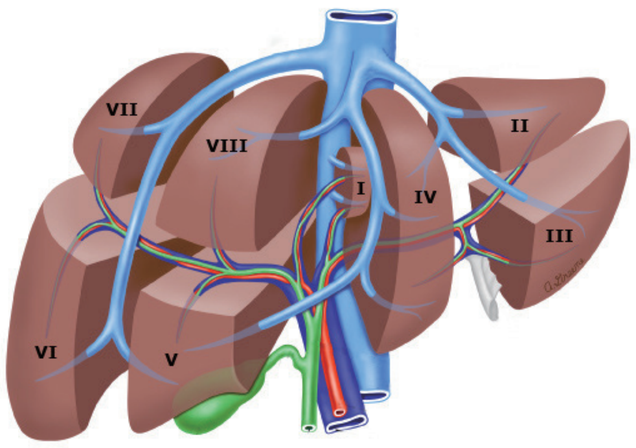
Transabdominal Ultrasound Liver Segmentation

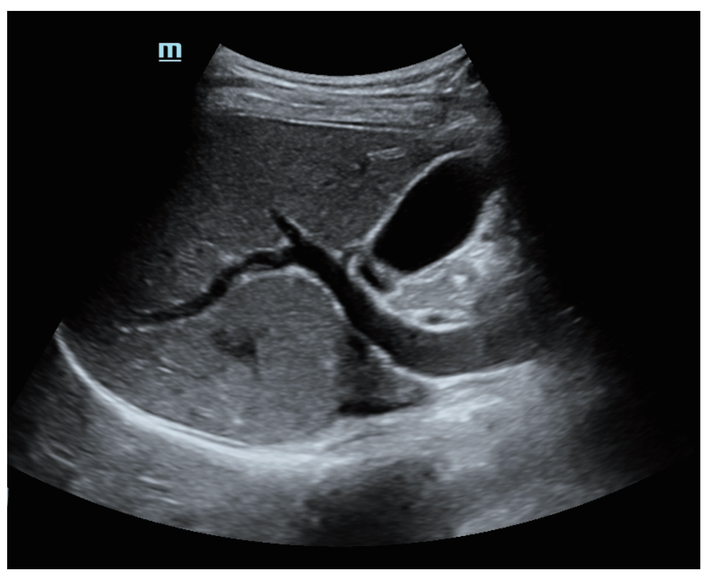
1. The Couinaud classification divides the liver into 8 segments (S1–S8).



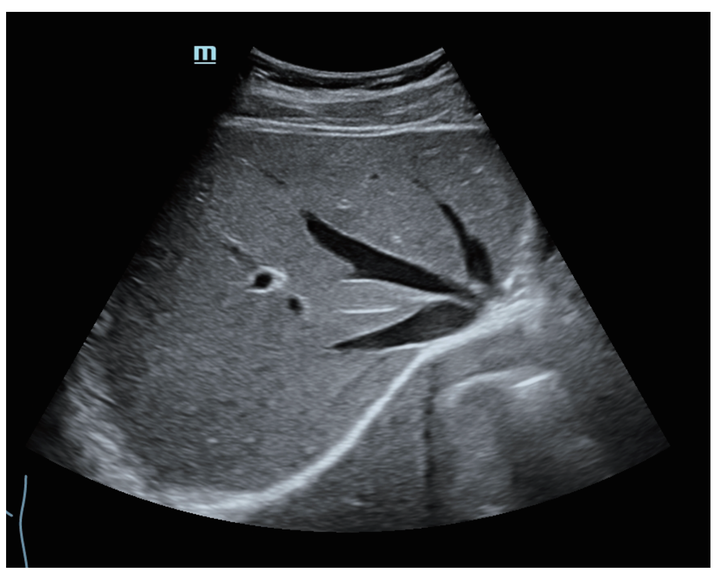
- I - Caudate lobe
- II - Left superior lateral segment
- III - Left inferior lateral segment
- IV - Left medial lobe
- V - Right inferior anterior segment
- VI - Right inferior posterior segment
- VII - Right superior posterior segment
- VIII - Right superior anterior segment

