

# 430 Radiology team

## IMAGING INVESTIGATION OF THE GASTROINTESTINAL TRACT

Khawlah AlOthman

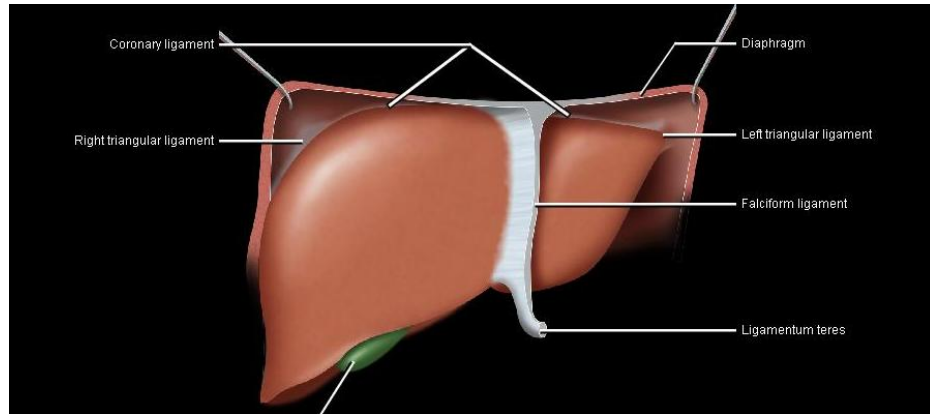
Hanan AlSalman  
Ghadeer AlWuhayd

Rawabi Al gamdi

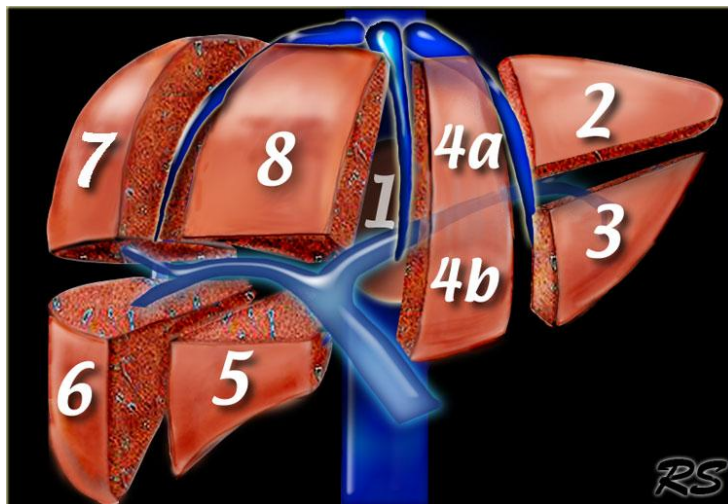
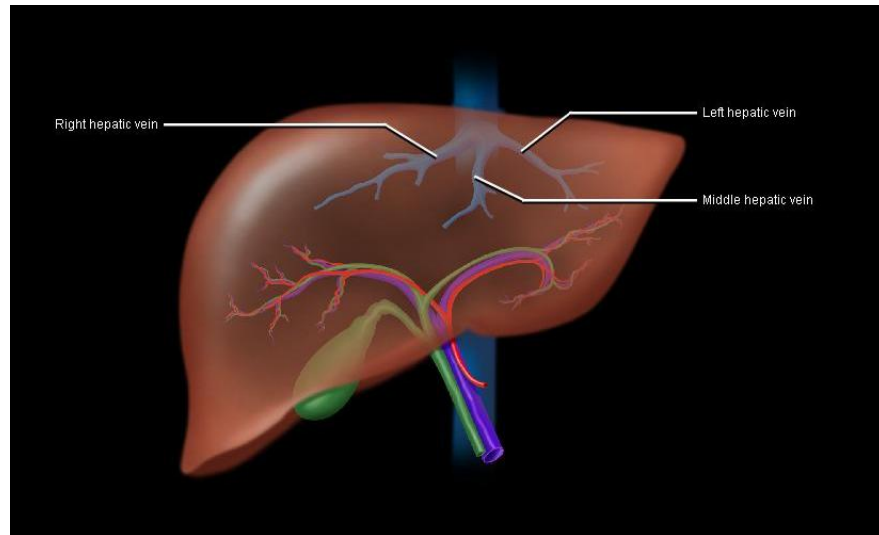
Maha AlKubidan  
Hanan Alrabiah

Dala Al gadi

## Normal anatomy of the Hepatobiliary system :



The liver's main job is to filter the blood coming from the digestive tract, before passing it to the rest of the body. The liver also detoxifies chemicals and metabolizes drugs. As it does so, the liver secretes bile that ends up back in the intestines. The liver also makes proteins important for blood clotting and other functions .



liver anatomy divides the liver into eight functionally independent segments.

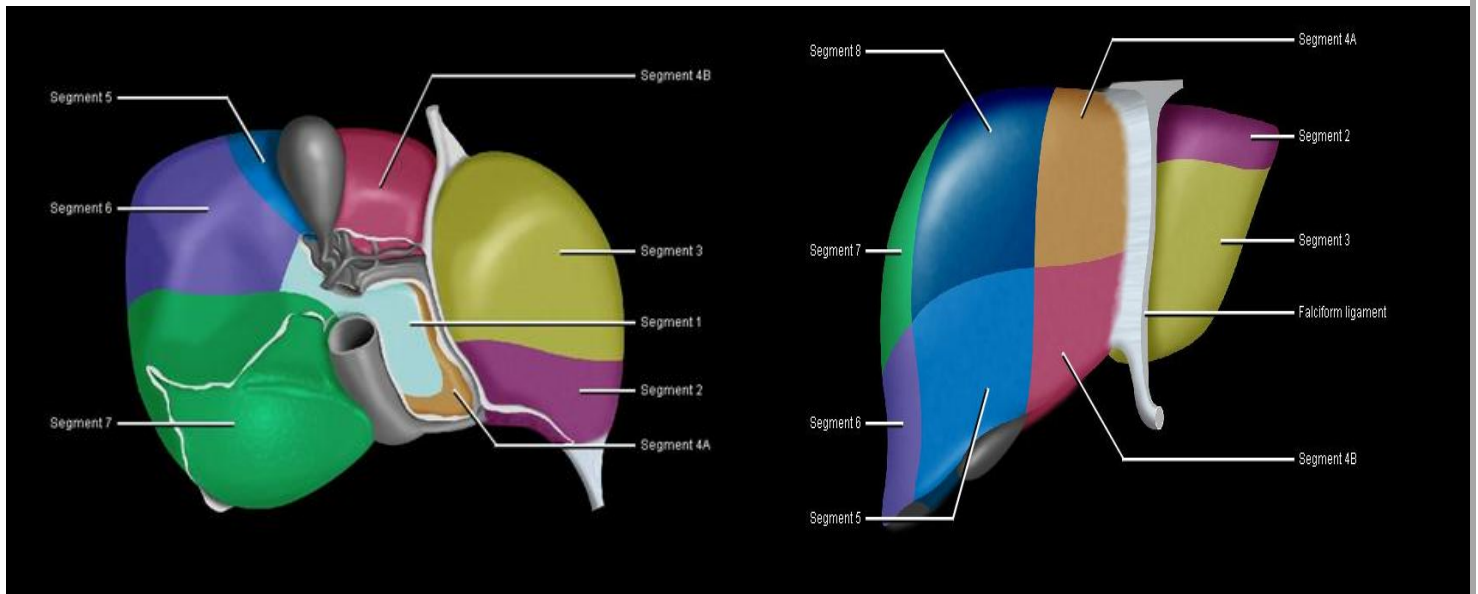
Each segment has its own vascular inflow, outflow and biliary drainage.

