

Clinical Ultrasound in Hepatology: Training for Hepatologists

UCL Institute for Liver and Digestive Health, Royal Free Hospital, London, UK

29-30 April 2017

Ultrasound anatomy of the normal liver

IVICA GRGUREVIC

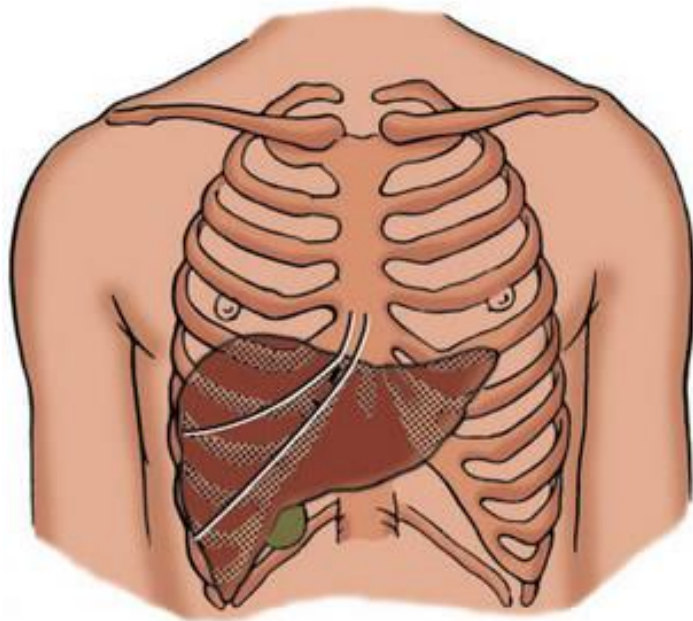
Assoc Prof, MD PhD, FEBGH

Department of Gastroenterology, Hepatology and Clinical Nutrition

University Hospital Dubrava

University of Zagreb School of Medicine, CROATIA

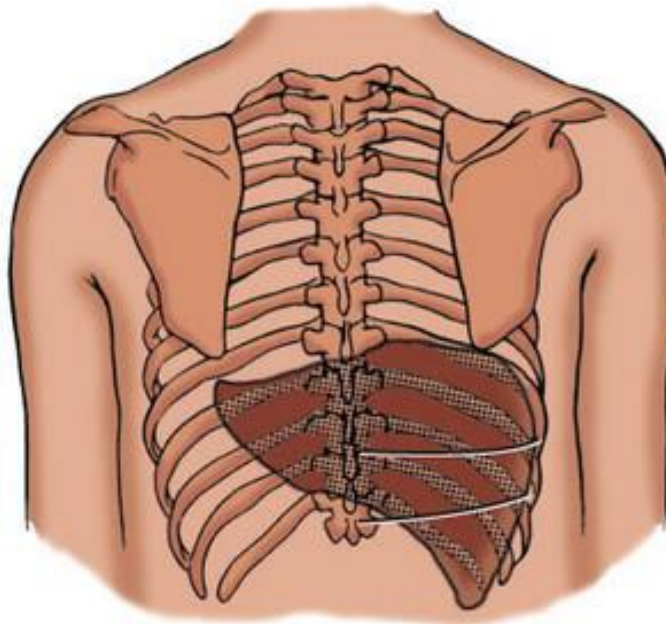




LATERAL STERNAL LINE

Liver	5
Lung	6
Pleura	7

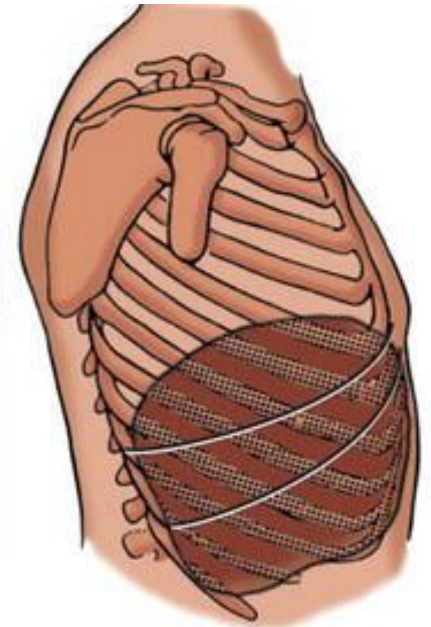
A



VERTEBRAL SPINES

Liver	8
Lung	10
Pleura	12

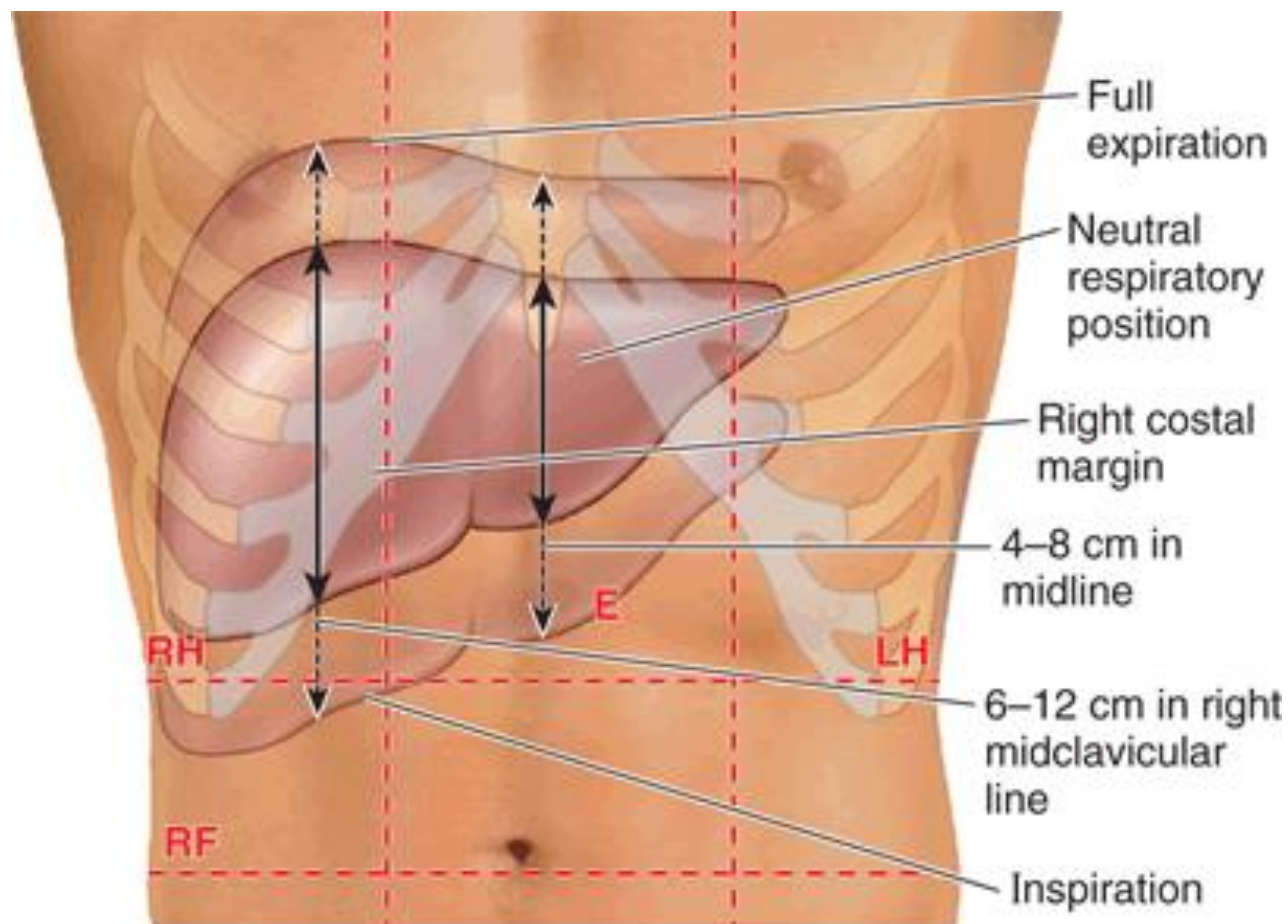
B



MID-AXILLARY LINE

Liver	6
Lung	8
Pleura	10

C



Vertical dimensions and range of movement of liver

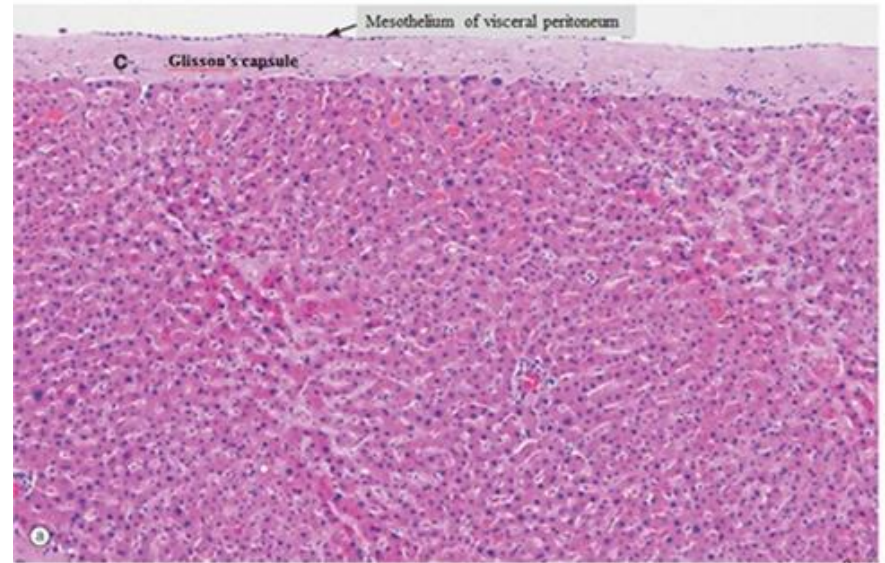
Key

E	Epigastric region	RF	Right flank
LH	Left hypochondrium	RH	Right hypochondrium
-----	Midclavicular and transpyloric planes		
-----	Transumbilical plane		

