Ultrasound in liver diseases

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Agenda

- Ultrasound in diffuse liver diseases
  - Fatty liver disease
  - Liver cirrhosis
  - Other «diffuse» liver disorders

- Ultrasound in focal liver lesions
  - incl. liver cysts and liver abscesses

Fatty liver disease

- steatosis or diffuse fatty liver -hyperechogenic liver
- focal fatty infiltration -a hyperechogenic area
- in ”focal sparing” you will find a hypoechogenic area in a diffuse fatty liver

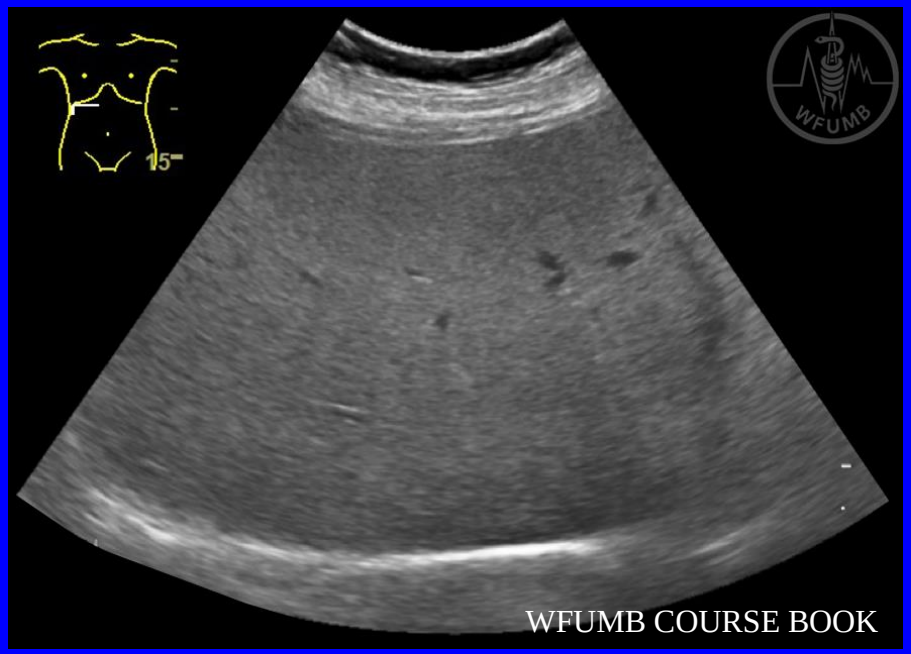
Fatty liver disease

- alcohol
- MASLD/ MAFLD (Metabolic dysfunction-associated steatotic liver disease)
- drugs/ toxic substances
- TPN
- pregnancy
- malnutrition/ bypass surgery
- inborn errors of metabolism (”metabolic” diseases)

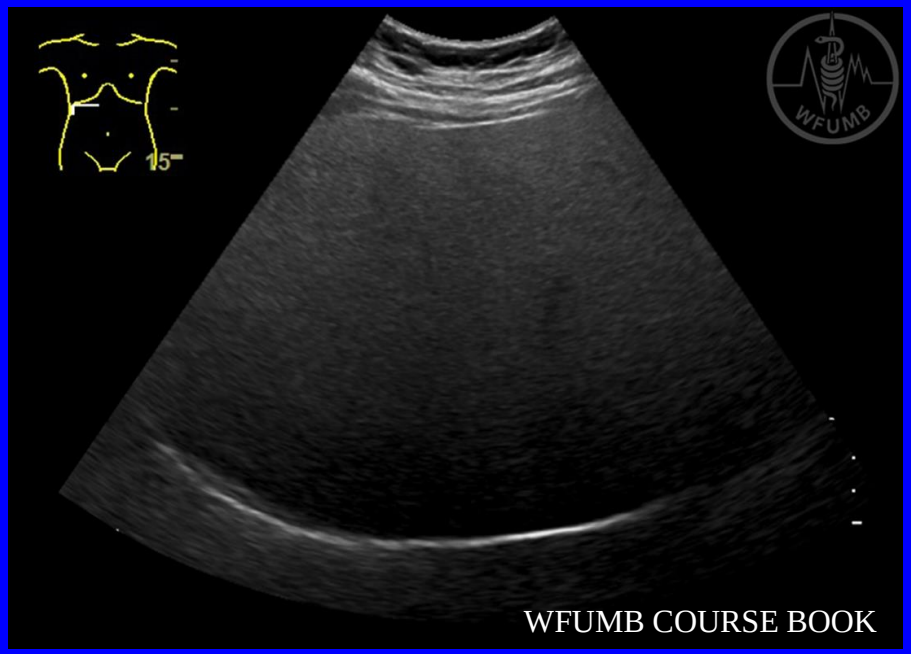
- hepatomegaly
- hyperechogenic with fine, closely packed echoes/ ”bright liver”
- blood vessels and diaphragm often less distinct
- increased attenuation => reduced visualisation ”in depth”
- sensitivity approx. 80% (depends of severity)
- lower specificity (fibrosis…)

