



2025

KARNATAKA RADIOLOGY EDUCATION PROGRAM

LIVER Anatomy and applied radiology -4

Segmental anatomy- Continued

Couinaud classification

The Couinaud classification of liver anatomy divides the liver into eight functionally independent segments.

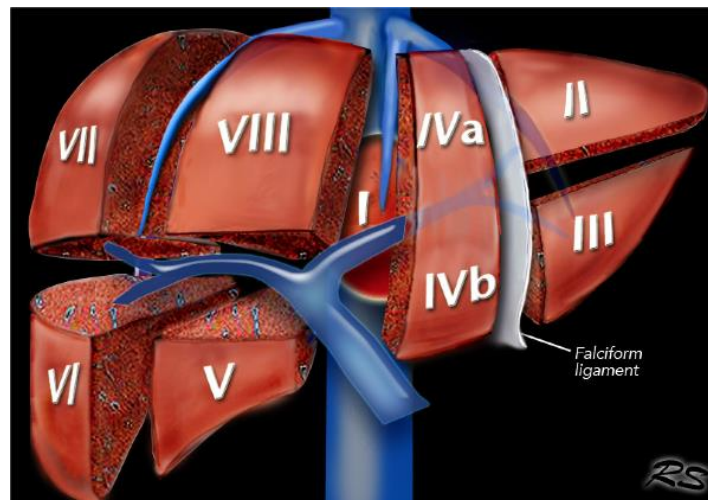
Each segment has its own vascular inflow, outflow and biliary drainage.

In the centre of each segment there is a branch of the portal vein, hepatic artery and bile duct.

In the periphery of each segment there is vascular outflow through the hepatic veins.

The liver is divided in three vertical planes:

- The plane of the right hepatic vein divides the right lobe into anterior and posterior segments.
- The plane of the 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.
- The umbilic plane runs from the falciform ligament to the inferior vena cava and divides the left lobe into a medial part, which is segment IV and a lateral part formed by segment II and III. This division is the only vertically oriented plane that is not defined by a hepatic vein.



Portal vein

The portal vein divides the liver into upper and lower segments.

The left and right portal veins branch superiorly and inferiorly to project into the center of each segment.

Left hepatic vein

The significance of the left hepatic vein is somewhat controversial. Some authors have shown it to coincide with the umbilical fissure, but in reality the left hepatic vein courses to the lateral to the umbilical fissure .

While some authors have claimed that the division between segments II and III is formed by the transverse plane of the left portal vein, most investigators feel that it is the plane defined by the left hepatic vein.

Transverse anatomy

This figure is a transverse image through the superior liver segments, that are divided by the right and middle hepatic veins and the falciform ligament.

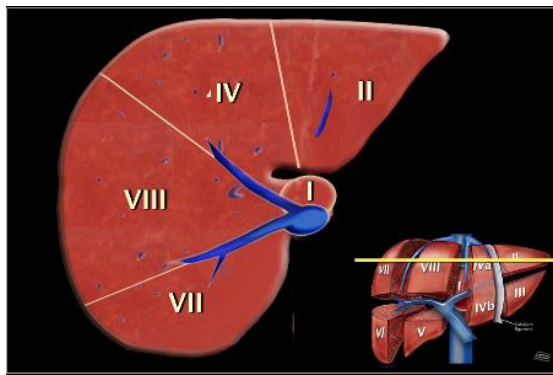


Image at the level of the superior liver segments.

This is a transverse image at the level of the left portal vein.

At this level the left portal vein divides the left lobe into the superior segments (II and IVa) and the inferior segments (III and IVb).

The left portal vein is at a higher level than the right portal vein.

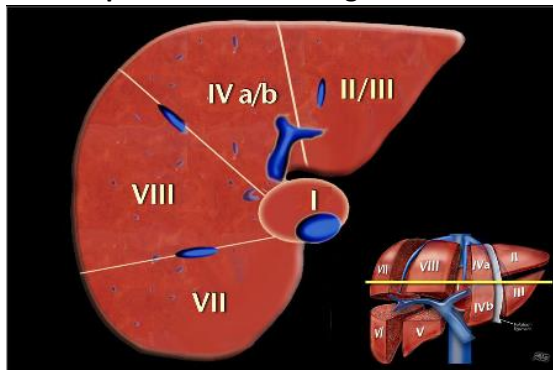


Image at the level of the left portal vein

This image is at the level of the right portal vein.