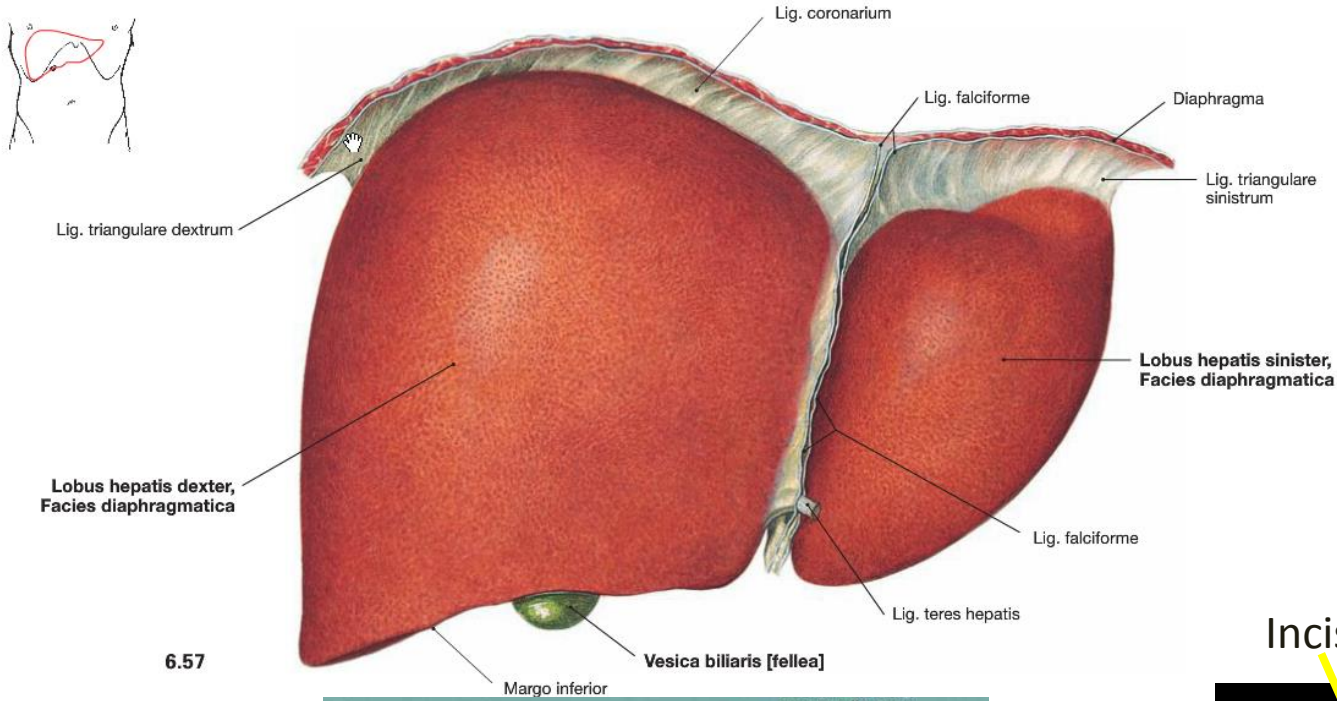
Capsula fibrosa hepatis



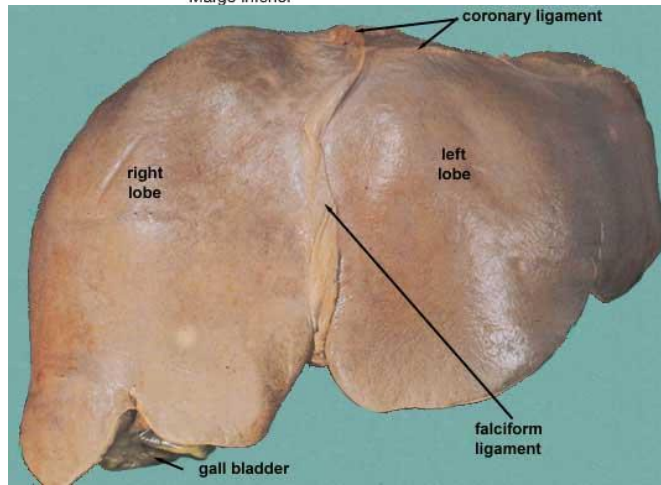
Capsule of liver – Glisson's capsule



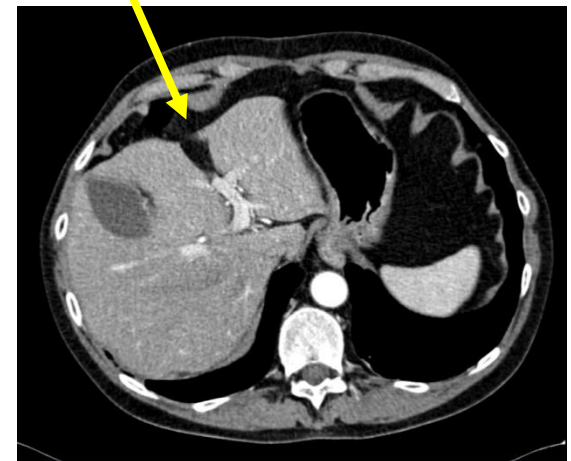
Diaphragmatic and anterior surface of the liver



6.57



Incisura ligamenti teretis



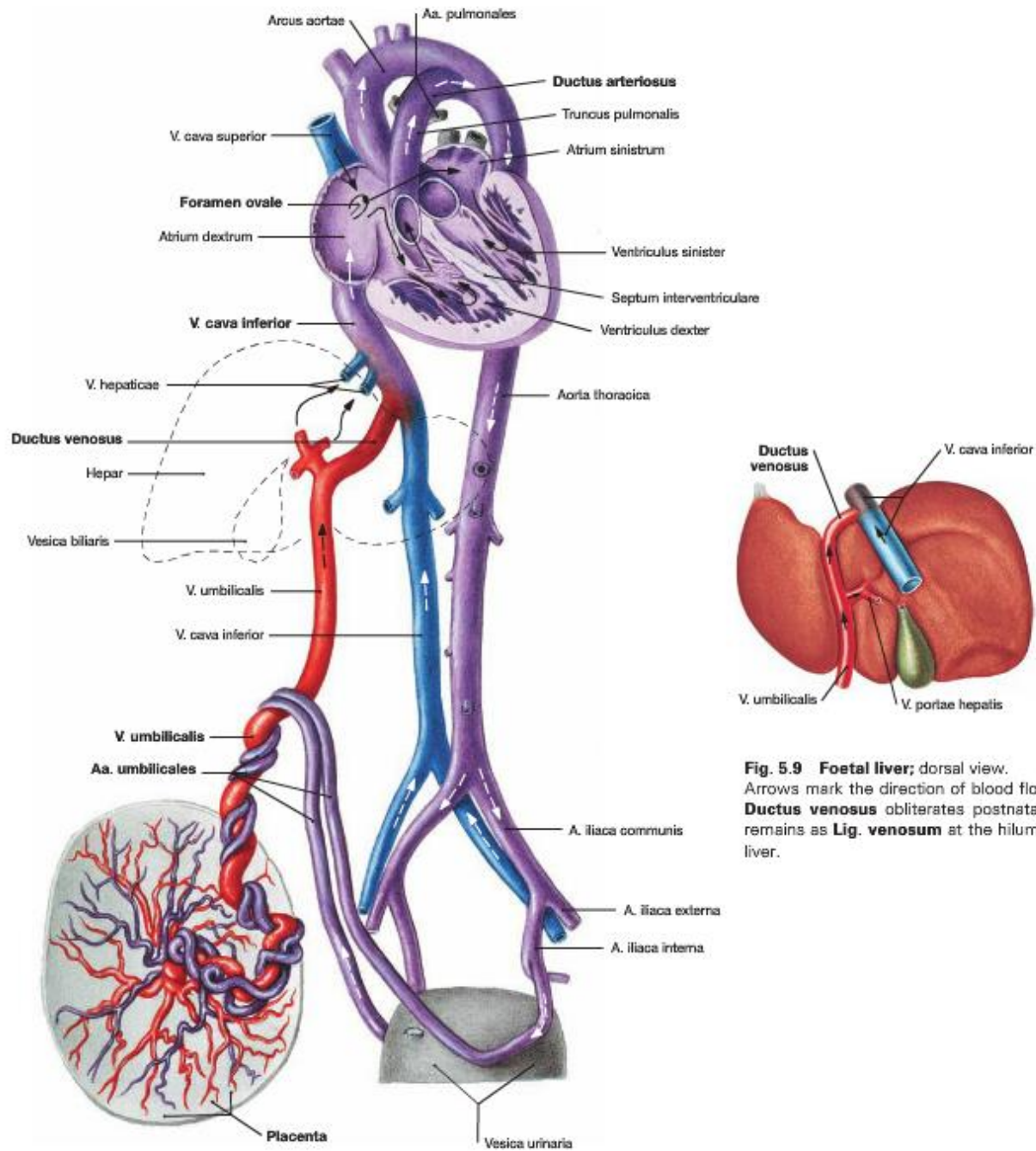
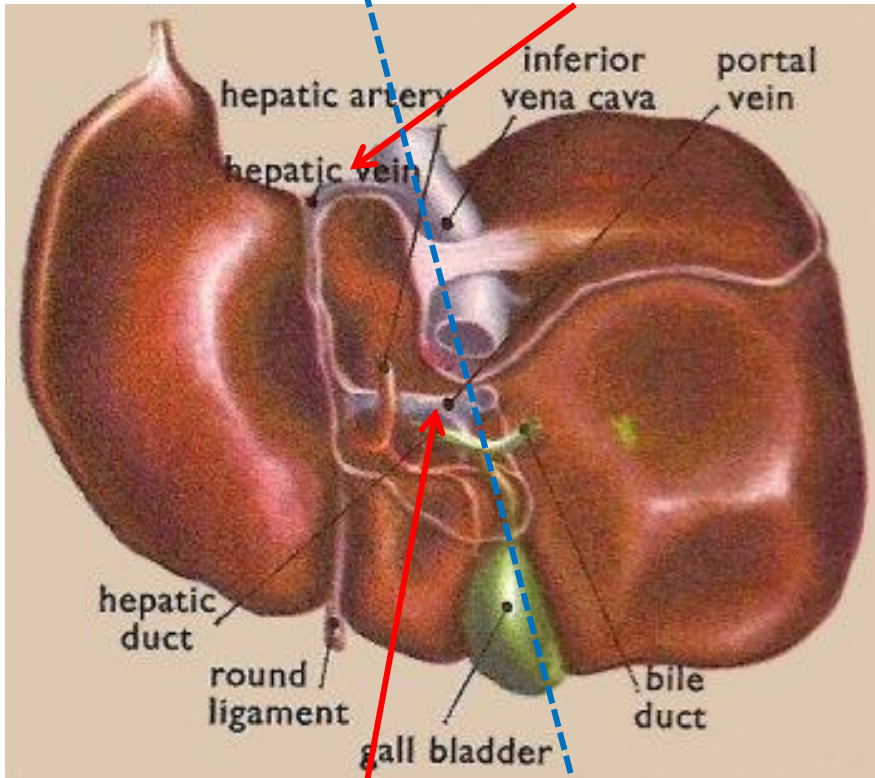