Liver steatosis

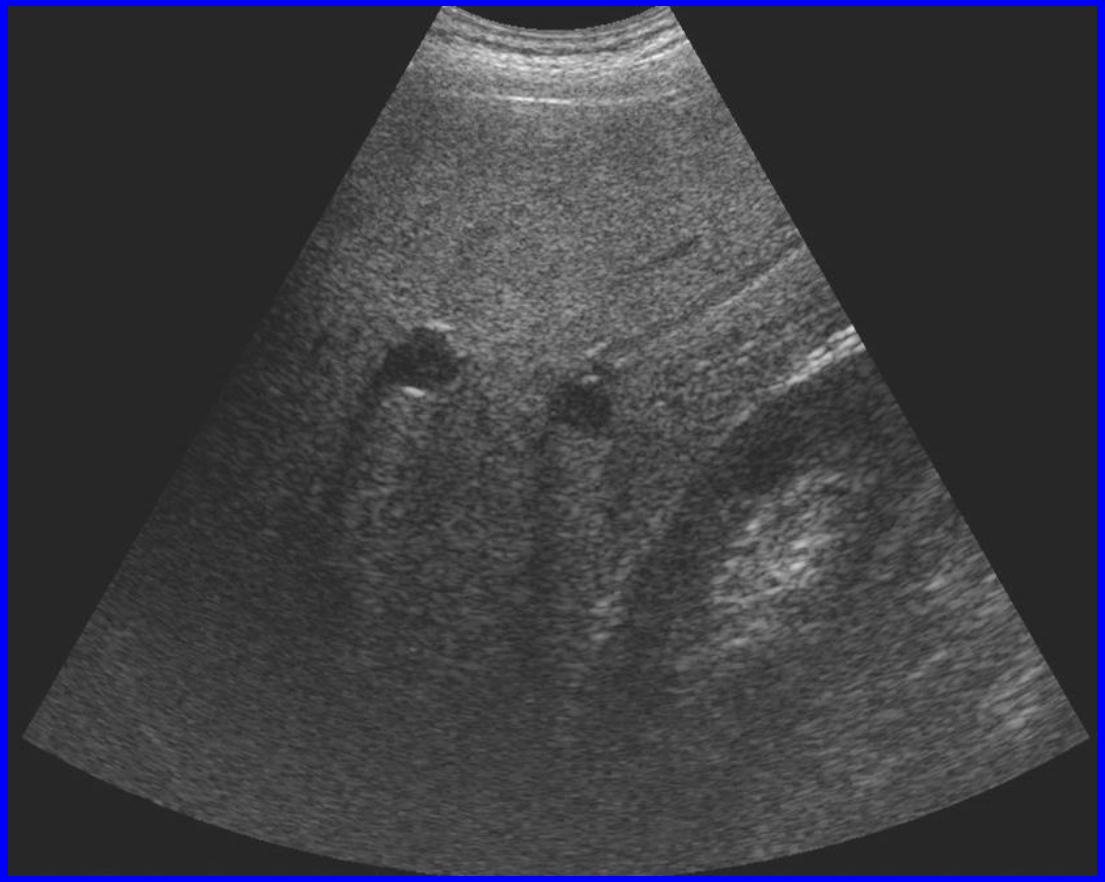
Mild liver steatosis



Severe liver steatosis



Severe liver steatosis

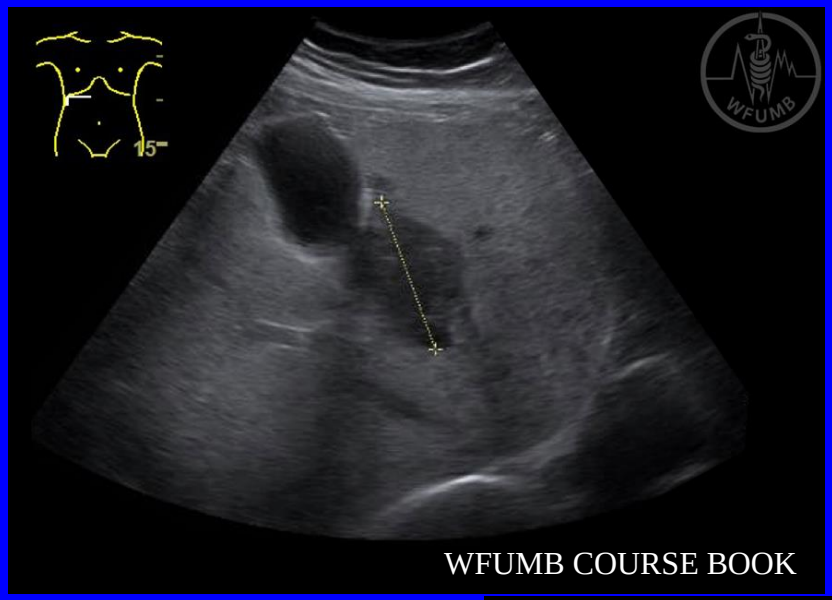


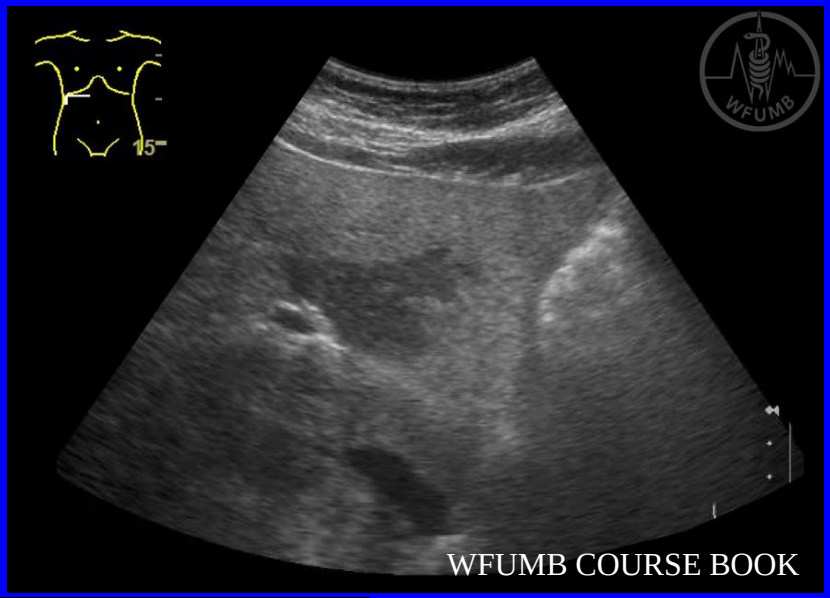
Focal fatty infiltration

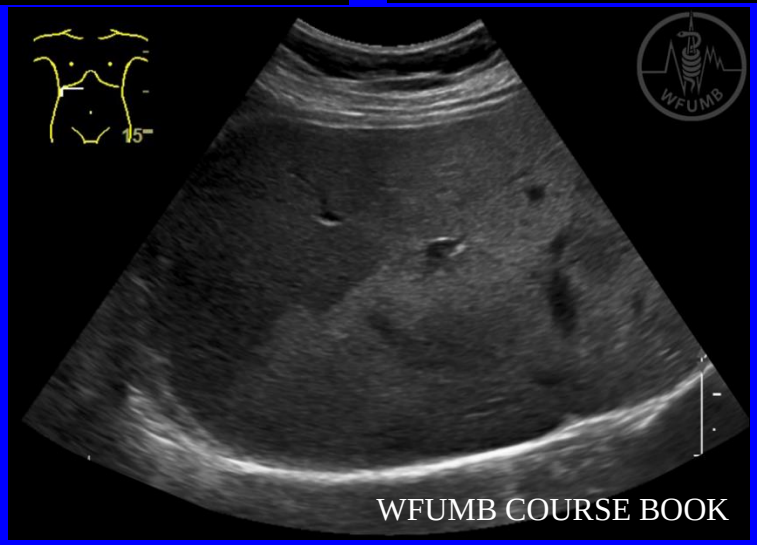
- hyperechogenic area
- vessels are normal without displacement
- no mass effect
- can respect anatomical margins

- DD: tumours

Fatty liver with ”focal areas of sparing”







Liver cirrhosis

- increased echogenicity (increased reflection due to fibrosis)