**Right hepatic vein** divides the right lobe into anterior and posterior segments.

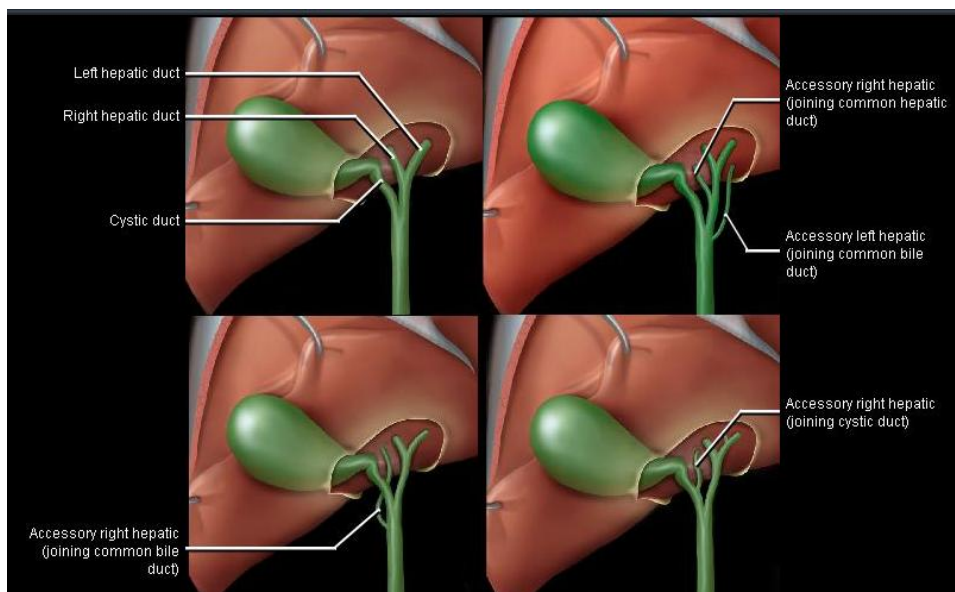
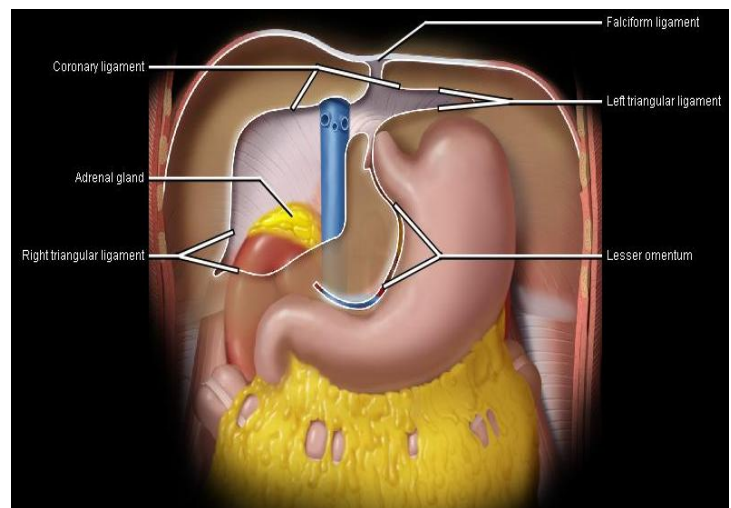
**Middle hepatic vein** divides the liver into right and left lobes (or right and left hemiliver). This plane runs from the inferior vena cava to the gallbladder fossa.

**Left hepatic vein** divides the left lobe into a medial and lateral part

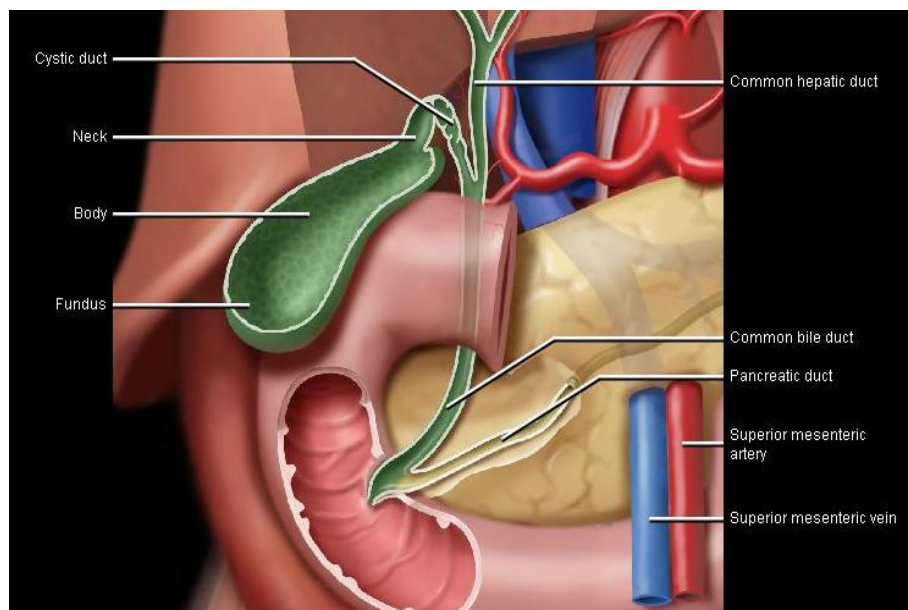
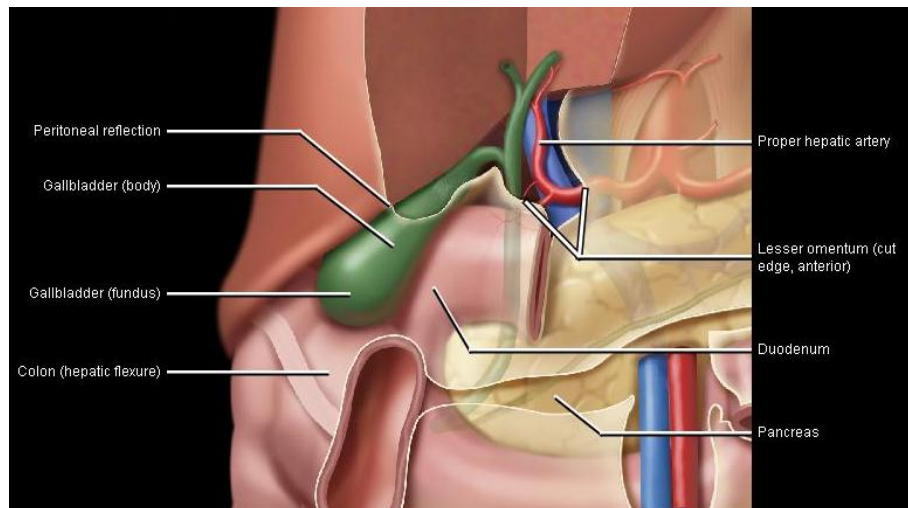
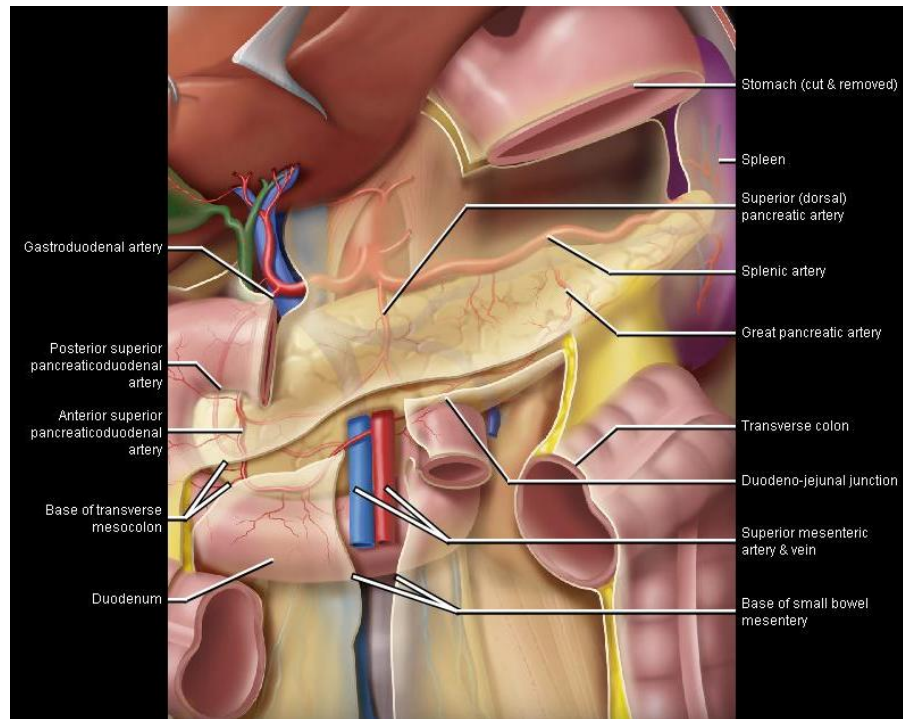
**Portal vein** divides the liver into upper and lower segments.



If we remove the liver , we will see behind it →







# Imaging Investigation Of The Gastrointestinal Tract:

## Normal CT scan of the abdomen

### What is CT Scanning ??

- CT scanning—sometimes called CAT scanning—is a noninvasive, painless medical test that helps physicians diagnose and treat medical conditions.
- CT imaging uses special x-ray equipment to produce multiple images or pictures of the inside of the body and a computer to join them together in cross-sectional views of the area being studied. The images can then be examined on a computer monitor or printed.
- CT scans of internal organs, bone, soft tissue and blood vessels provide greater clarity than conventional.