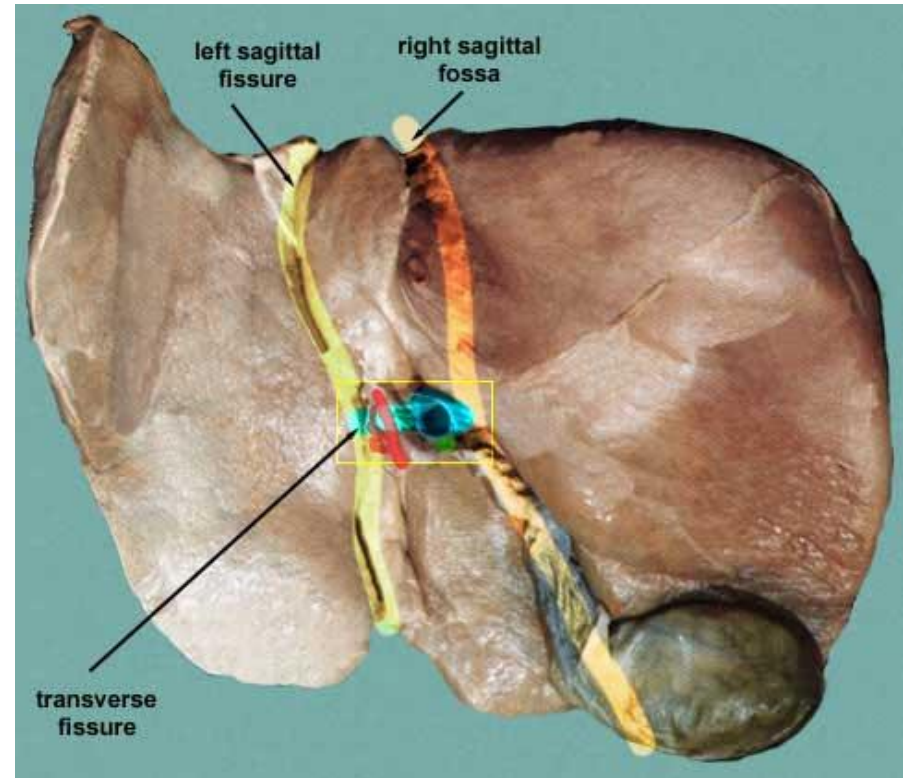
Fig. 5.9 Foetal liver; dorsal view. Arrows mark the direction of blood flow. The **Ductus venosus** obliterates postnatally and remains as **Lig. venosum** at the hilum of the liver.

Visceral surface of the liver

Upper liver pedicle

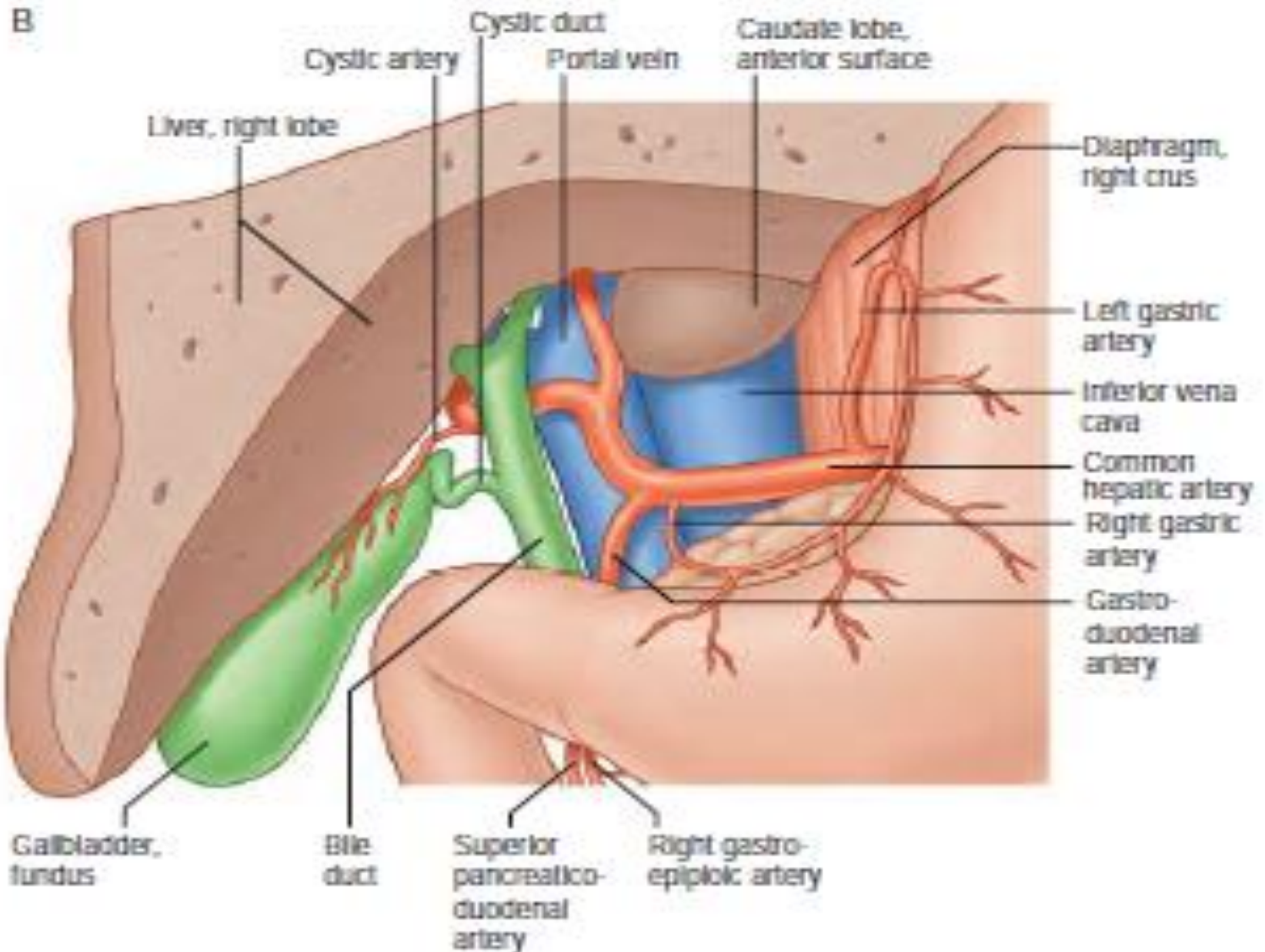


Lower liver pedicle



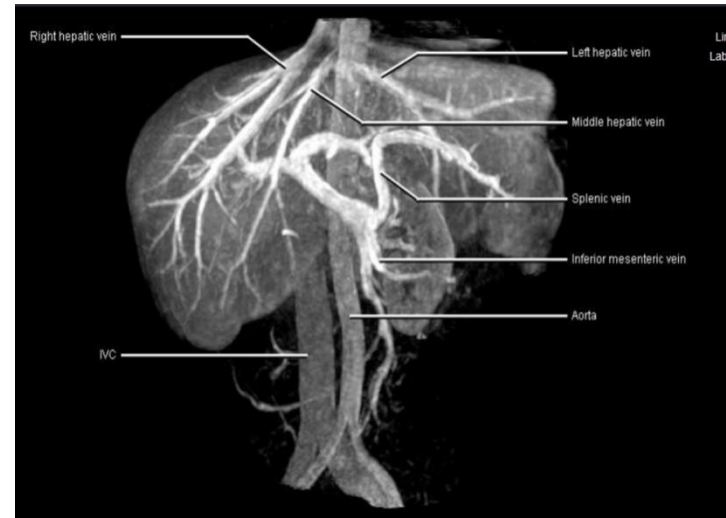
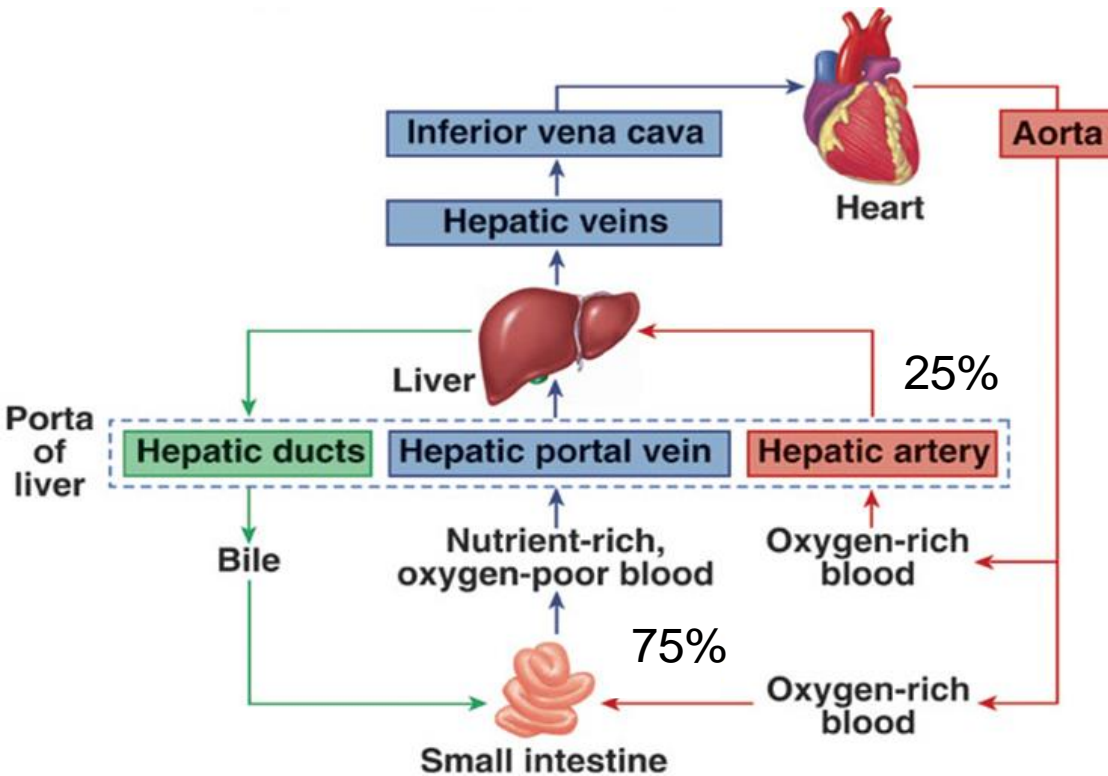
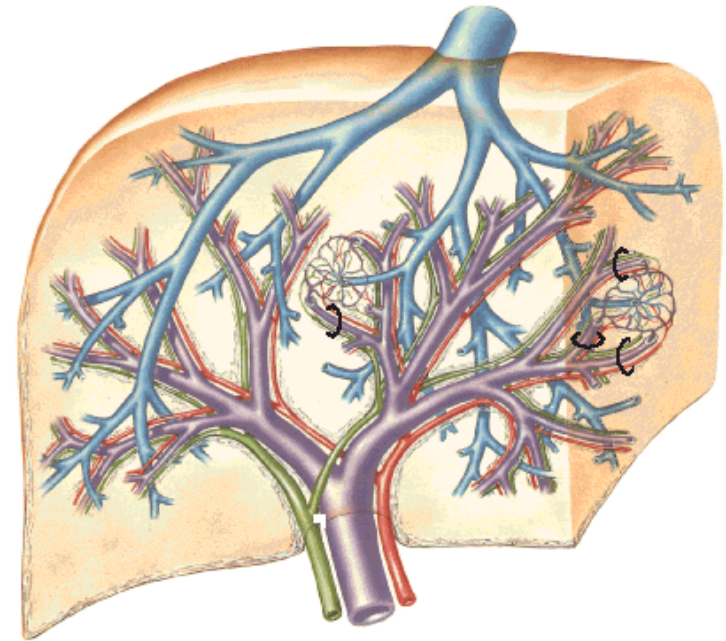
Main portal fissure: Cantlie's line
(Sir James Cantlie, Scotland, 1897)