- coarse and irregular echo-structure
- portal vein walls often not defined
- no significant increase in attenuation as in fatty liver
- irregular contour because of surface nodularity -Lelio et al. Radiology 1989
  - especially with high-frequency transducers and ascites
- atrophy of the right lobe and hypertrophy of the caudate lobe
- regenerative nodules (DD: metastases/tumours)

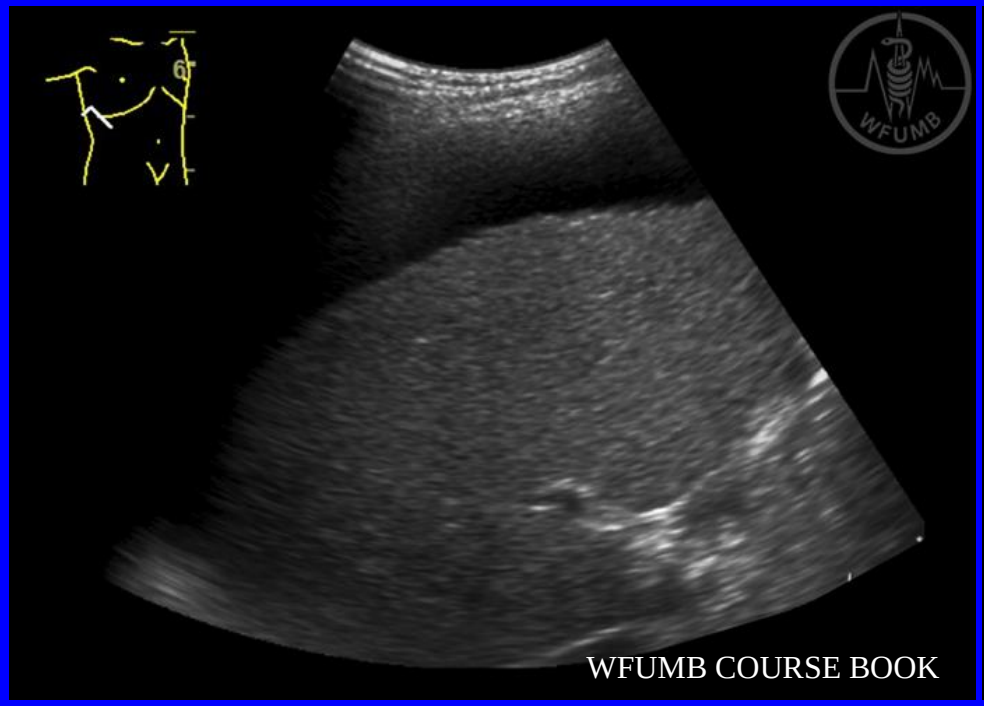
- *but; normal in up to 20% (consider US elastography)*