### What are some common uses of the procedure in Abdomen and pelvis?

This procedure is typically used to help diagnose the cause of abdominal pain and diseases of the bowel and colon, such as:

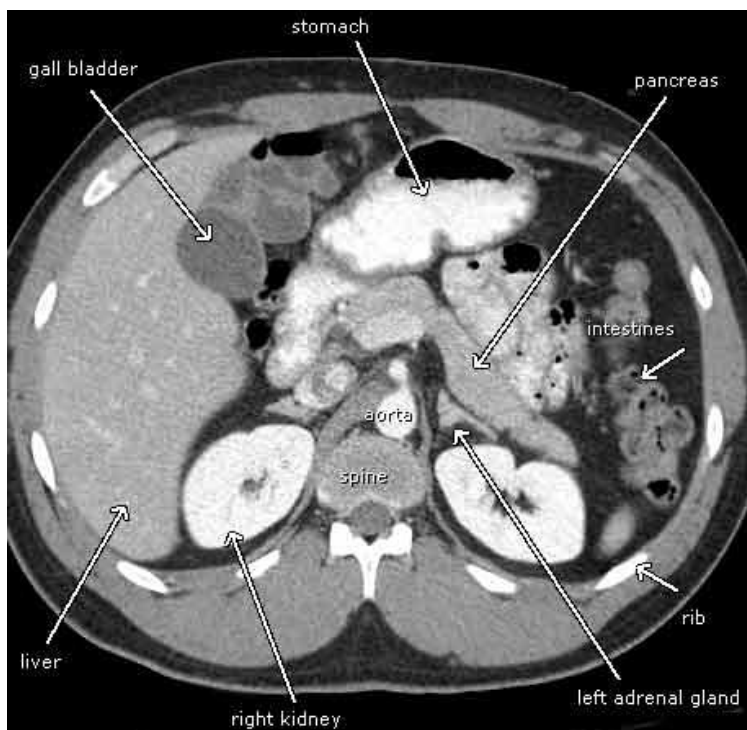
- abscesses in the abdomen
- inflamed colon
- cancers of the colon, liver, pancreas and kidneys
- pancreatitis
- lymphoma
- staging for cancer
- diverticulitis
- appendicitis

scanning of the abdomen/pelvis is also performed to:

- visualize the liver, spleen, pancreas and kidneys
- plan and properly administer radiation treatments for tumors
- guide biopsies and other minimally invasive procedures
- CT imaging can also play a significant role in the detection, diagnosis and treatment of vascular disorders that can lead to stroke, gangrene or kidney failure.

CT is radiological modality containing an x-ray source, detectors and the computer data processing system. The essential component of a CT system include a circular scanning gantry which holds the x-ray tube, and imaging sensors, a table for a patient, an x-ray generator and a computerized data processing unit. The patient lies on the table and is placed inside the gantry.

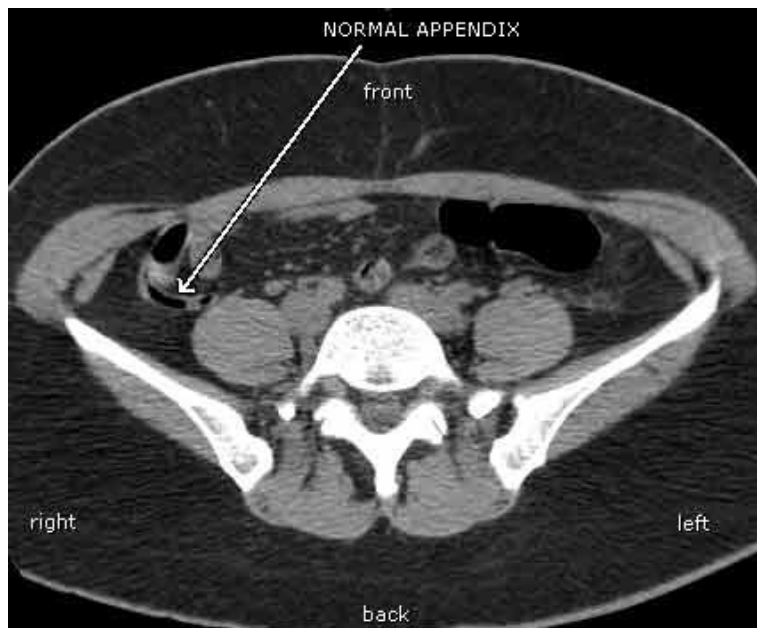
The x-ray tube is rotated 360° around the patient while the computer collects the data and formulates an axial image or slice. Each cross sectional slice represents a thickness between 3mm to 1.5cm of body tissue.



- In many ways CT scanning works very much like other x-ray examinations. X-rays are a form of radiation—like light or radio waves—that can be directed at the body. Different body parts absorb the x-rays in varying degrees.

- In a conventional x-ray exam, a small burst of radiation is aimed at and passes through the body, recording an image on photographic film or a special image recording plate. Bones appear white on the x-ray; soft tissue shows up in shades of gray and air appears black.

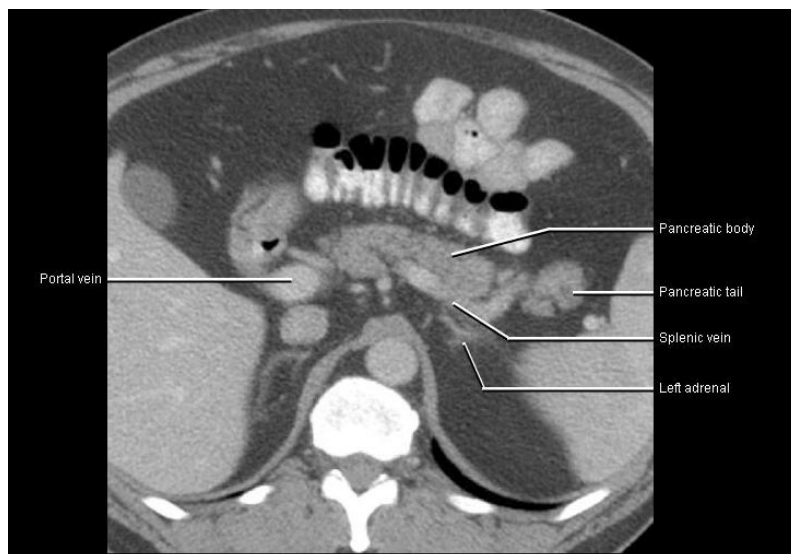
- With CT scanning, numerous x-ray beams and a set of electronic x-ray detectors rotate around you, measuring the amount of radiation being absorbed throughout your body. At the same time, the examination table is moving through the scanner, so that the x-ray beam follows a spiral path. A special computer program processes this series of pictures, or slices of your body, to create two-dimensional cross-sectional images, which are then displayed on a monitor.



- CT imaging is sometimes compared to looking into a loaf of bread by cutting the loaf into thin slices. When the image slices are reassembled by computer software, the result is a very detailed multidimensional view of the body's interior.

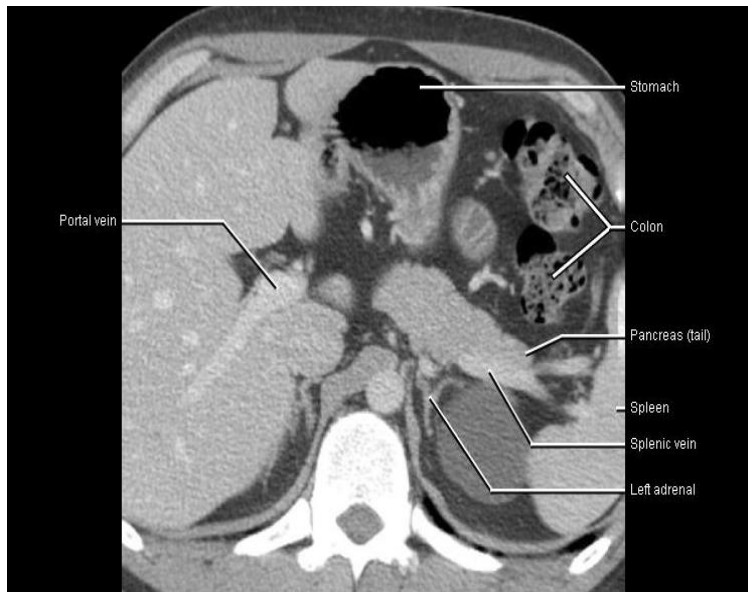
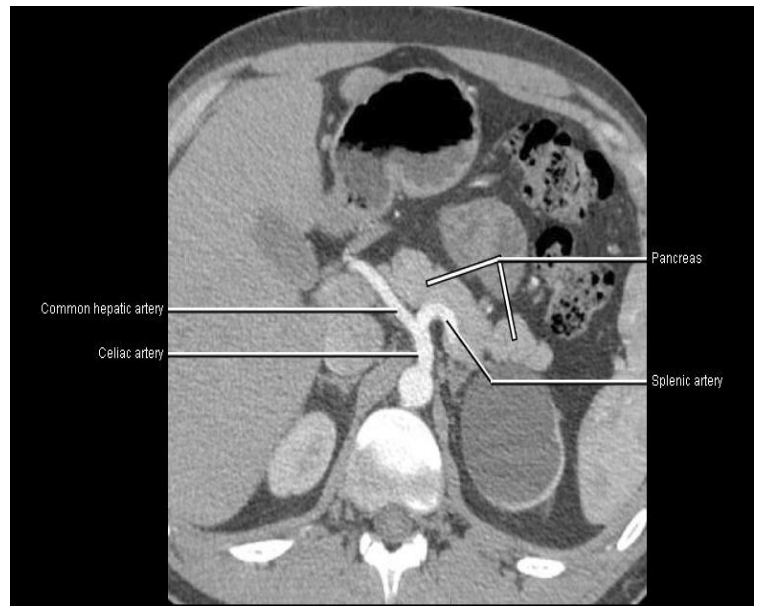
- Refinements in detector technology allow new CT scanners to obtain multiple slices in a single rotation. These scanners, called "multislice CT" or "multidetector CT," allow thinner slices to be obtained in a shorter period of time, resulting in more detail and additional view capability.