Lig. hepatoduodenale and hepatogastricum

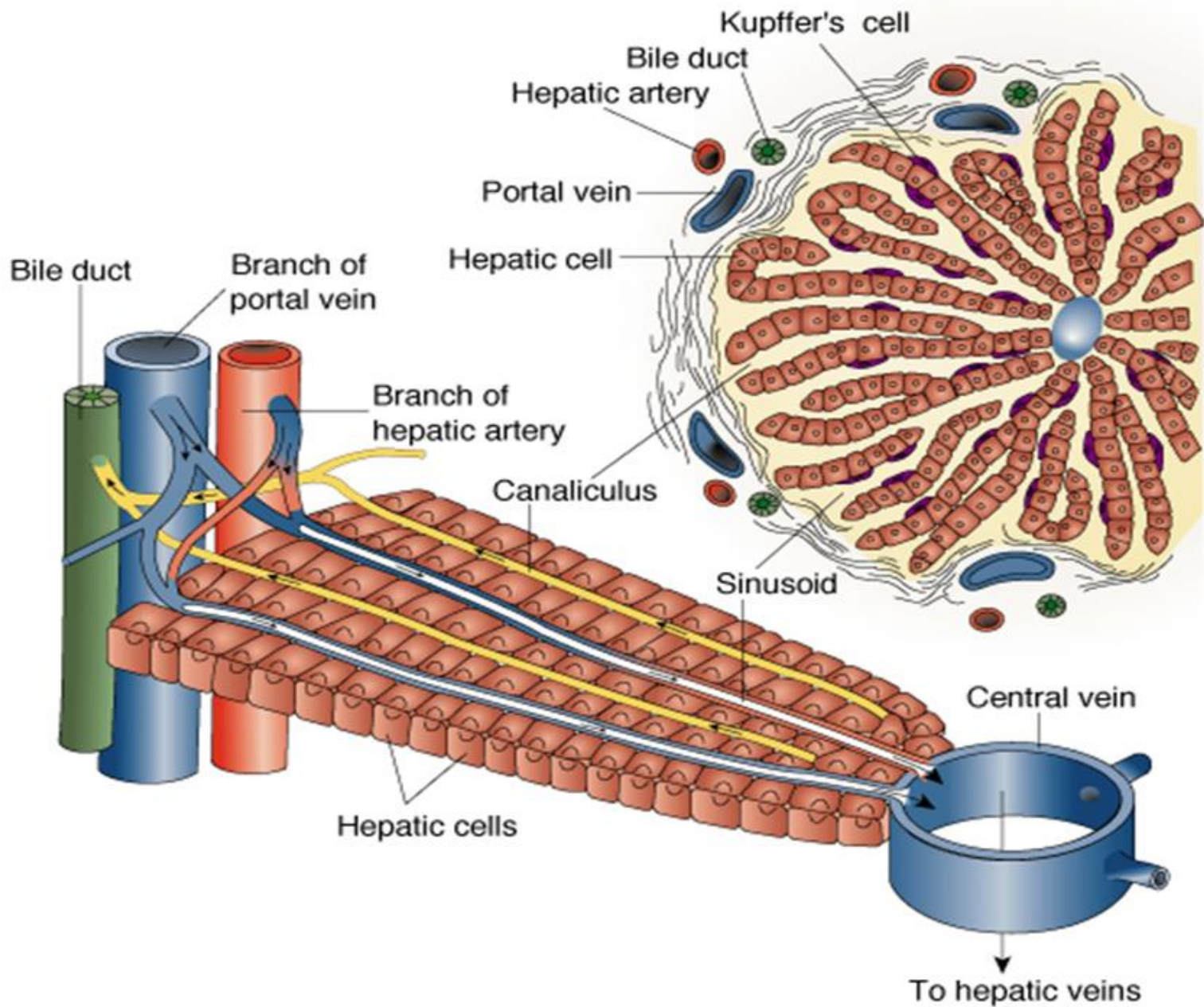


Liver vascular supply

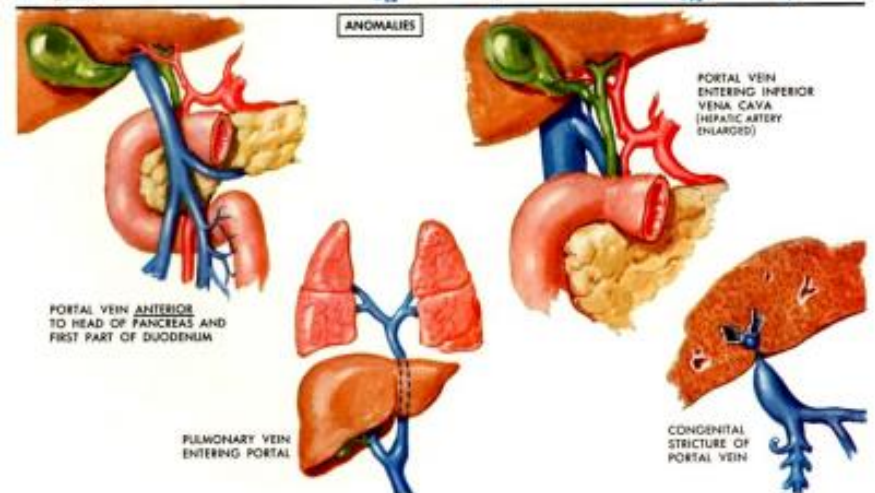
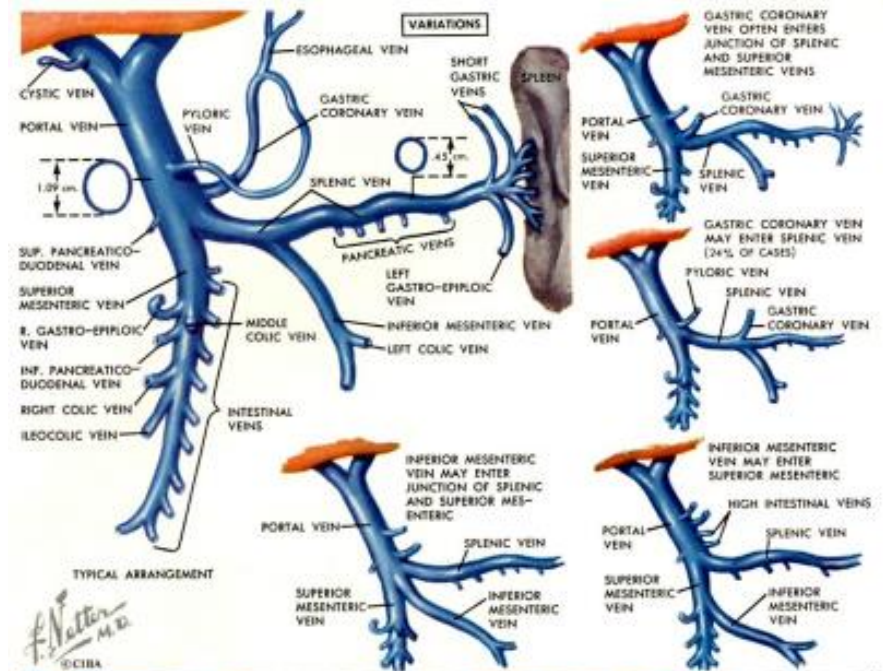
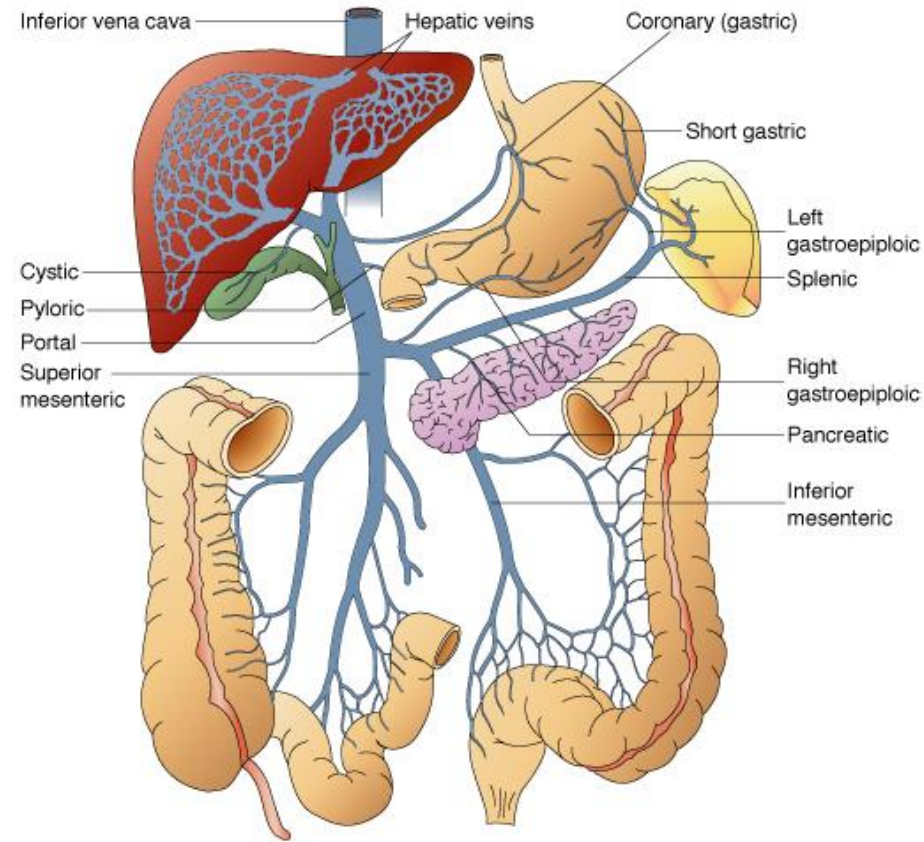
- arterial supply
- portal supply
- venous outflow