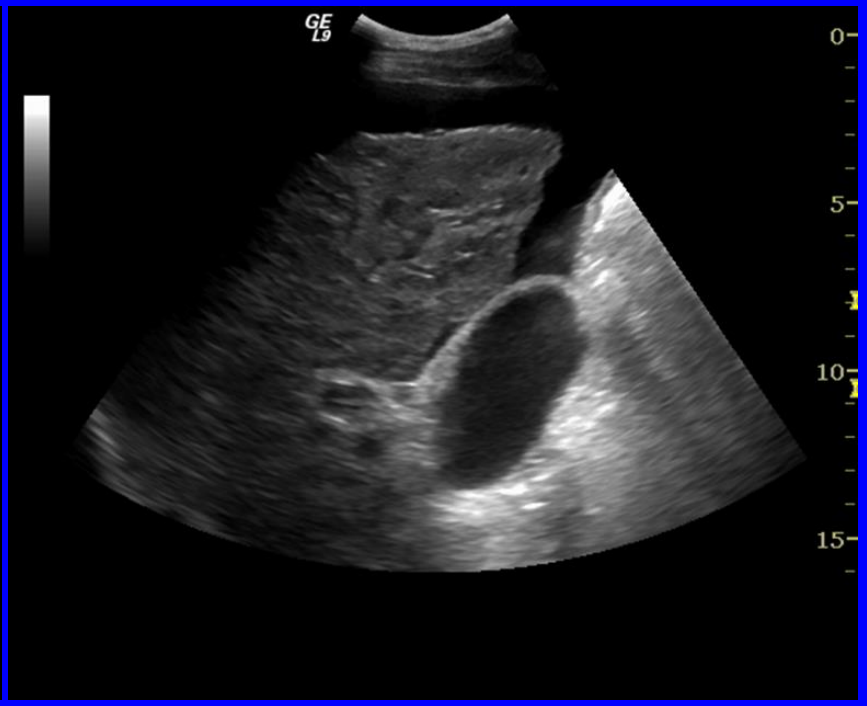
Liver cirrhosis

- hepatic veins: often flattened flow-curve
- thickened and layered wall of the gallbladder
- ascites (Morrison`s pouch)
- portal hypertension (PHT)
  - alteration in or reversal of portal vein flow
  - portal vein diameter increase in size to > 13-15mm
  - splenomegaly
  - collaterals/ recanalized paraumbilical vein

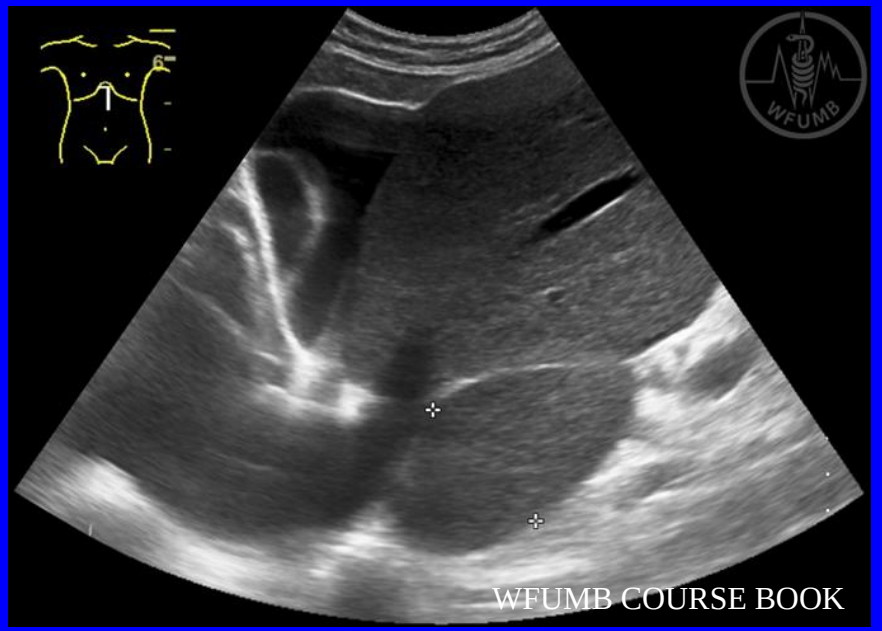
- increased risk of HCC
  - US surveillance (and AFP?) every 6 months