At this level the right portal vein divides the right lobe of the liver into superior segments (VII and VIII) and the inferior segments (V and VI).

The level of the right portal vein is inferior to the level of the left portal vein.

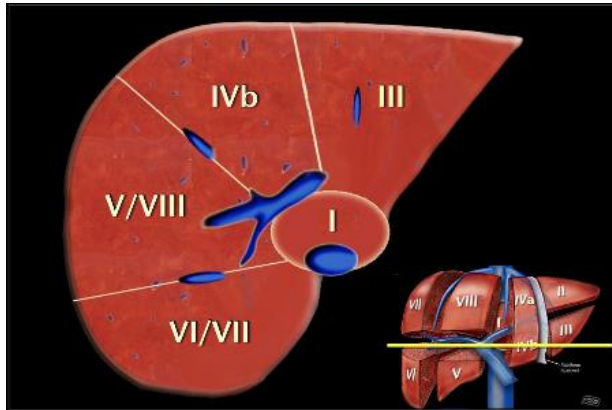


Image at the level of the right portal vein

At the level of the splenic vein, which is below the level of the right portal vein, only the inferior segments are visible.

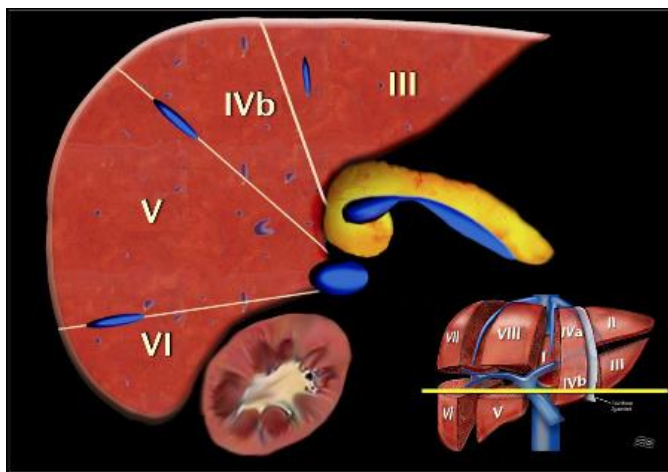


Image at the level of the splenic vein.

How to separate liver segments on cross sectional imaging

Left liver: lateral(II/III) vs medial segment (IVA/B)