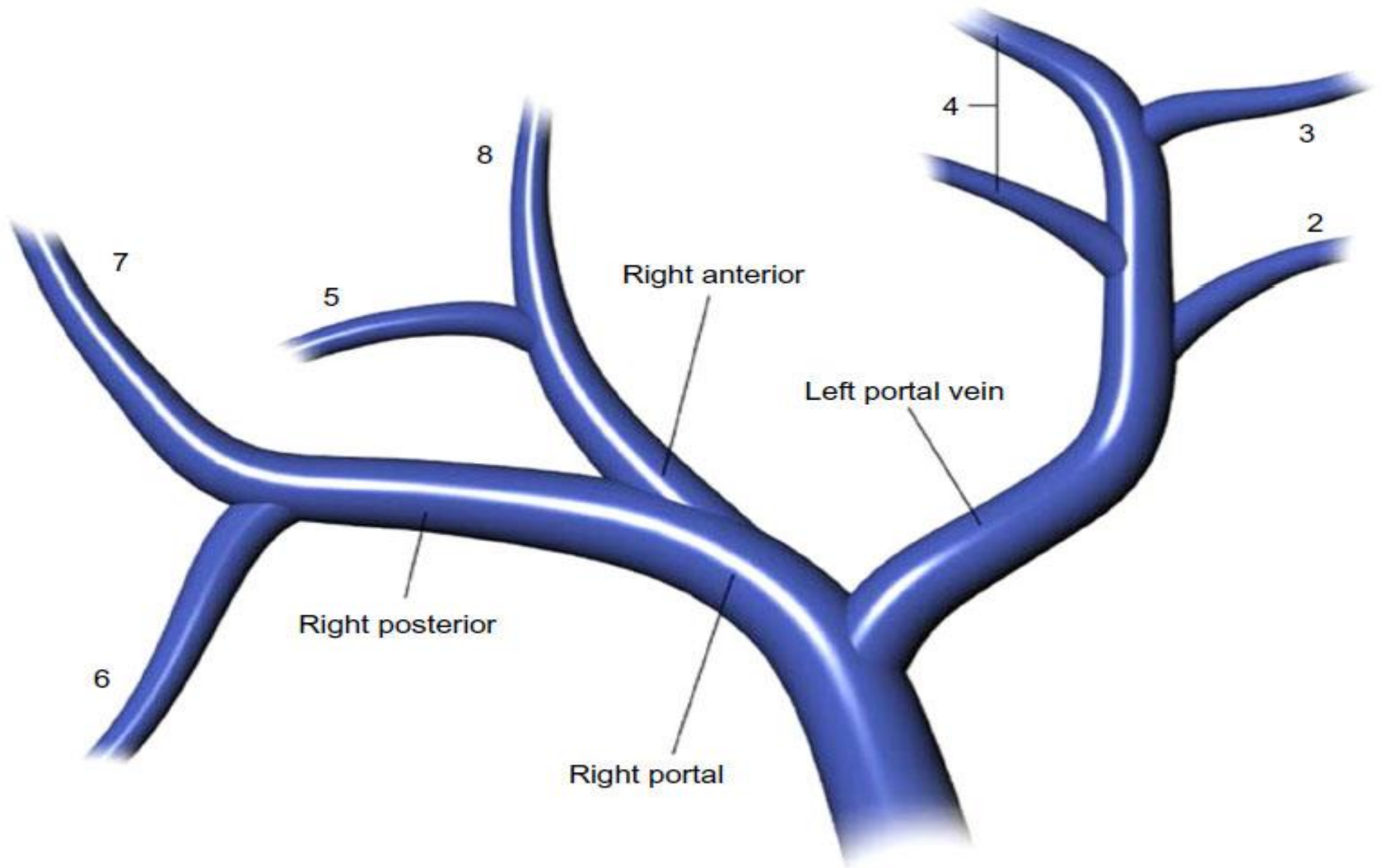


Cross section of liver lobule

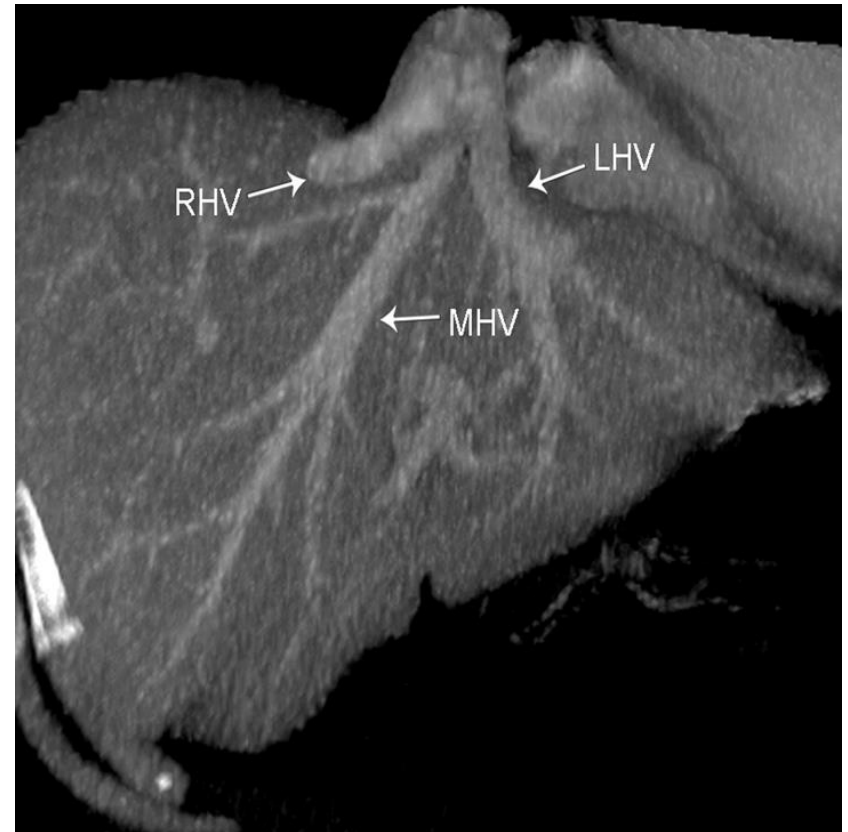
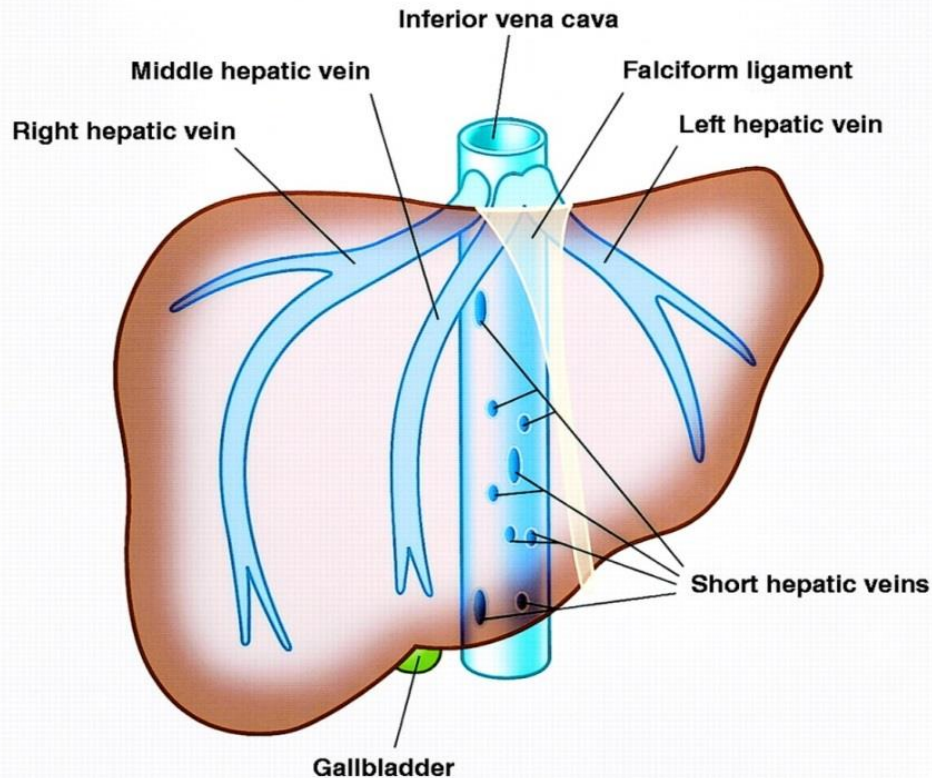