Liver cirrhosis

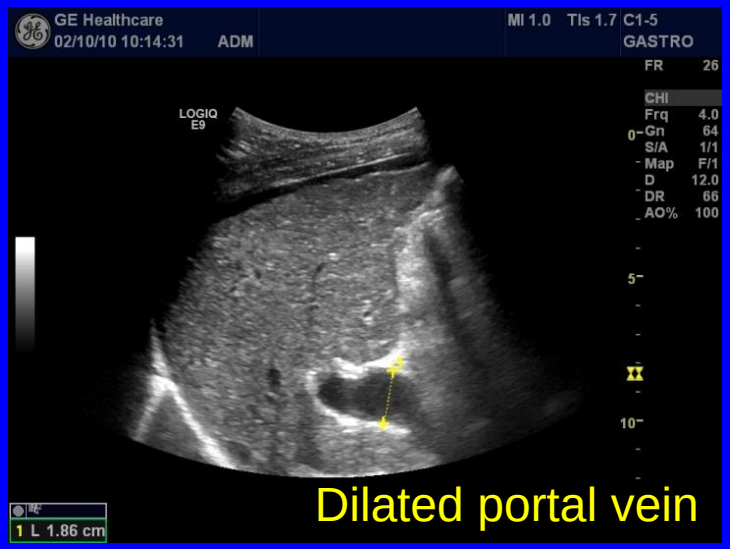




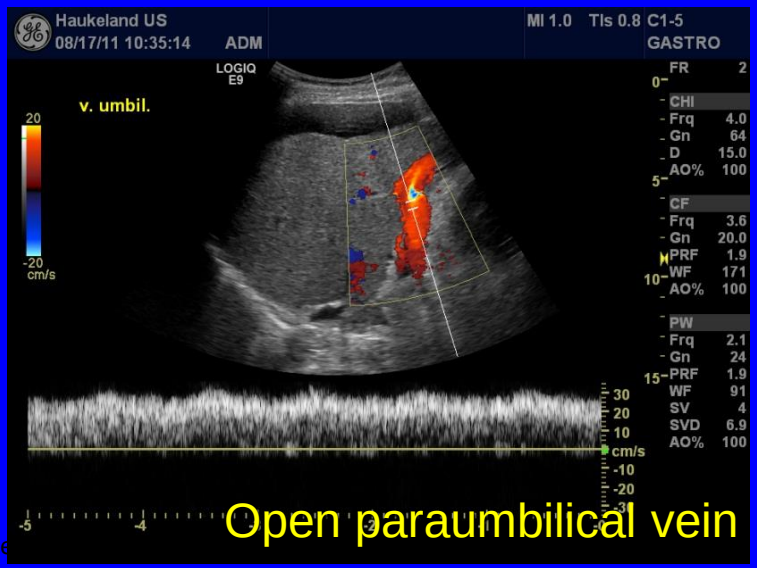
Enlarged caudate lobe



Portal hypertension

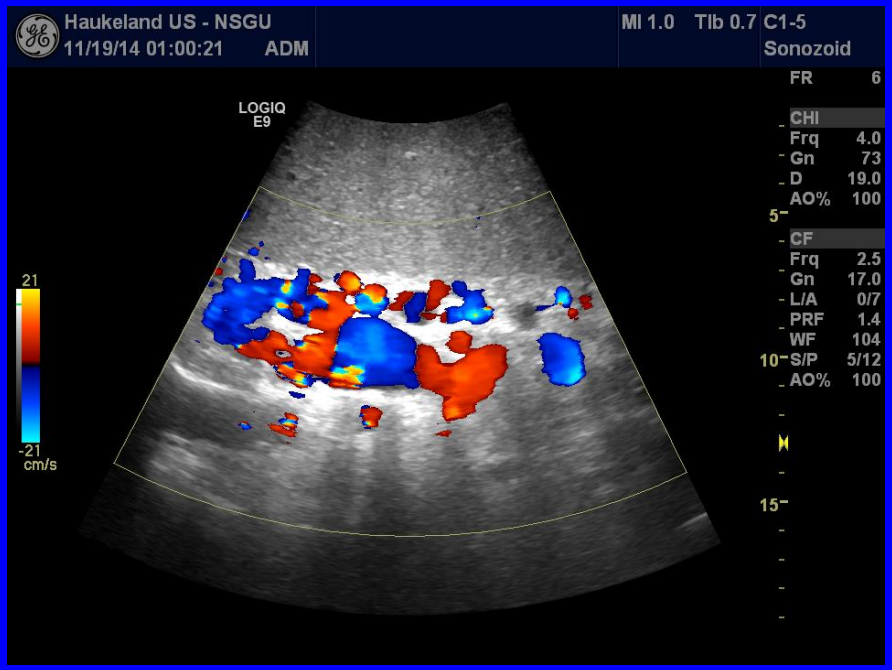


Dilated portal vein



Open paraumbilical vein

Splenomegaly and collaterals



Other «diffuse» liver disorders

- Acute viral hepatitis
- Cholestatic liver disease
- Schistosomiasis
- Diffuse malignant infiltration
- Budd-Chiari syndrome
- Intrahepatic portal vein thrombosis
- Congestive heart failure