- Modern CT scanners are so fast that they can scan through large sections of the body in just a few seconds. Such speed is beneficial for all patients but especially children, the elderly and critically ill.
- For some CT exams, a contrast material is used to enhance visibility in the area of the body being studied.

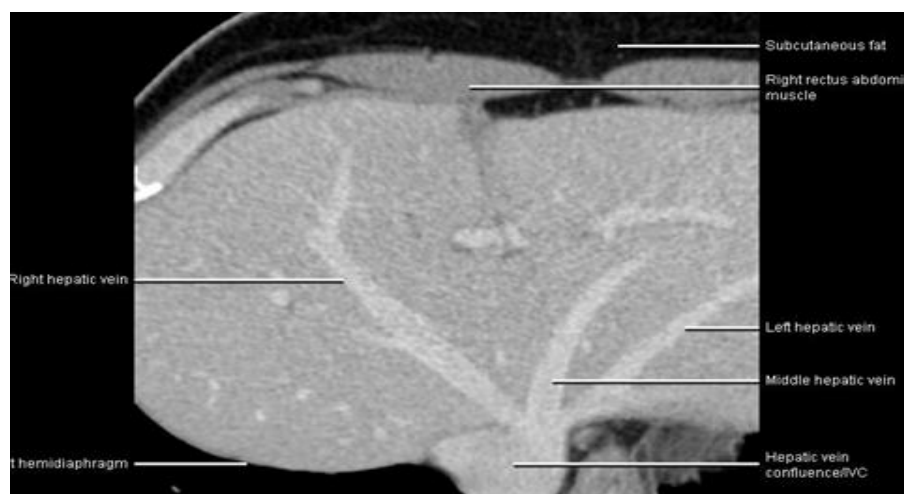




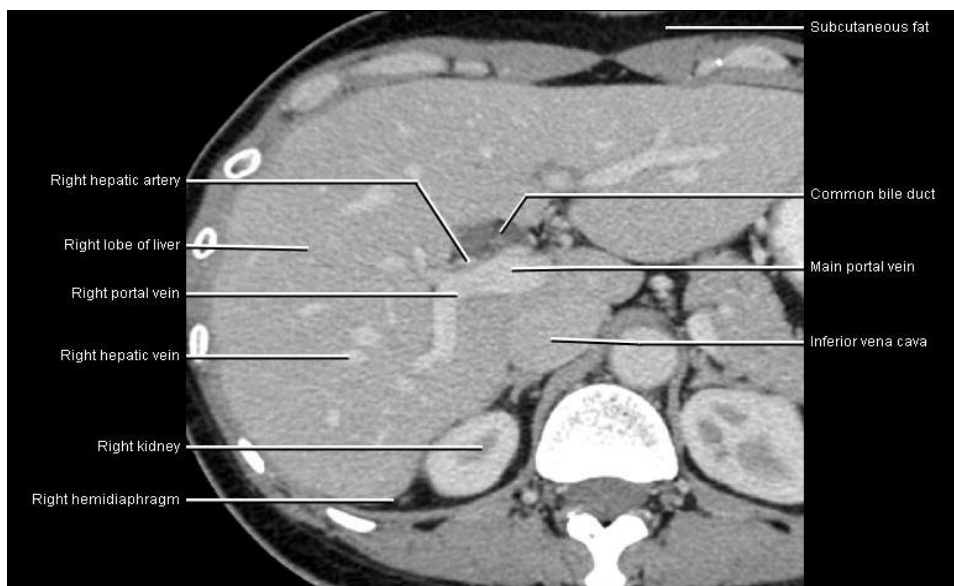
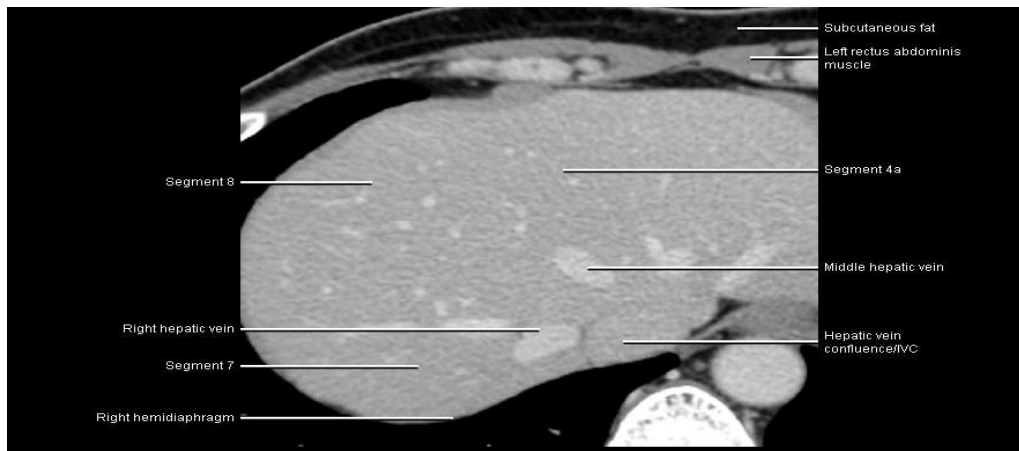
Normal CT scan with contrast →



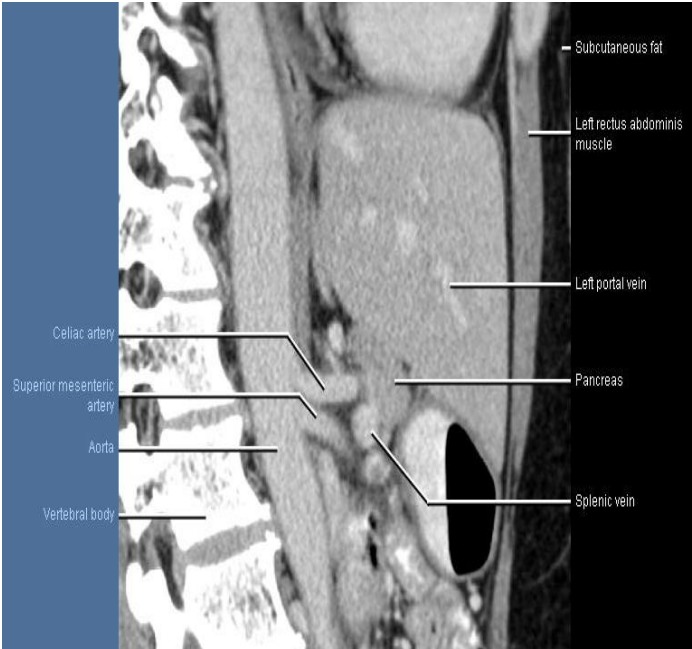
## Normal CT scan of the liver :