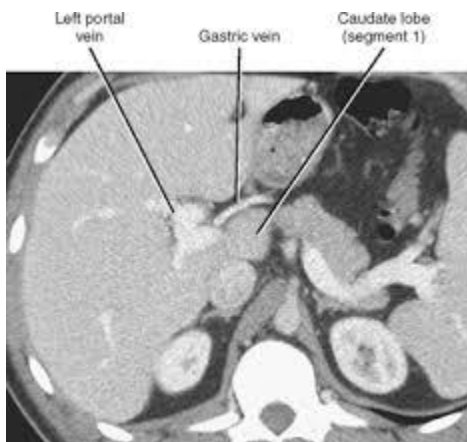
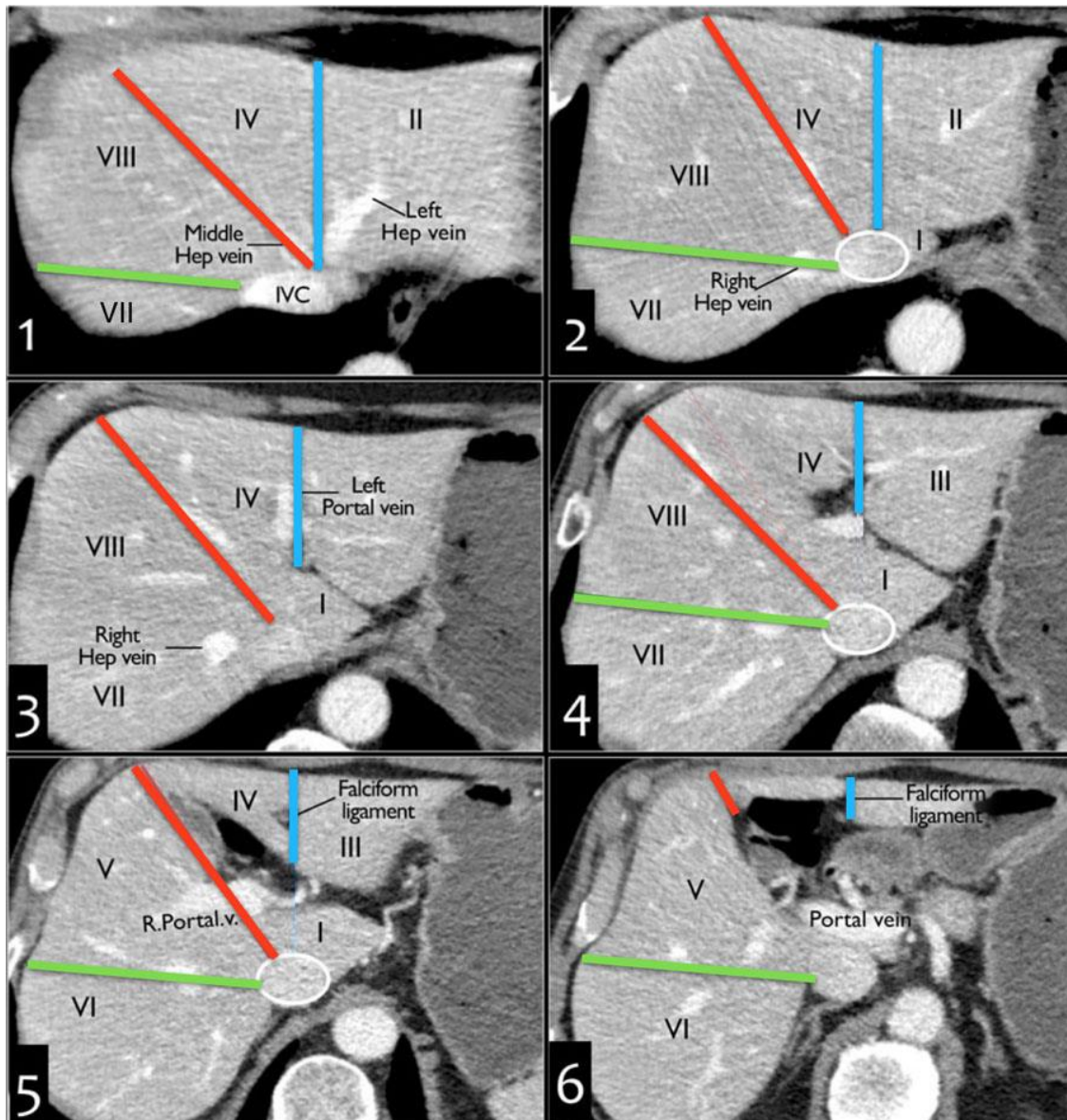
Extrapolate a line along the falciform ligament superiorly to the confluence of the left and middle hepatic veins at the IVC (blue line).

Left vs Right liver: IVA/B vs V/VIII

Extrapolate a line from the gallbladder fossa superiorly along the middle hepatic vein to the IVC (red line).

Right liver: anterior (V/VIII) vs posterior segment (VI/VII)

Extrapolate a line along the right hepatic vein from the IVC inferiorly to the lateral liver margin (green line).