Acute viral hepatitis

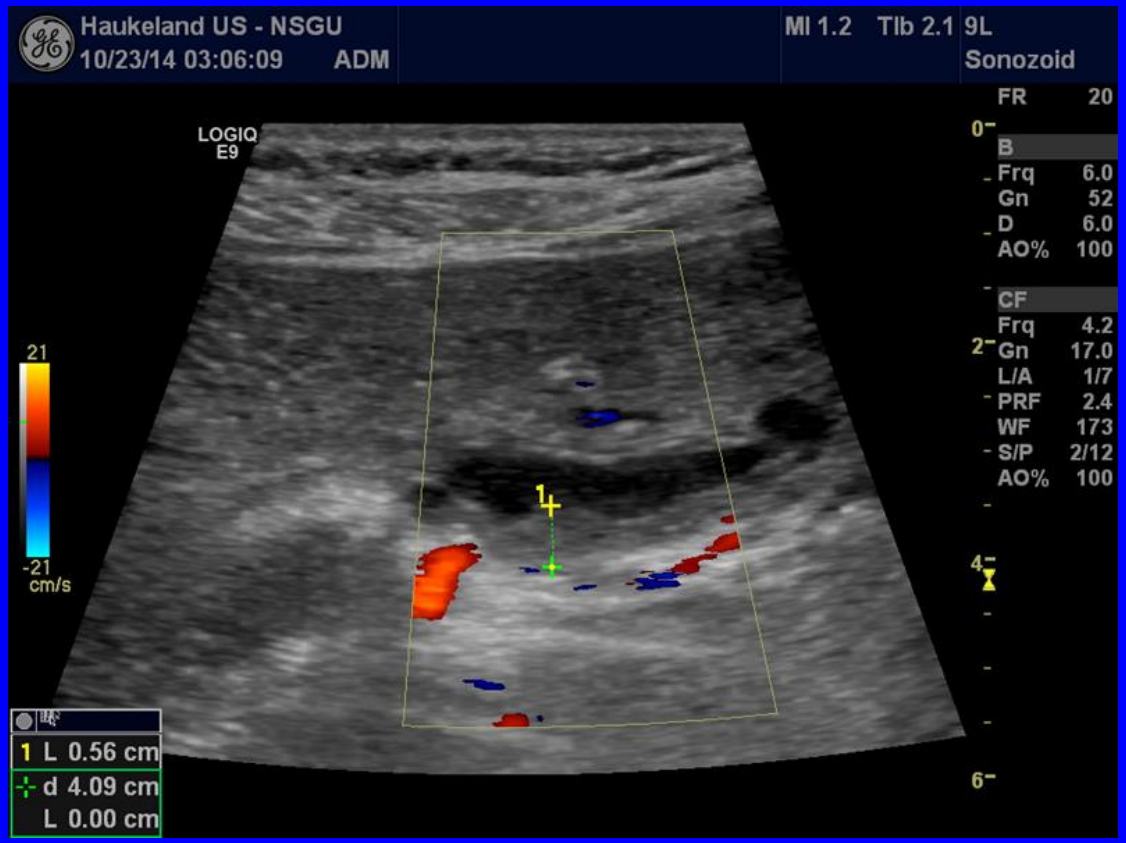
- exclude obstructive jaundice, tumour and cirrhosis
- hepatomegaly
- occasionally ”starry night liver”
  - hyperechogenic portal vein walls (”periportal cuffing”)
  - hypoechogenic liver parenchyma (edema)
- gallbladder wall thickening/ layered gallbladder wall
  - most frequent sign
- periportal lymph node enlargement
- but, most often US is normal

Primary biliary cholangitis/ Primary sclerosing cholangitis

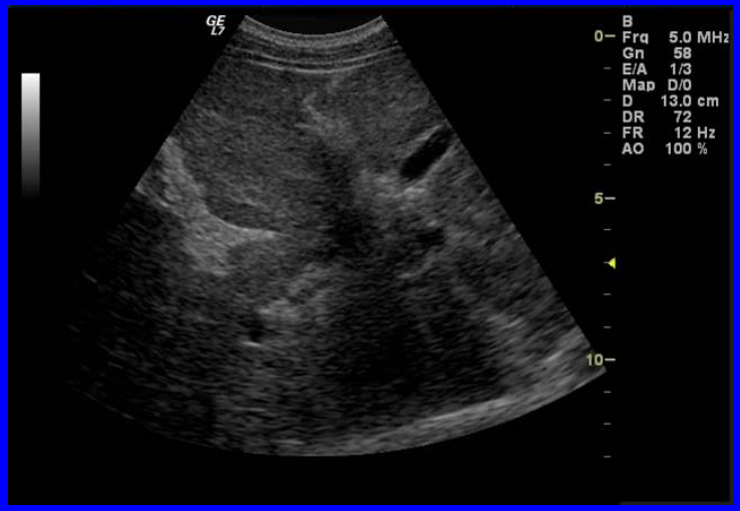
- periportal fibrosis
- periportal lymph nodes
- stones in the gallbladder or bile ducts
- ”end stage liver disease” (cirrhosis +/- PHT)