Portal vein



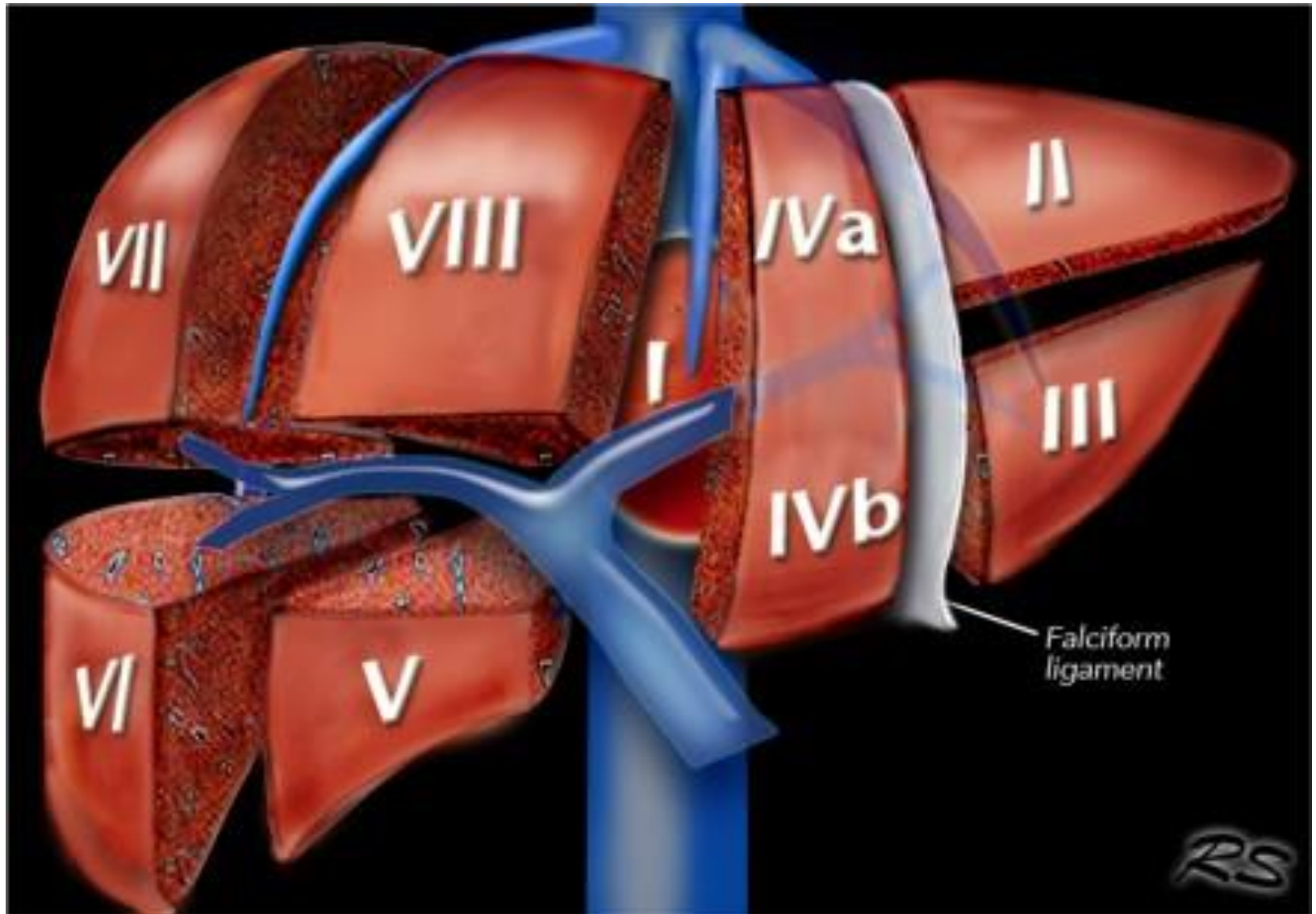


Venous outflow



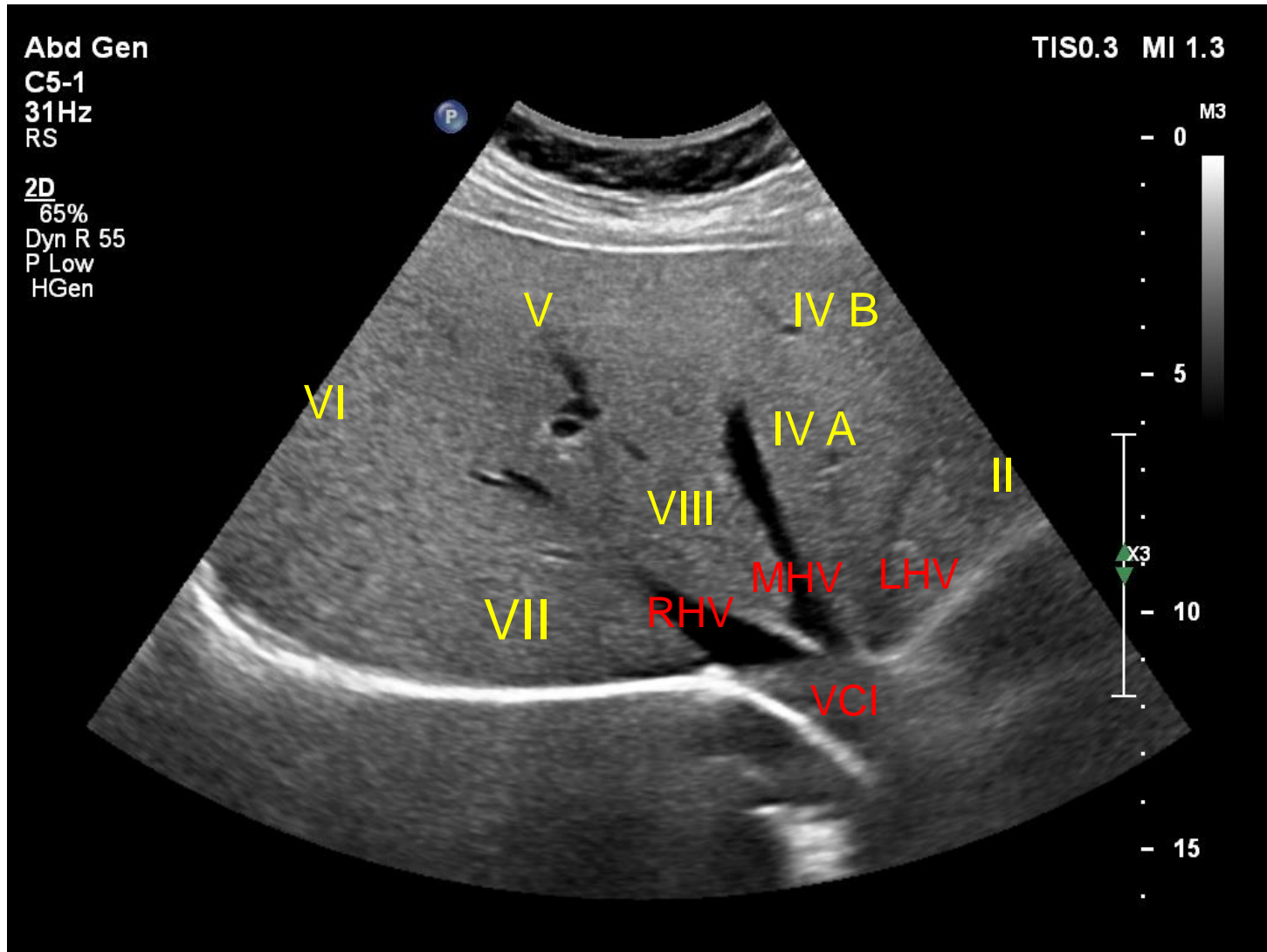
Venous outflow – three major hepatic veins drain into the IVC

Functional division - segmental liver anatomy



It was first described by the French Surgeon **Claude Couinaud** in 1957.

Liver vascular segments: US



US approach to the liver

Subcostal

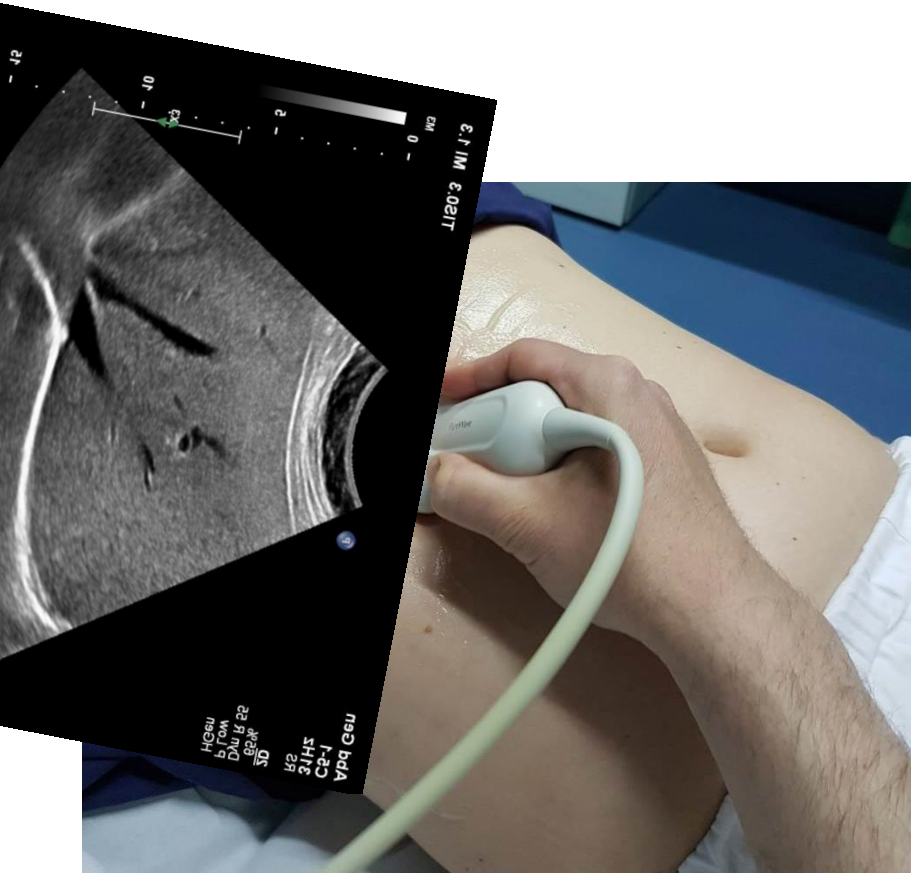


Intercostal



- Beauty of the US is that it allows to analyze the structure of interest from the different aspects/points/planes
- The more you see, the more reliable information you get...like a puzzle
- Do not hesitate to look at the liver from different spots