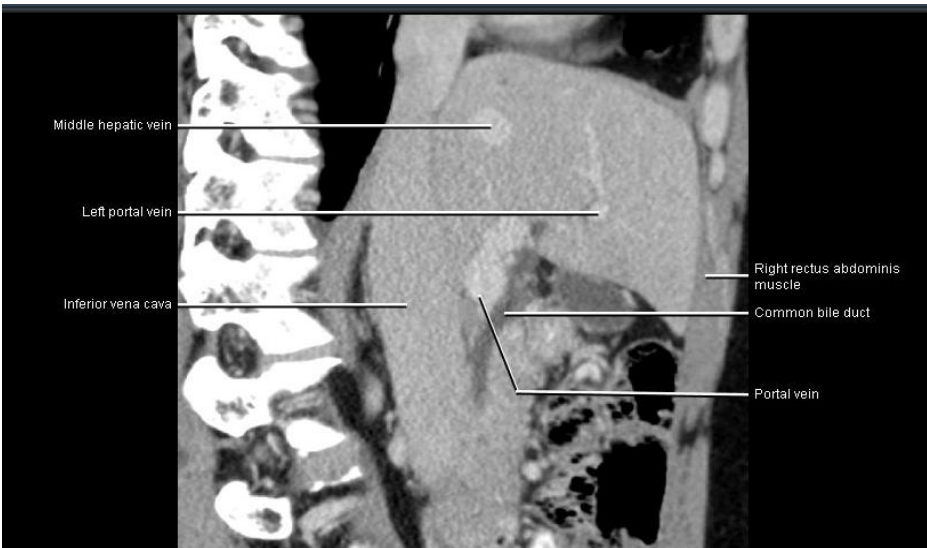




**You should know liver segments in CT scan**



## Sagittal plane

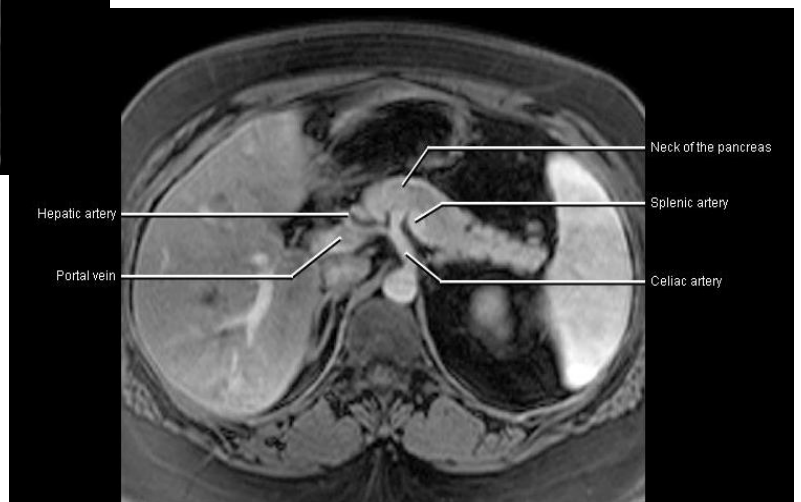




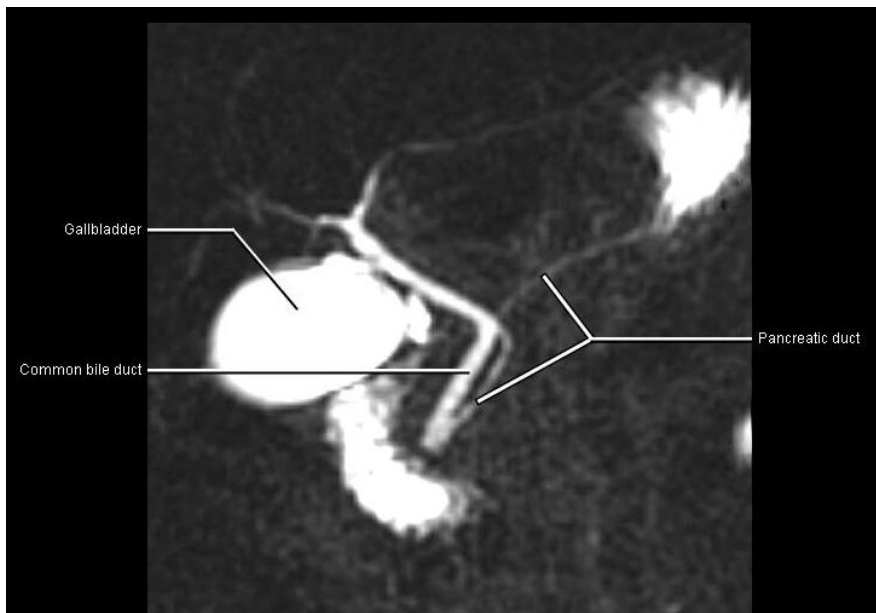
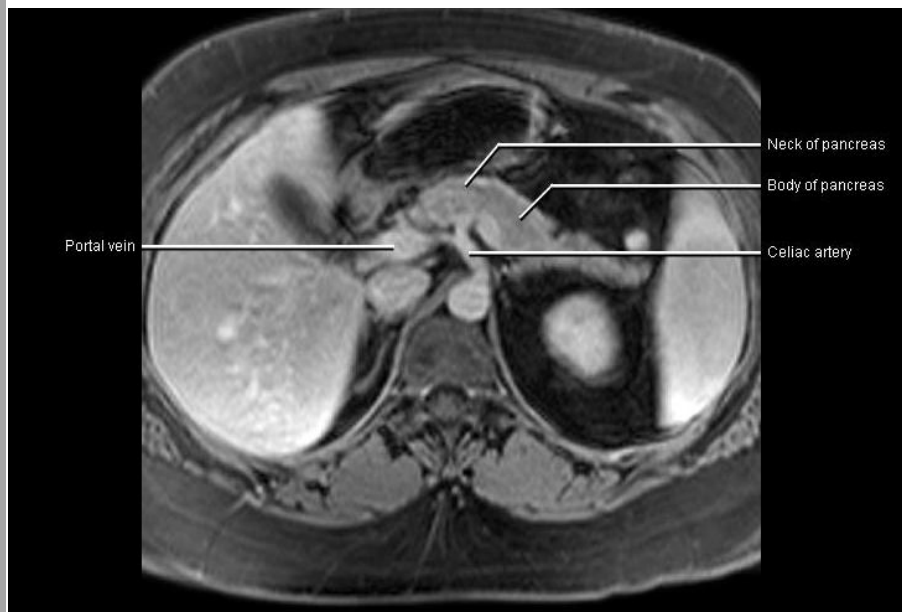
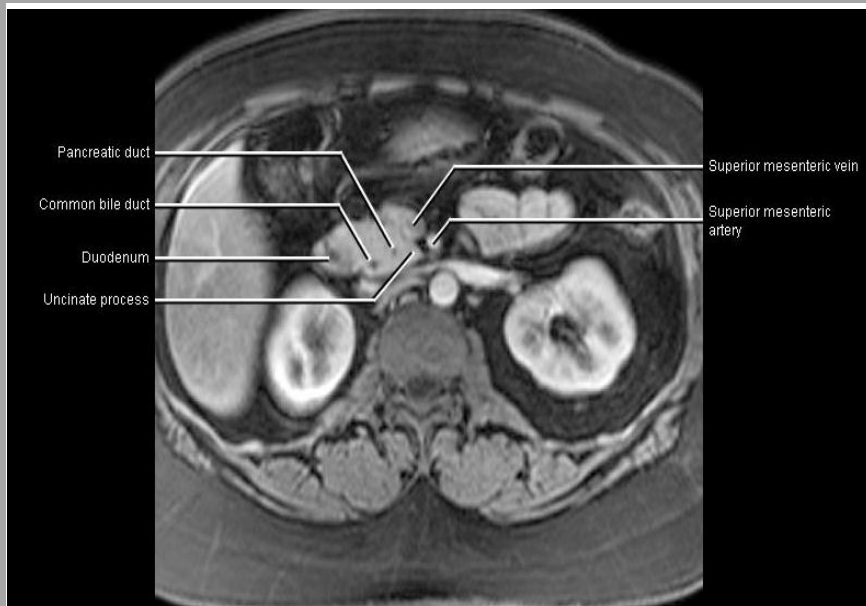
### Normal MRI of the abdomen :

MRI is based upon the remission of an absorb radio frequency signal while the patient in a strong magnetic field. An external magnetic field is usually generated by a magnet with field strength of 0.2 to 1.5 Tesla. **The system includes a magnet, RF coils (Transmitter and receiver), gradient coils, and a computer display unit with digital storage facilities.** The principle of MRI cannot be discussed in detail.

The musculoskeletal system is ideally suited for evaluation by MRI since different tissue displayed different signal intensities on T1 & T2 weighted images. The images displayed may have a low signal intensity, intermediate signal intensity, or high signal intensity







**MRCP (Magnetic Resonance Cholangiopancreatogram)**

## Ultrasound

- Not expensive
- allows comparison with the opposite side, normal side
- uses no ionizing radiation,
- performed at bed side or in the operating room.
- It is a non invasive modality

**NOTE : liver segments in ultrasound ,doctor said "better to know them "**

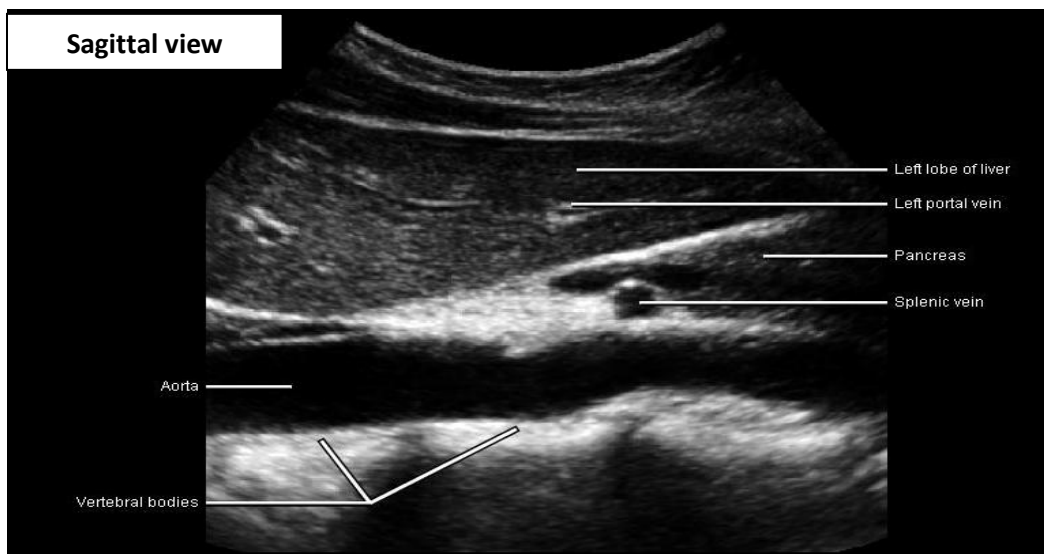
- When the transducer is held in a **transverse** orientation, images of the patient's anatomy are taken in the axial plane " slices "
- When the transducer is held in a **longitudinal** orientation, images of the patient's anatomy appear in the sagittal plane.