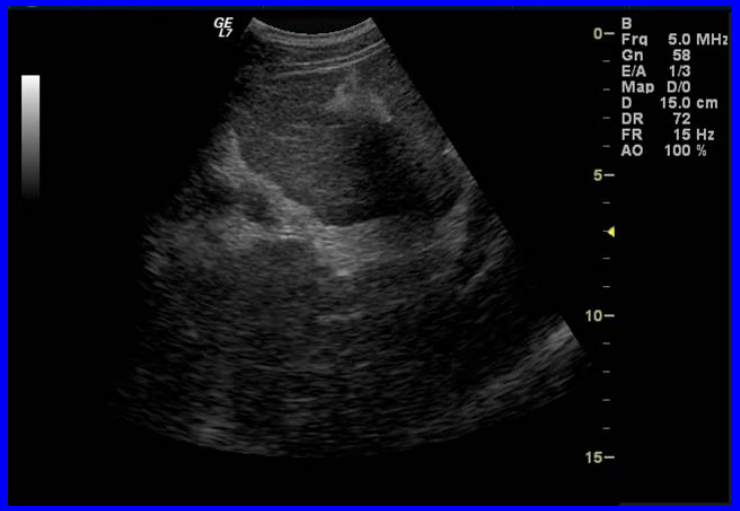
- irregular bile ducts in PSC

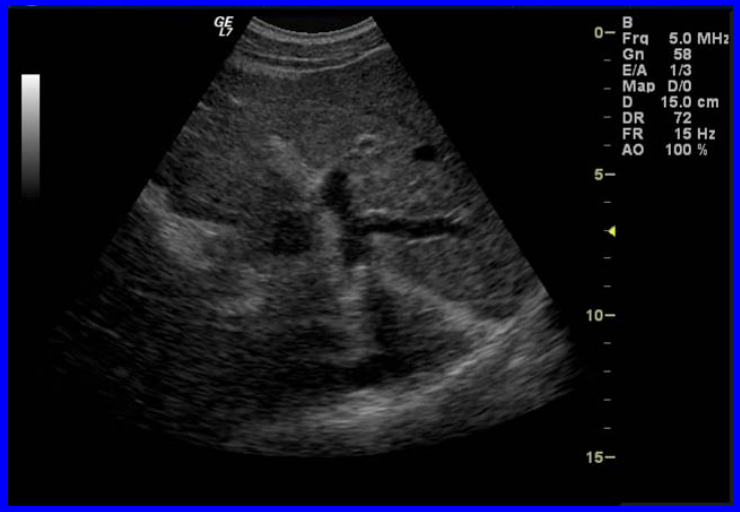
PSC

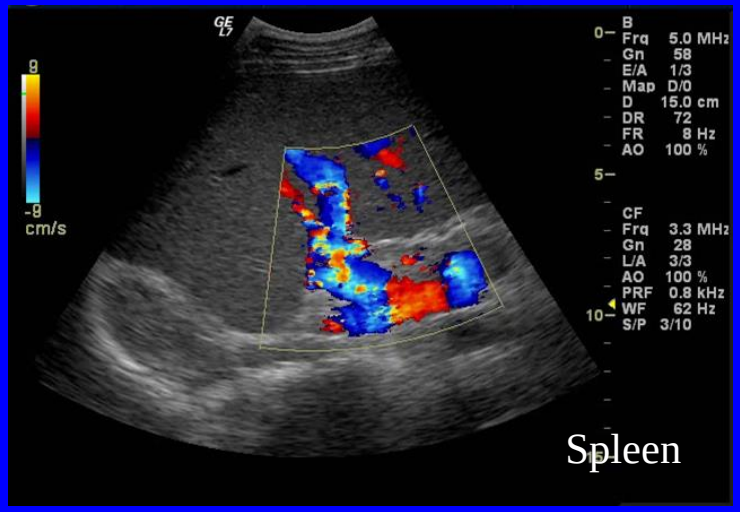


Schistosomiasis –male 24 year of age (Etiopia 2012)