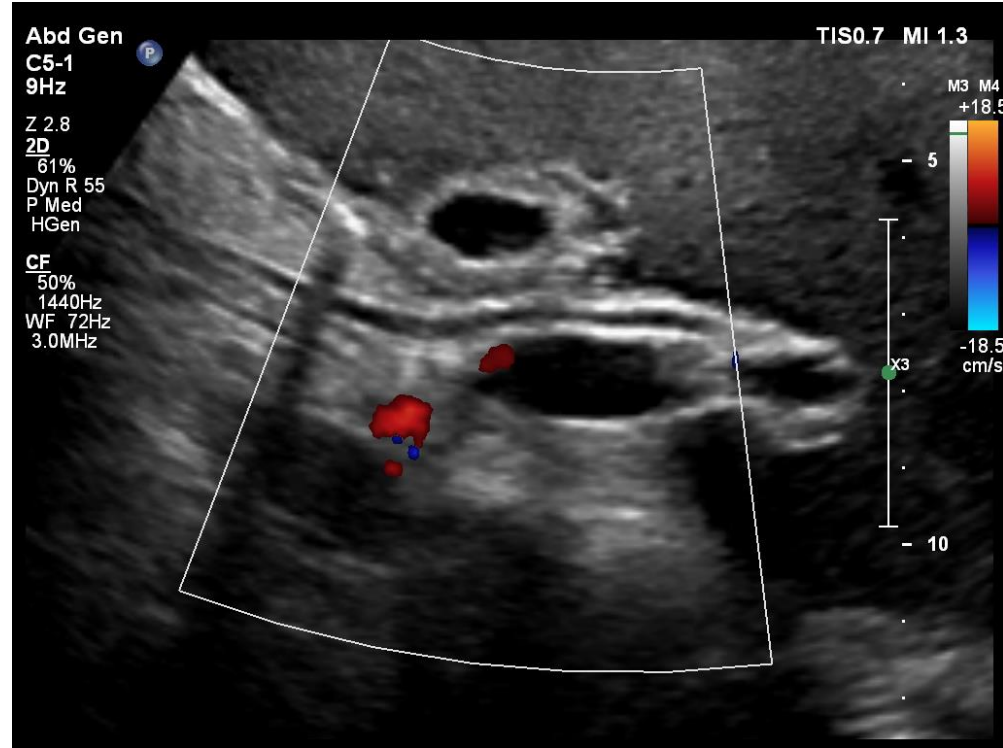
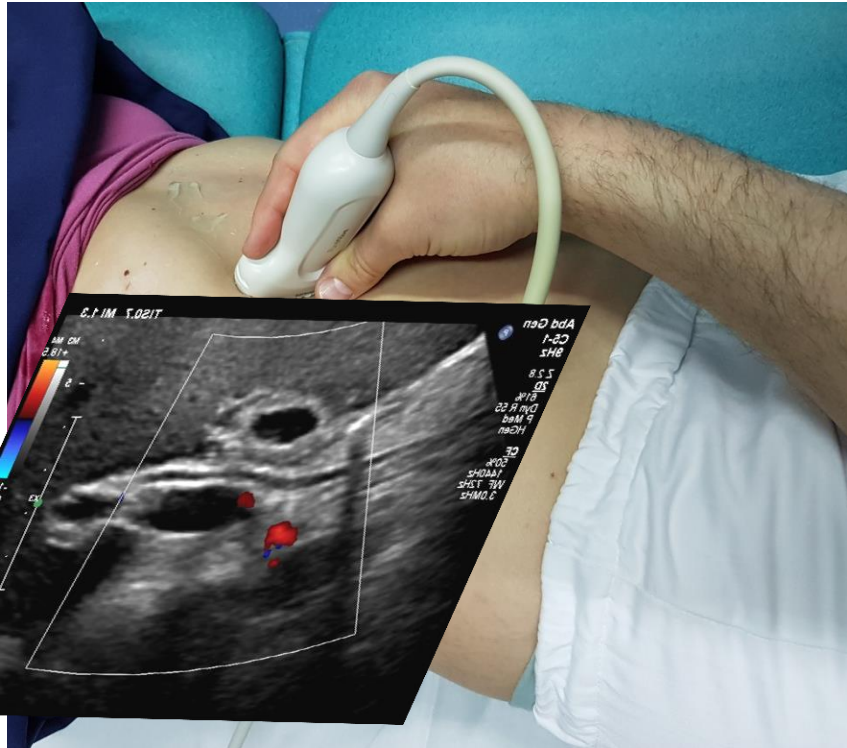
Normal liver: subcostal approach