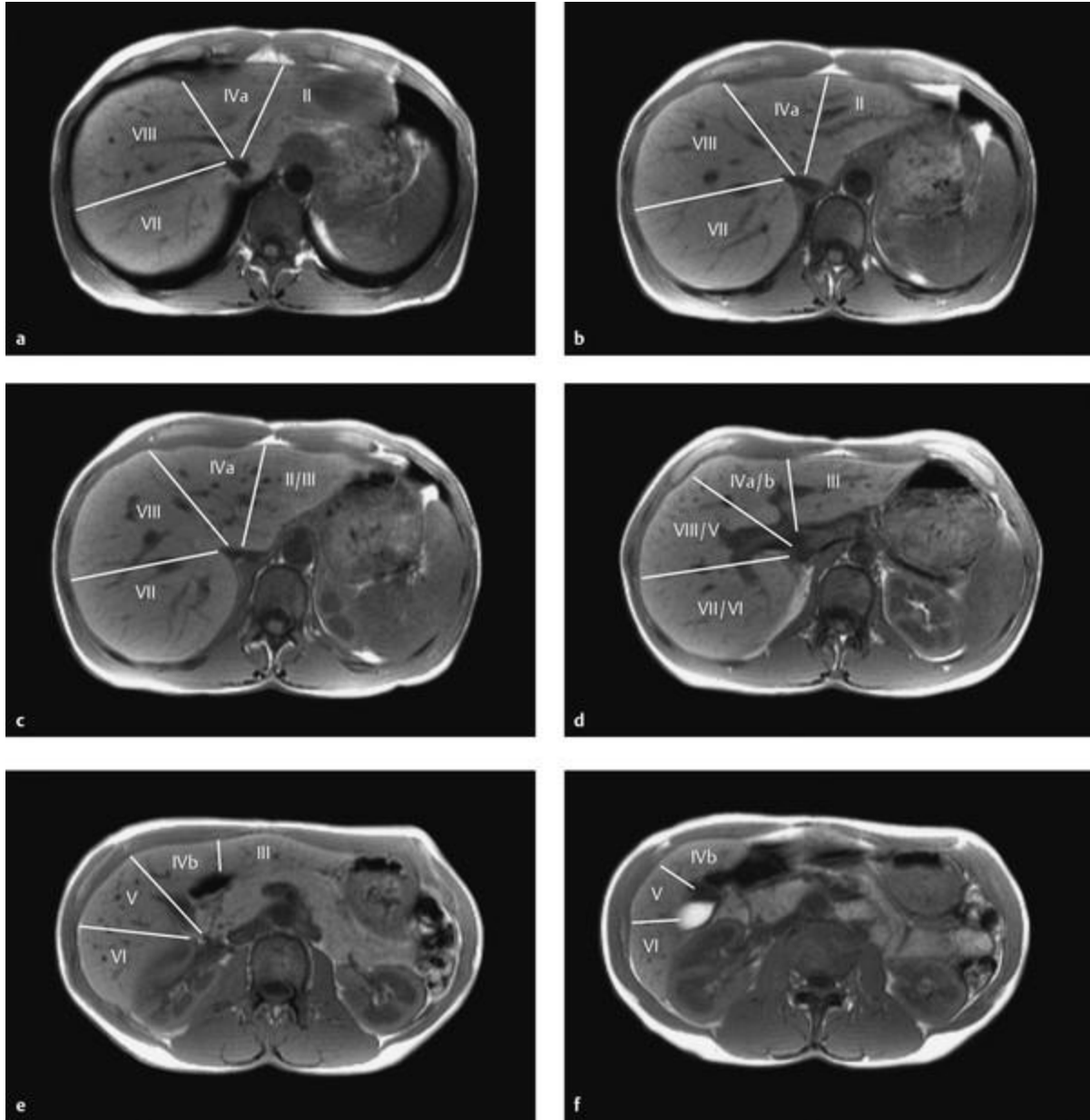


Caudate lobe

The caudate lobe or segment I is located posteriorly.

The caudate lobe is anatomically different from other lobes in that it often has direct connections to the IVC through hepatic veins, that are separate from the main hepatic veins.

The caudate lobe may be supplied by both right and left branches of the portal vein.



Segmental anatomy of the liver after Couinaud and Bismuth. (a) Cranial image slice. (b) Axial slices at progressively lower level. Segmental boundaries are defined by the hepatic veins and portal vein branches. (c) Axial slices starting from the liver dome (a) and progressively more caudal levels. Segmental boundaries are defined by the hepatic veins and portal vein branches. (d) Axial slices at progressively higher levels. Segmental boundaries are defined by the hepatic veins and portal vein branches. (e) Axial slices at progressively higher levels. Segmental boundaries are defined by the hepatic veins and portal vein branches. (f) Axial slices at progressively higher levels. Segmental boundaries are defined by the hepatic veins and portal vein branches.

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