2. Understanding the "hepatic hilum" is important for liver ultrasound segmentation.

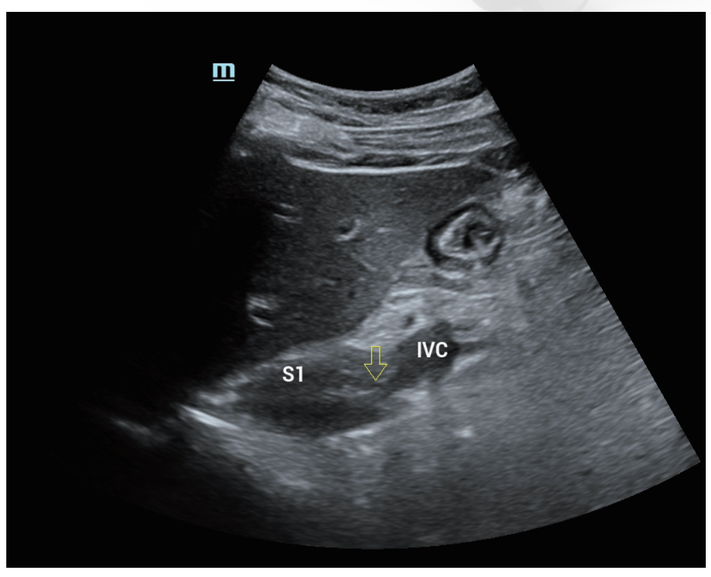
First hepatic hilum: The porta hepatis or transverse fissure is the point where vessels and ducts enter or leave the liver.
Second hepatic hilum: About 5 cm superior to the porta hepatis, where the upper hepatic veins (left, middle, and right hepatic veins) converge and enter the inferior vena cava.
Third hepatic hilum: Where the lower hepatic veins (right posterior hepatic veins and short hepatic veins) converge and enter the inferior vena cava.



First hepatic hilum

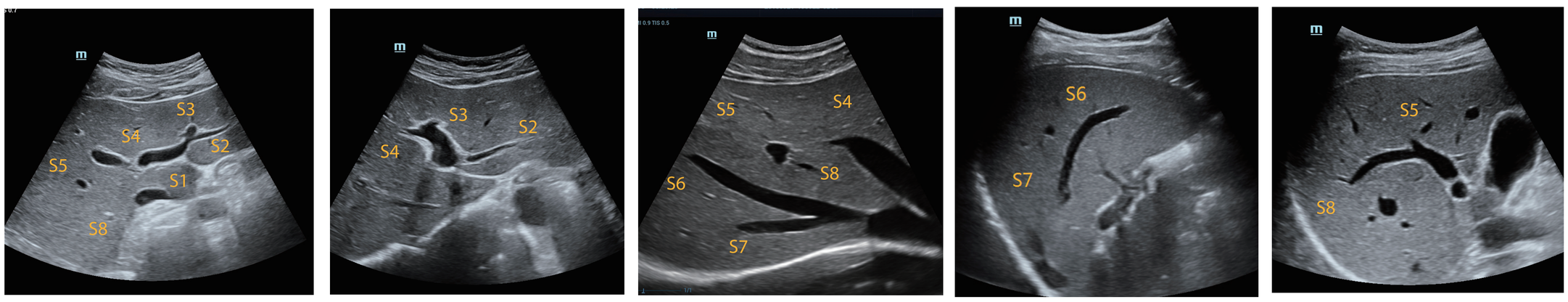


Second hepatic hilum



Third hepatic hilum (↓ : short hepatic vein; S1: caudate lobe; IVC: inferior vena cava)

3. The key to liver segmentation is the anatomy of the hepatic and portal veins. The segmentation of the left lobe is generally based on the portal vein, while the right lobe involves both the hepatic veins and portal vein.



S1 (caudate lobe), S2 (left superior lateral segment), S3 (left inferior lateral segment), S4 (left medial lobe), S5 (right inferior anterior segment), S6 (right inferior posterior segment), S7 (right superior posterior segment), S8 (right superior anterior segment)

During liver ultrasound segmentation, full attention should be paid to the intrahepatic vessels. Portal vein tracking starts with the main portal vein at the porta hepatis then identifying each branch of the portal vein. Hepatic vein assessment begins at the convergence of the hepatic veins at the second hilum and then follows the course of each hepatic vein. This combined with other anatomical markers (e.g. gallbladder, ligamentum teres, diaphragm, stomach, etc.) allow for accurate determination of the liver segments. Intrahepatic vascular variations should be noted as these can cause changes in liver segmentation.

Image courtesy of Ruijin Hospital, Shanghai Jiaotong University, School of Medicine