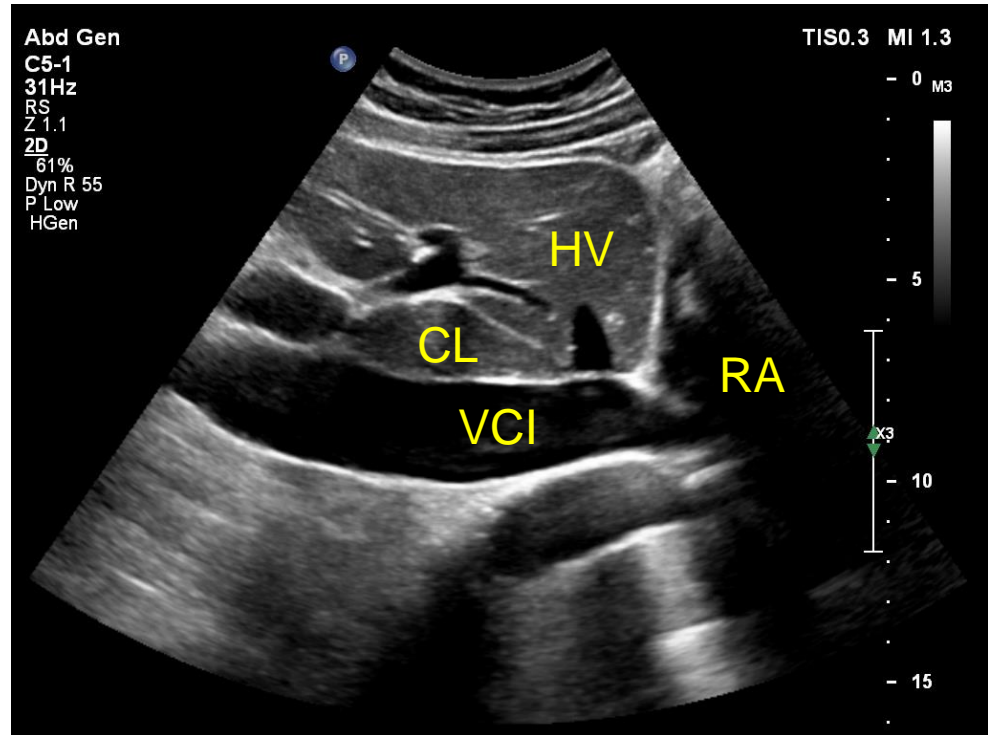
Normal liver: intercostal approach



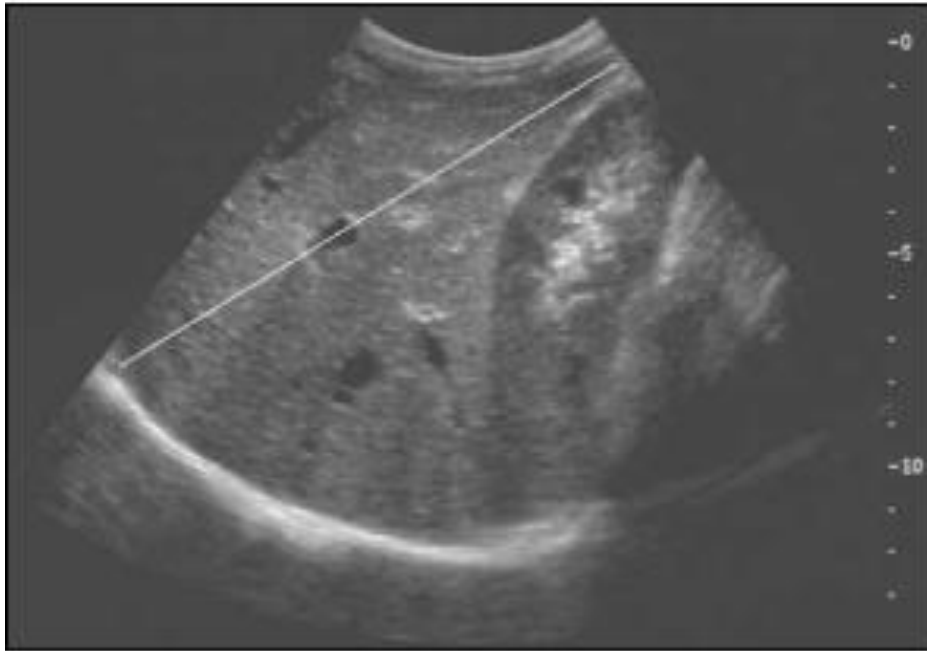
Normal liver: left decubital position



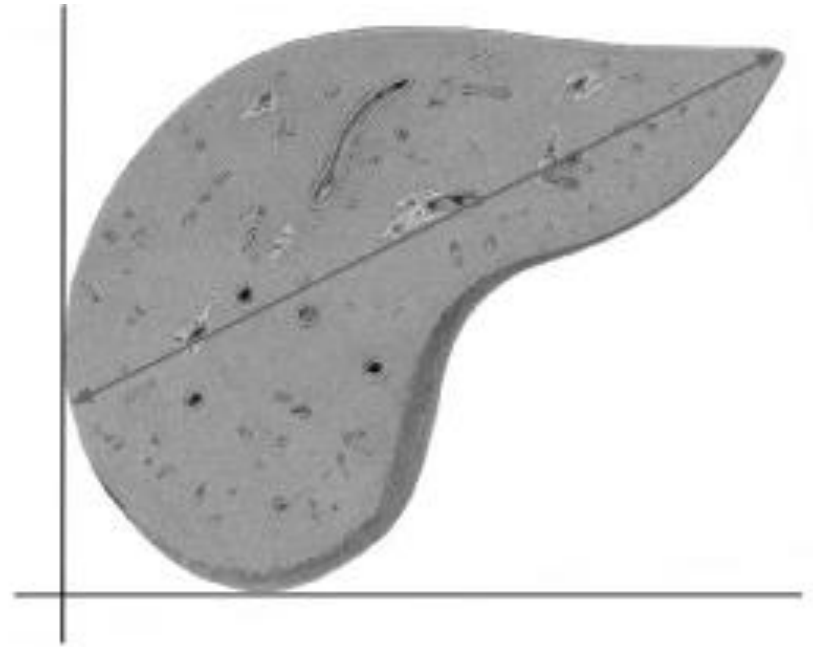
Sagittal plane median line



Normal liver size <15-16 cm CC in MCL



A



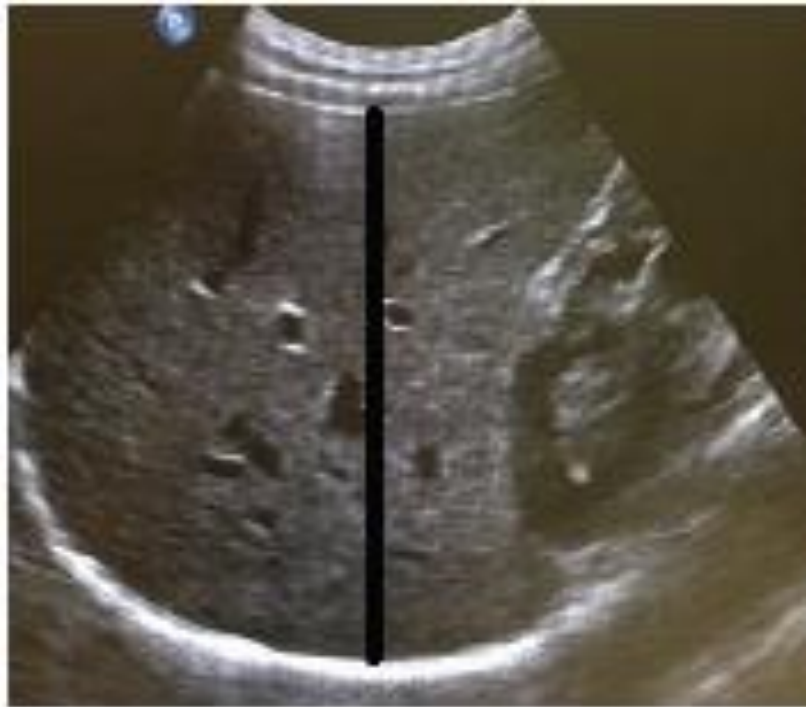
B

Measurement of liver size in the largest craniocaudal diameter in the MCL during inspiration in a supine subject. Measured in the midhepatic line with a large field of view from the post diaphragm to the lower anterior edge.

N=2080* and 1789** subjects; Germany

**Kratzer W. J. Ultrasound Med. 2003; **Patzak M. J Clin Ultrasound 2014.*

Normal liver <13 cm AP in MCL



MCL Max AP

- The maximum anteroposterior diameter of the liver seen on this image
AVG $11.33 \pm 1.42^*$
- The normal liver size defined as 13 ± 0.5 cm**

**Childs JT. AJUM 2014; **German Association of Ultrasound in Medicine (DEGUM) in Schmidt G. Ultraschall Kursbuch. 4 ed. Stuttgart: Thieme Verlag; 2003*

Ultrasound measurements of the liver: an intra- and inter-rater reliability study

	Measurement	Mean	SD
Measurements of the whole liver	1. Max Long	13.7 cm	1.42 cm
	2. Max AP	11.4 cm	1.94 cm
	3. Max Trans	20.6 cm	1.91 cm
Measurements of the right lobe	4. MCL Dome to Tip	14.1 cm	1.63 cm
	5. MCL Area	98.4 cm ²	30.84 cm
	6. MCL Perimeter	40.72 cm	4.9 cm
	7. MCL Max Long	11.84 cm	1.32 cm
	8. MCL MidAP	11.27 cm	1.11 cm
	9. MCL Max AP	11.33 cm	1.42 cm
Measurements of the left lobe	10. Midline Area	43.35 cm ²	9.89 cm
	11. Midline Perimeter	27.47 cm	2.95 cm
	12. Midline Max Long	9.03 cm	1.07 cm
	13. Midline Mid AP	6.96 cm	1.47 cm
	14. Midline Max AP	7.04 cm	1.36 cm
	15. MHV AP	7.21 cm	0.96 cm

the most reliable measurements

EFSUMB – European Course Book

Editor: Christoph F. Dietrich

Ultrasound of the liver

Christoph F. Dietrich, Carla Serra², Maciej Jedrzejczyk³

Size

The size of the liver has been measured by many methods, including 3D-reconstructions. Liver size measurement has no impact in daily routine because there is no reliable and reproducible ultrasound method established so far.

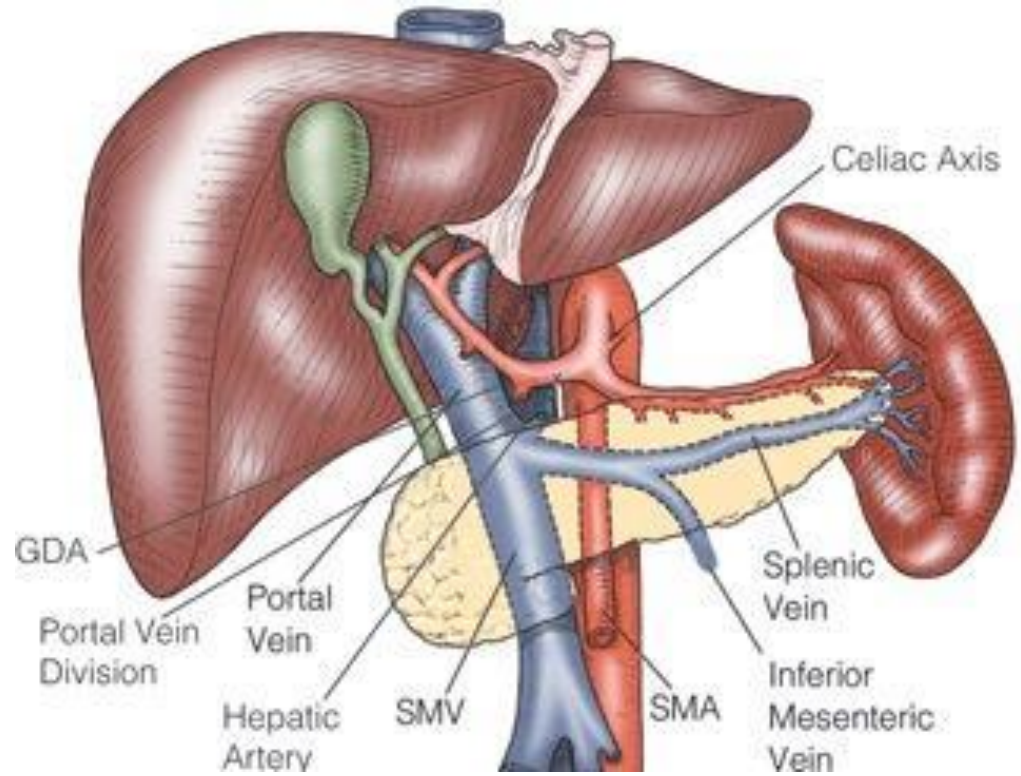
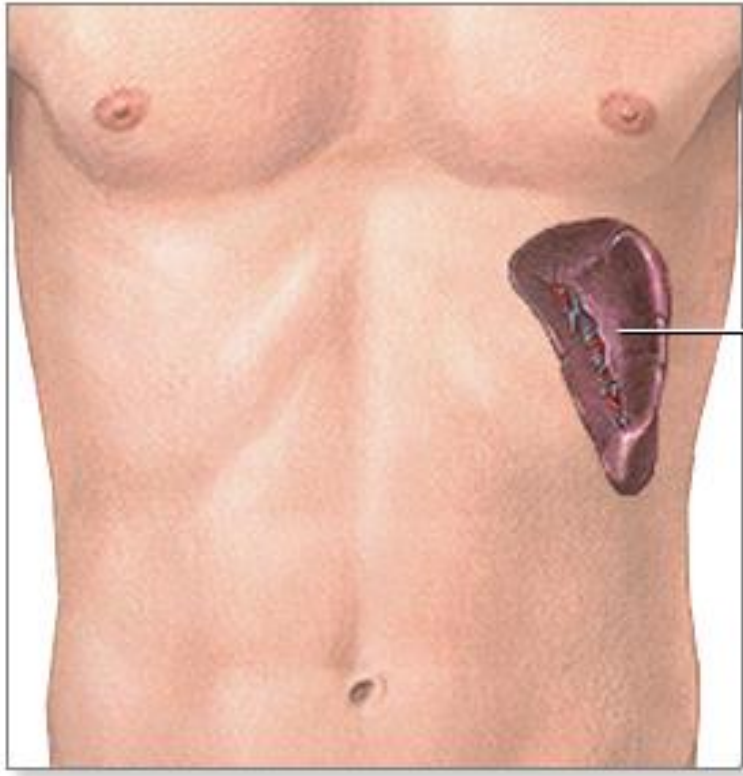
Examination criteria: „SSOTM”

- S = size
- S = shape
- O = outline
- T = texture
- M = measurement

EFSUMB Course Book 2012: Liver

- ***Shape***
 - Normally described as pyramidal.
- ***Outline***
 - surface should be smooth with no lumps protruding or indentations.
 - The inferior liver border in the normal patient should have an acute angled edge.
- ***Texture, echogenicity***
 - The normal liver parenchyma is of medium homogenous echogenicity, usually slightly darker than the spleen and slightly brighter than the renal cortex

Spleen



Normal spleen US



US approach through 10/11th
left IC space
Normal Spleen Size
<13 cm superior to inferior
axis
6-7cm in the medial to lateral
axis
5 to 6cm in the anterior to
posterior plane.
10% accessory spleen (<3 cm)

Splenic vasculature



Splenic arteries

Splenic vein

University Hospital Dubrava, Zagreb, HR

