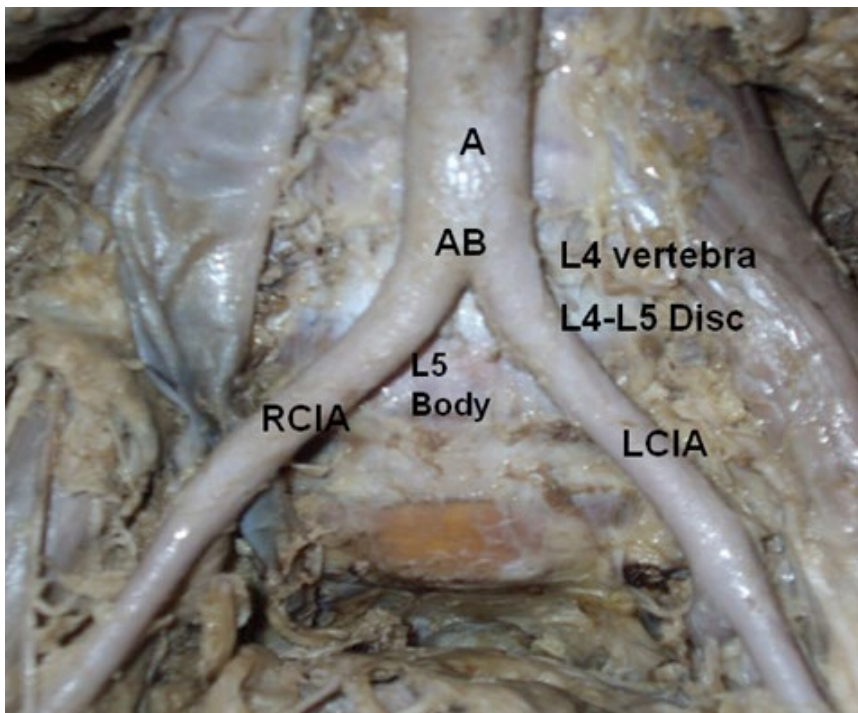
Credit: <http://www.omicsonline.org/pentafurcation-of-the-celiac-trunk-2161-0940.S7-001.php?aid=4737>



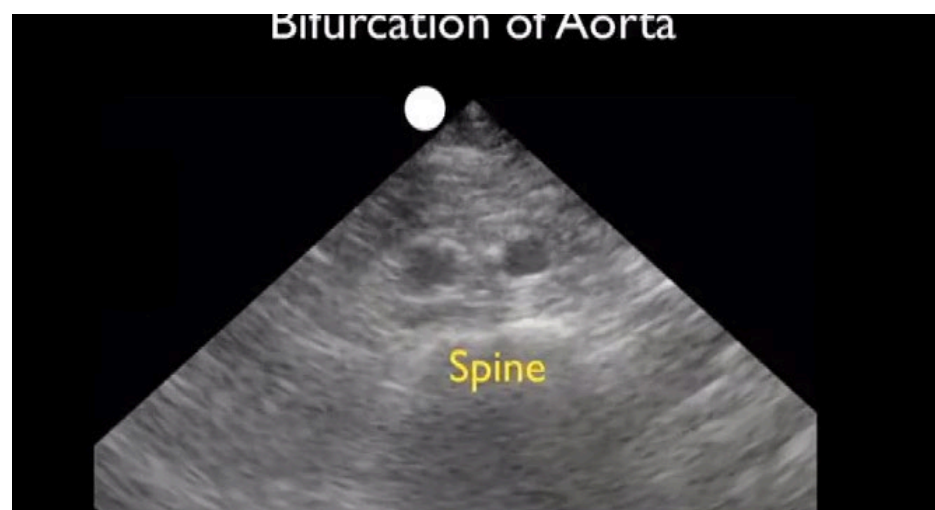
Credit: <https://vimeo.com/41791516>

### Distal (Above and at the Iliac Bifurcation)

- The aorta will bifurcate at the level of the umbilicus (L4 vertebra) into the common iliac arteries.
- Slowly fan up and down to view the distal aorta branch off into the two branches of the iliac arteries.
- Normal diameter of the common iliac arteries is 1.5cm (half of the normal aorta diameter).