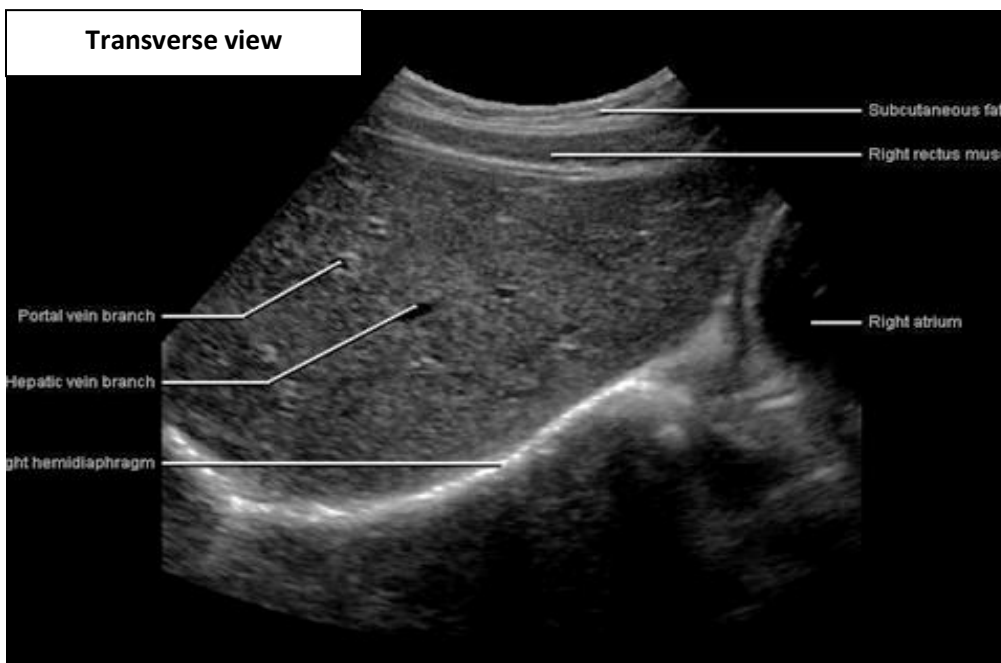
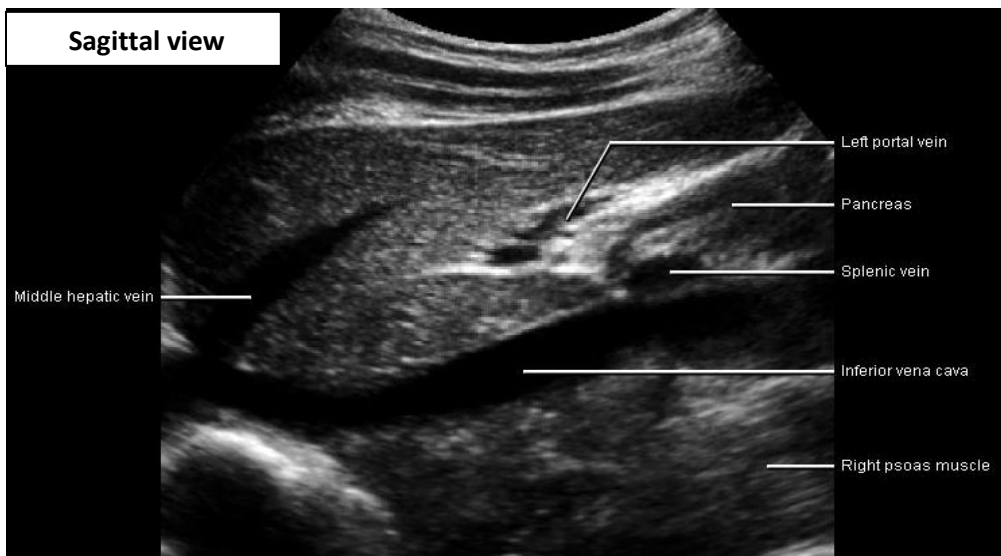
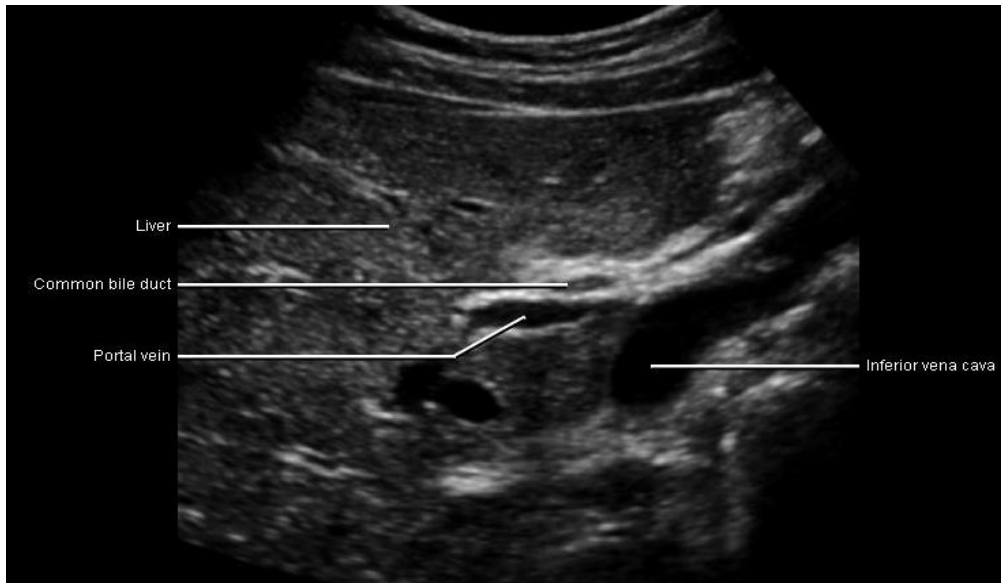


**Sagittal " longitudinal section"**

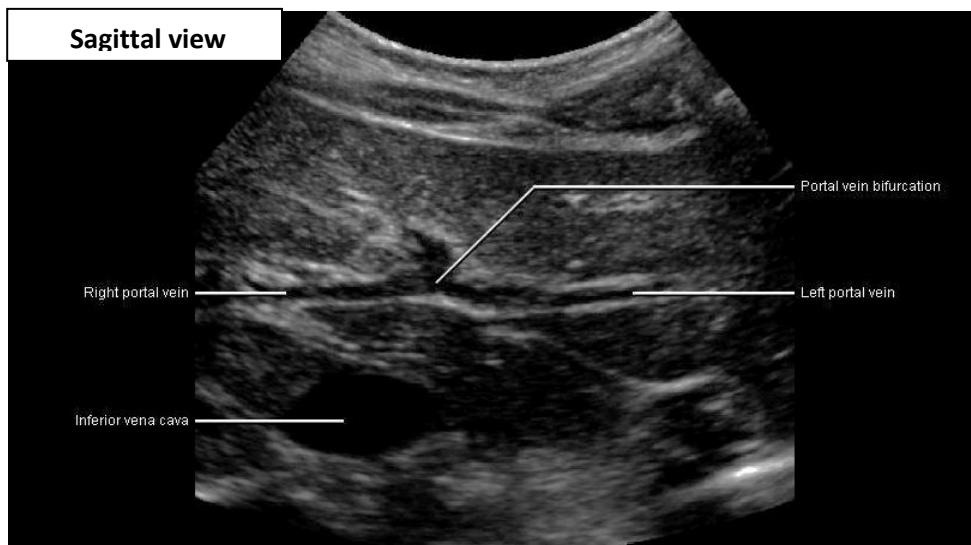
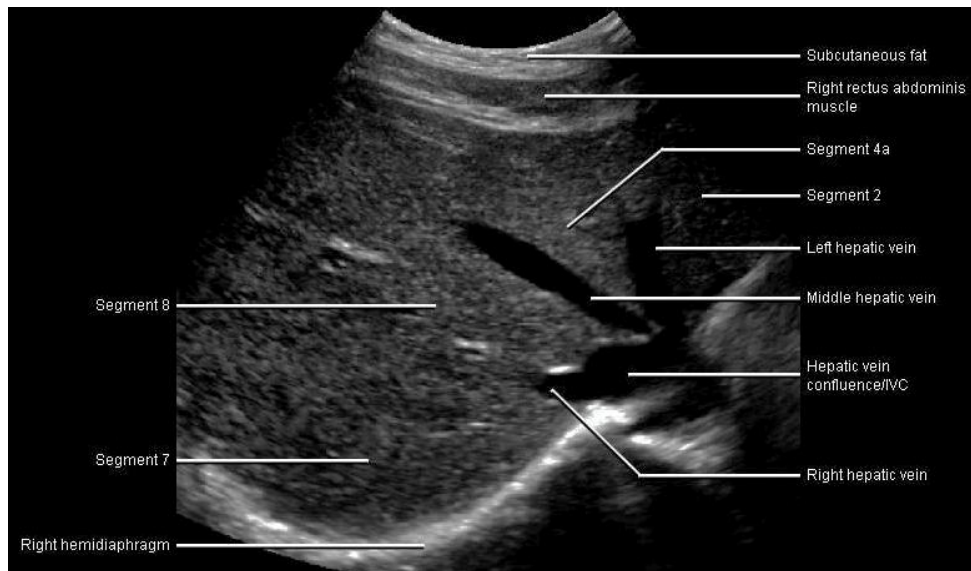
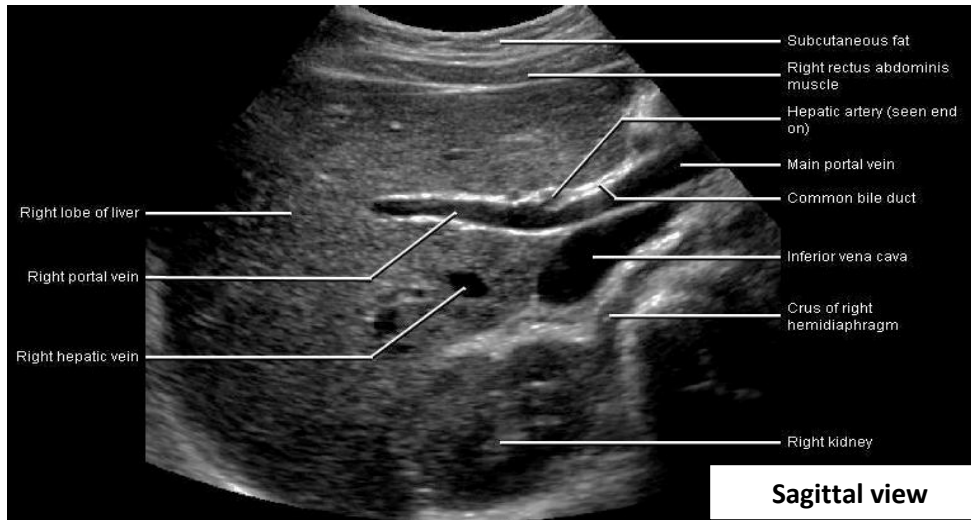


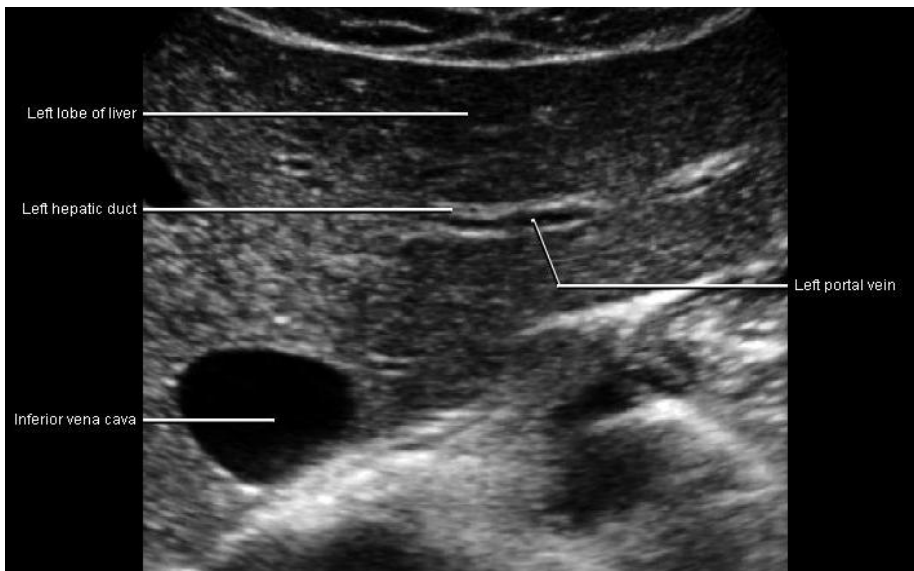
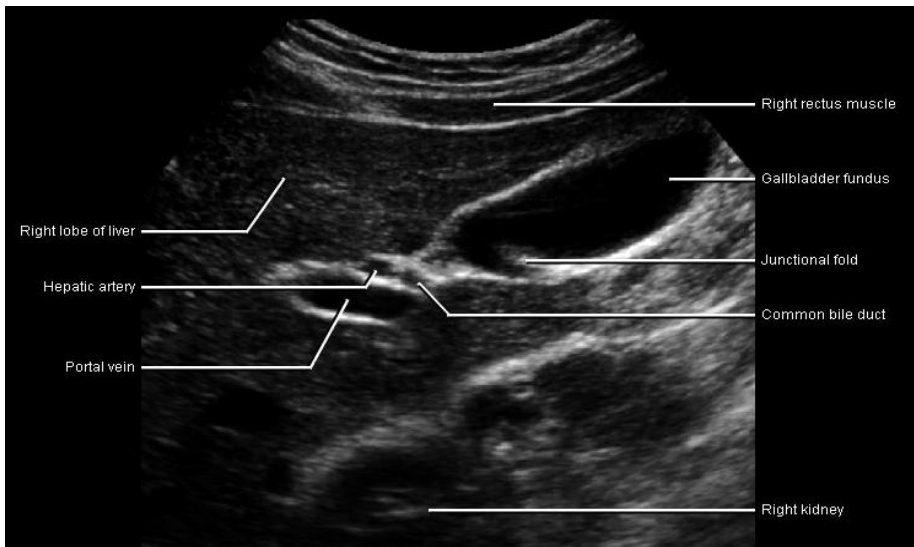
**transverse "cross section"**