Credit: <http://www.jcdr.net/ReadXMLFile.aspx?id=4559>



Credit: Source: <https://www.youtube.com/watch?v=uiTsFtanyzM>

### Longitudinal Evaluation of Abdominal Aorta

- Turning the transducer clock-wise 90 degrees (probe marker towards the head) allows for the longitudinal view of the aorta to appear.
- The patient's head will be to the left of the screen, and the feet to the right.
- The celiac trunk (proximal aorta) and the SMA (mid-aorta) can be seen exiting the aorta, with the SMA running parallel to the aorta distally.



Source: [www.emergencyultrasoundteaching.com](http://www.emergencyultrasoundteaching.com)

### Structures to Identify:

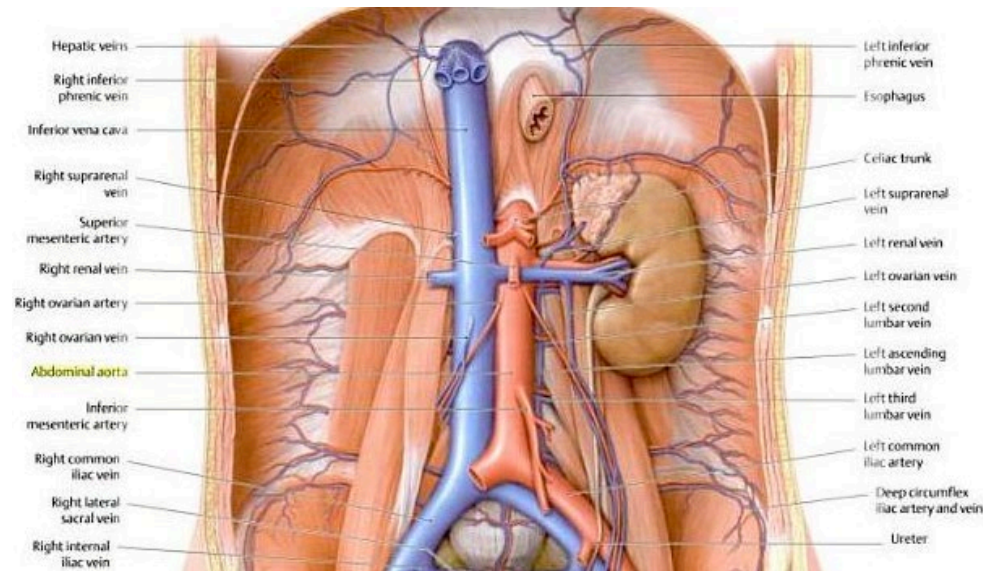
- Transverse View
  - ✓ Vertebral body with posterior shadow
  - ✓ Inferior vena cava
  - ✓ Aorta
  - ✓ Proximal aorta
    - Celiac trunk
    - Hepatic artery
    - Splenic artery
  - ✓ Mid aorta
    - Superior mesenteric artery
    - Splenic vein
    - Left renal vein
  - ✓ Distal aorta
    - Bifurcation into common iliac arteries
- Longitudinal View
  - ✓ Celiac trunk