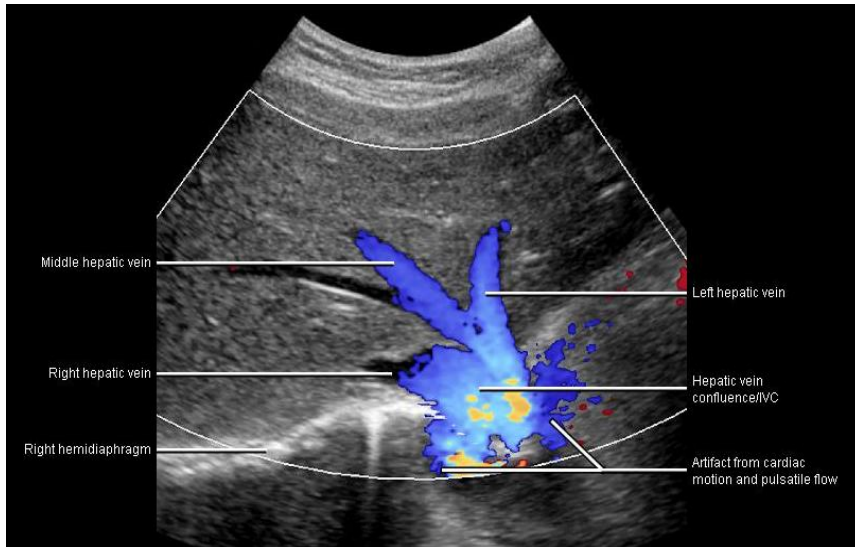




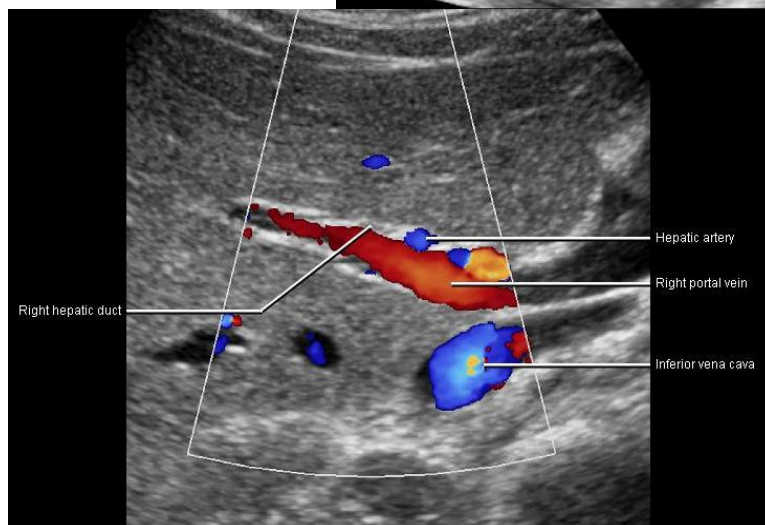
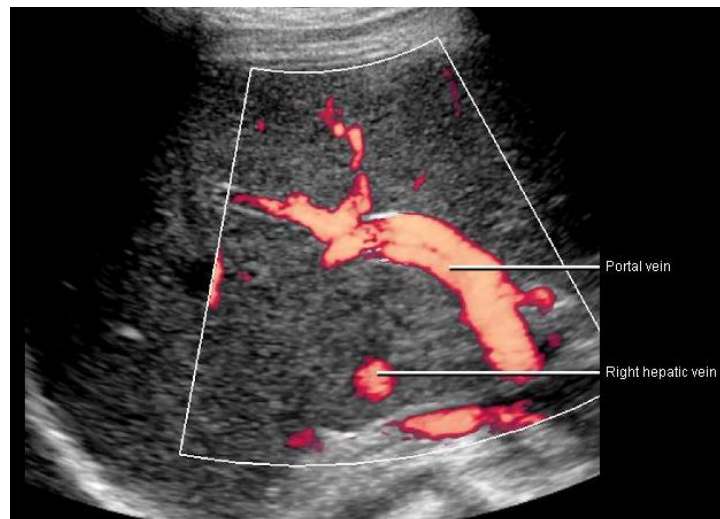


## Doppler Ultrasound :

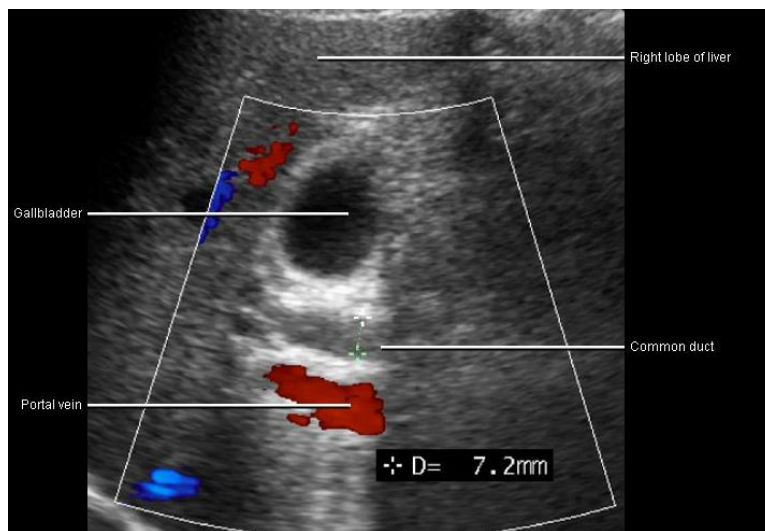
A Doppler ultrasound test uses reflected sound waves to see how blood flows through a blood vessel. **It helps doctors evaluate blood flow** through major arteries and veins.



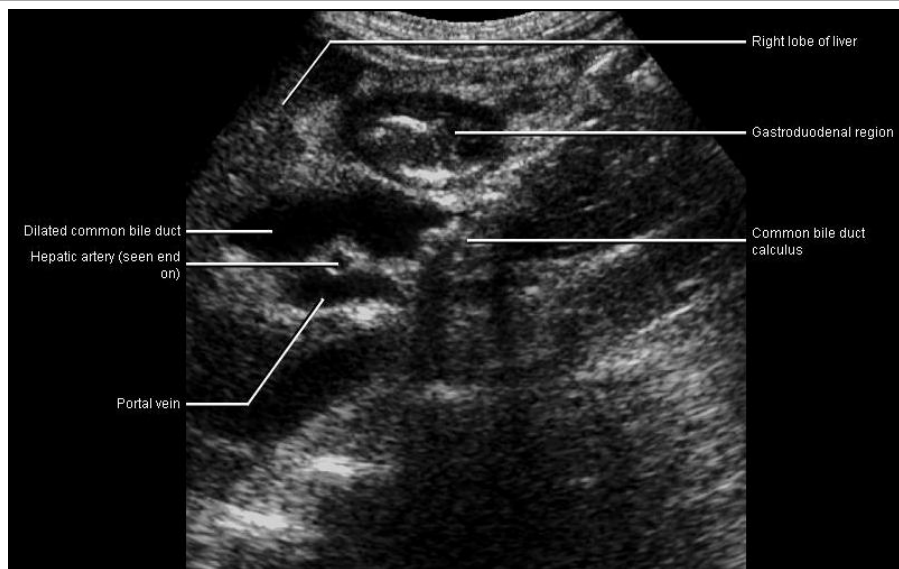
“Rabbit sign”







## Pathology :



**Common bile duct calculus**



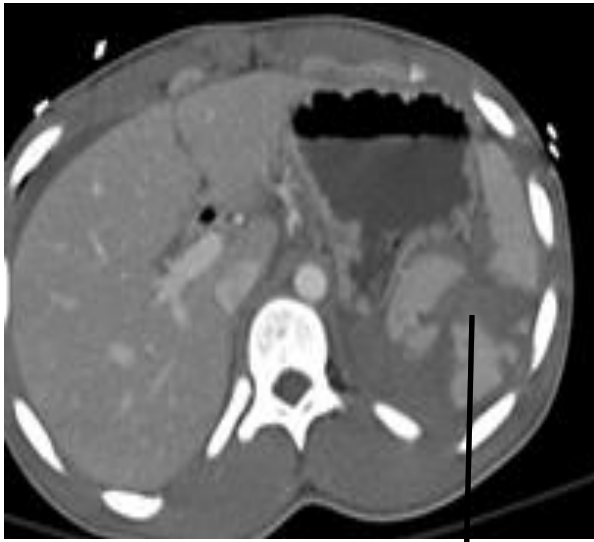
**Gallstones**



**Gallbladder sludge** “The presence of sludge in the gallbladder is a first step in the formation of gallstones , however, in many cases sludge doesn't cause any problems at all.

## **Blunt trauma :**

refers to physical trauma caused to a body part, either by impact, injury or physical attack; the latter usually being referred to as blunt force trauma.



Blunt splenic  
trauma



Blunt liver trauma

### **blunt trauma is result of :**

- Spleen injury
- Liver injury
- Bowel injury
- Renal injuries

- IV contrast → assists with diagnosis of **active bleeding**.
- PO “oral contrast “ → rarely helpful.
- bowel injuries can be detected without PO contrast
- Oral contrast is not necessary in the evaluation of blunt abdominal trauma by computed tomography.
- **CT is the diagnostic modality of choice for the evaluation of blunt liver trauma in hemodynamically stable patients and can accurately help identify hepatic parenchymal injuries**

## **Free abdomen fluid:**

Free abdominal fluid can be present in the solid organ injury such as a bowel injury and Mesenteric injury or without obvious solid organ injury such as ascites





## Cholelithiasis



- CT scan can indicate only if there is stone within gallbladder , but can't confirm if this patient suffering also from cholecystitis as a complication of gallstone → Because CT scan can't indicate the Pericholecystic fluid or Thickened wall of the gallbladder which they are a common finding in cholecystitis .
- Sensitivity of CT for stone is approximately 70% and Specificity about 97% .
- CT evaluation of acute cholecystitis findings and usefulness in diagnosis.
- Diagnosis of intrahepatic and common bile duct stones → combined unenhanced and contrast-enhanced helical CT .

## CT scan risks :

- CT scans are not recommended for pregnant women because there is a small risk that the X-rays may harm the unborn child.
- Children are at greater risk from a build-up of radiation than adults and should only have a CT scan if it is justified by a serious condition that puts them at an increased risk.
- During a CT scan, you're briefly exposed to much more radiation than you would be during a plain X-ray. This radiation from imaging tests has a very small potential to increase your risk of cancer.

Q: For radiation dose, how many CXR = 1 CT?

A: 1 CT abdomen= roughly 250-500 CXRs!( International Commission on Radiological Protection (ICRP))

Q: Does radiation cause fetal or oocyte mutations?

A: low doses (less than 10 rad) from most medical procedures pose insignificant mutation risk.