✓ **Superior mesenteric artery**

## INFERIOR VENA CAVA ULTRASOUND

### *Gross Anatomy*



Credit: anatomytopics.wordpress.com

### *Ultrasound Anatomy*

#### Probe Selection:

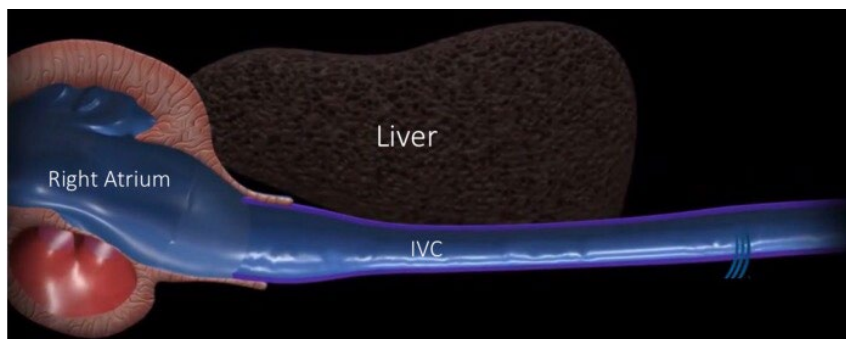
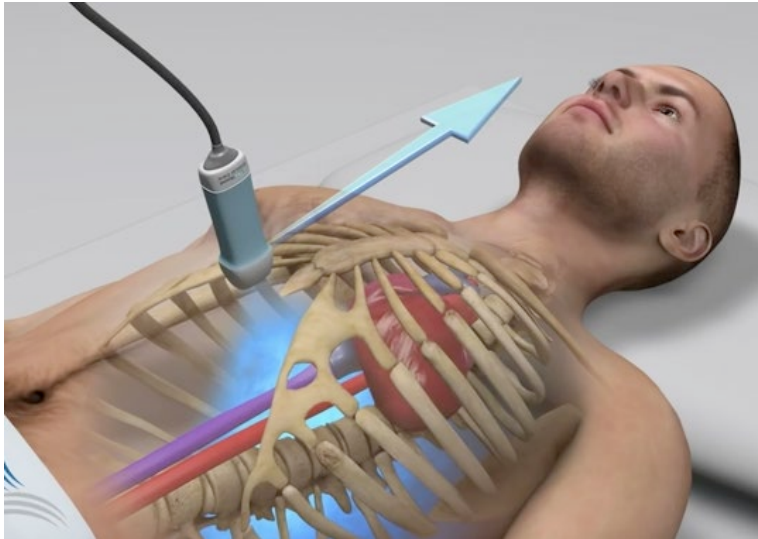
- Curvilinear
  - Phased array
- Low frequency probes, increased depth

#### Patient Positioning and Preparation:

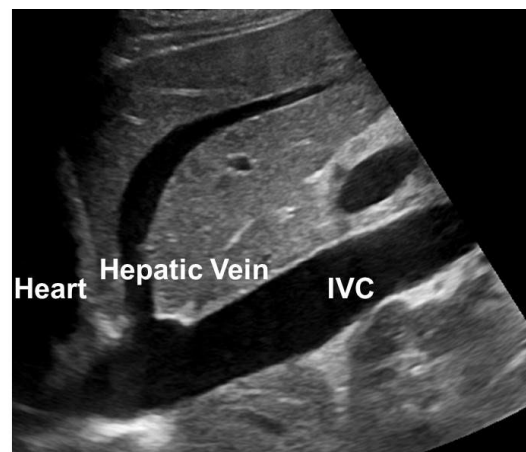
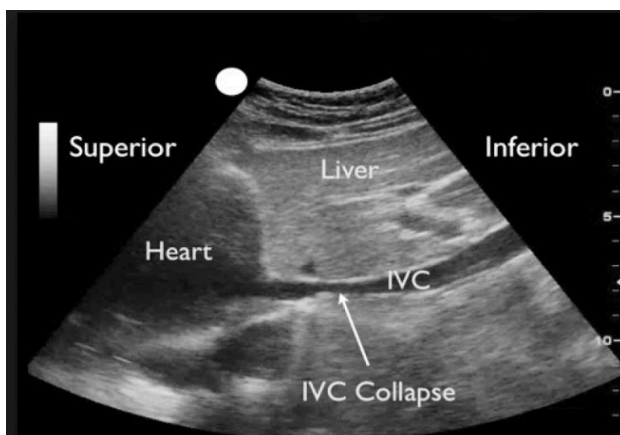
- Supine
- Ideally, fasting prior to exam (to avoid bowel gas, which causes air artifact and decreased visualization of the structures beneath)

#### 1. Technique:

- Place the probe in longitudinal orientation to the subxiphoid region.
- Slide probe 1-2 cm to the patient's right and slightly rock the probe towards the head and under the rib margin.
- The inferior vena cava (IVC) can be seen entering the right atrium of the heart, which will help differentiate it from the aorta.
- The IVC can also be differentiated from the aorta by seeing diameter variability on patient inspiration or sniffing.



Credit: <https://www.youtube.com/watch?v=McUUFvnFuJU>



Credit: <https://www.ahcmmedia.com/articles/136856-ultrasound-for-trauma>

Structures to Identify:

- Inferior vena cava
- Right atrium
- Hepatic vein (may not be visible)