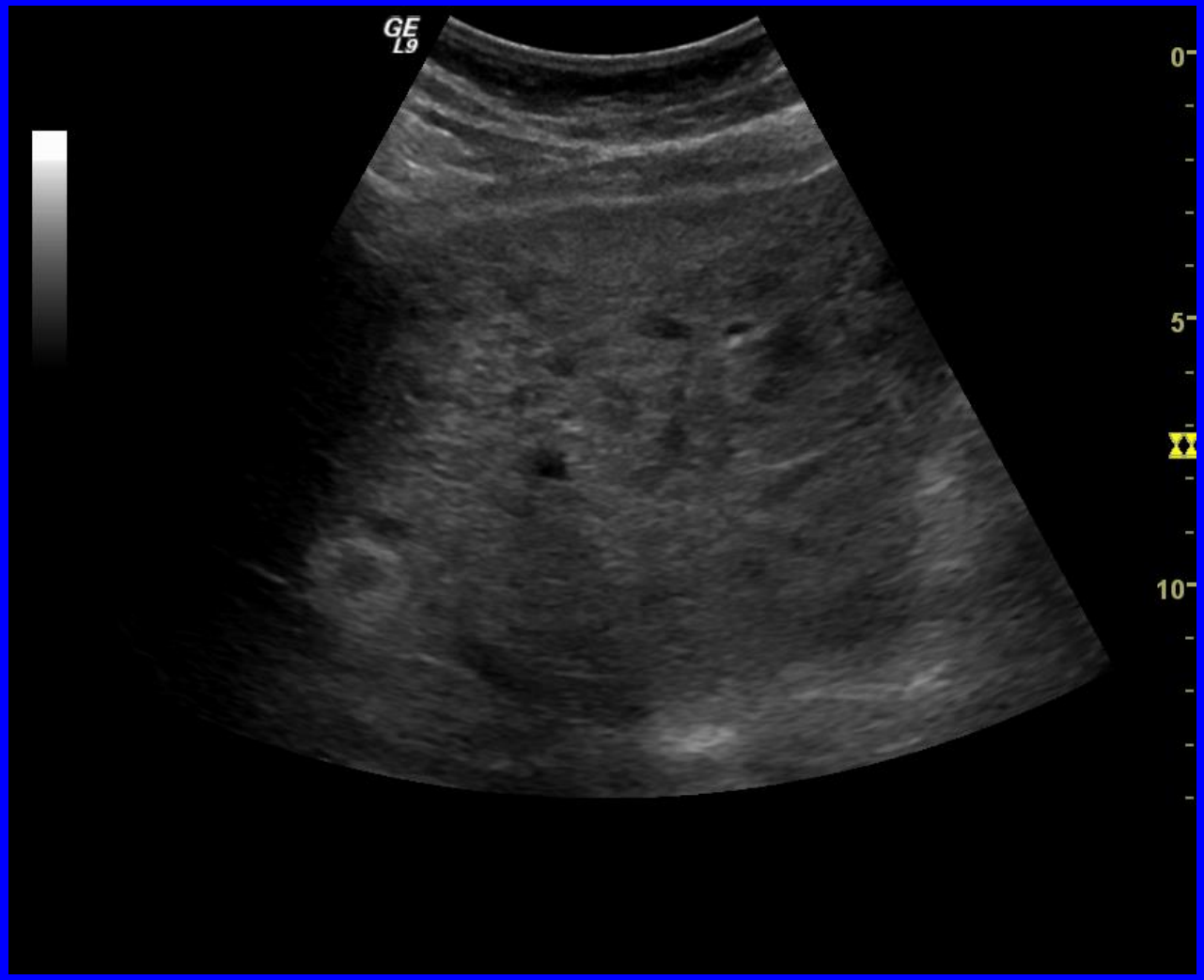


- periportal fibrosis
- PHT
- splenomegaly

Diffuse malignant infiltration

- myelomatosis/ plasma cell leukaemia
  - hepatomegaly

Diffuse infiltrative hepatocellular carcinoma



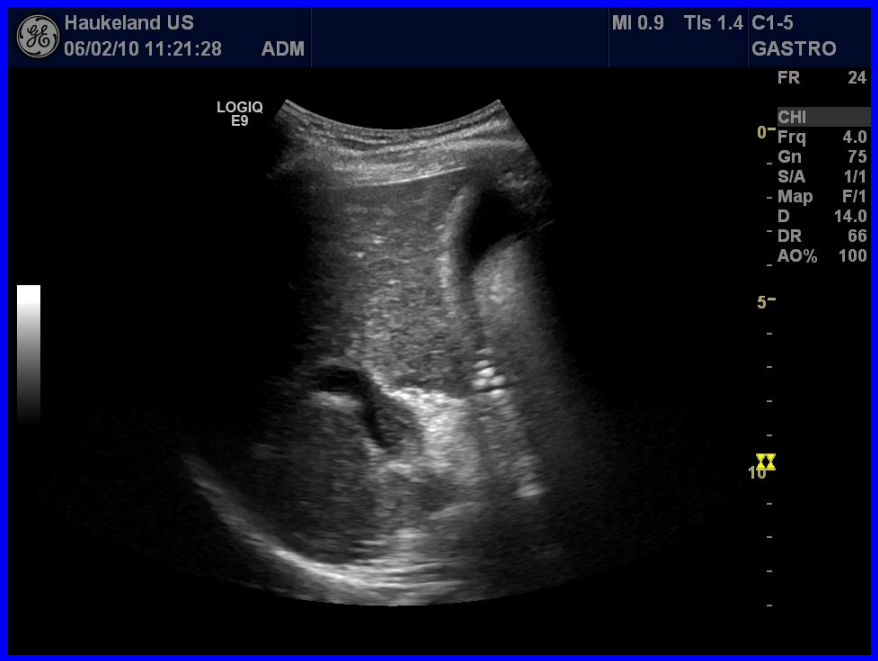
Budd-Chiari syndrome

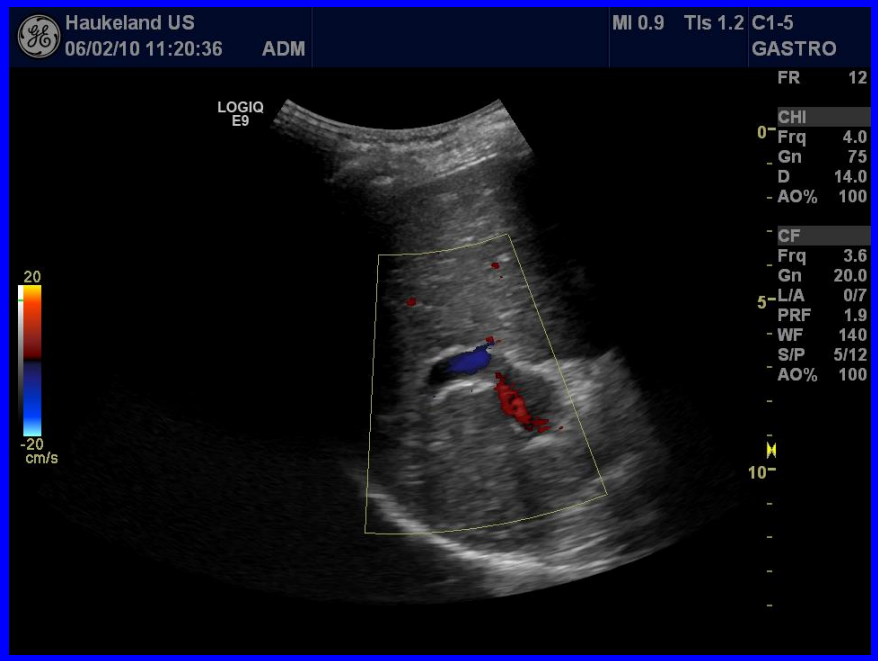
- asymptomatic to acute liver failure
- hepatomegaly and ascites
- visible thrombotic material inside the veins?
- blood flow in liver veins are compromized on Color Doppler (CDS)/ CEUS)
- partial or complete lack of visualization of the liver veins
- PHT

Budd-Chiari syndrome

- all degrees
- echoic thromb
- anechoic thromb
- absence of flow (CDS/CEUS)
- absence of vessels
- hepatomegaly
- ascites
- collaterals

Intrahepatic portal vein thrombosis





Congestive liver failure

- dilatation of the hepatic veins
- dilatation of vena cava
  - compression/ Valsalva
- hepatomegaly
- ascites
- portal hypertension

- ESLD

Ultrasound in focal liver lesions

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Agenda

- Benign focal liver lesions
  - Liver cysts
  - Liver abscess
  - Hemangioma
  - FNH
  - Adenoma
  - Other benign focal liver lesions

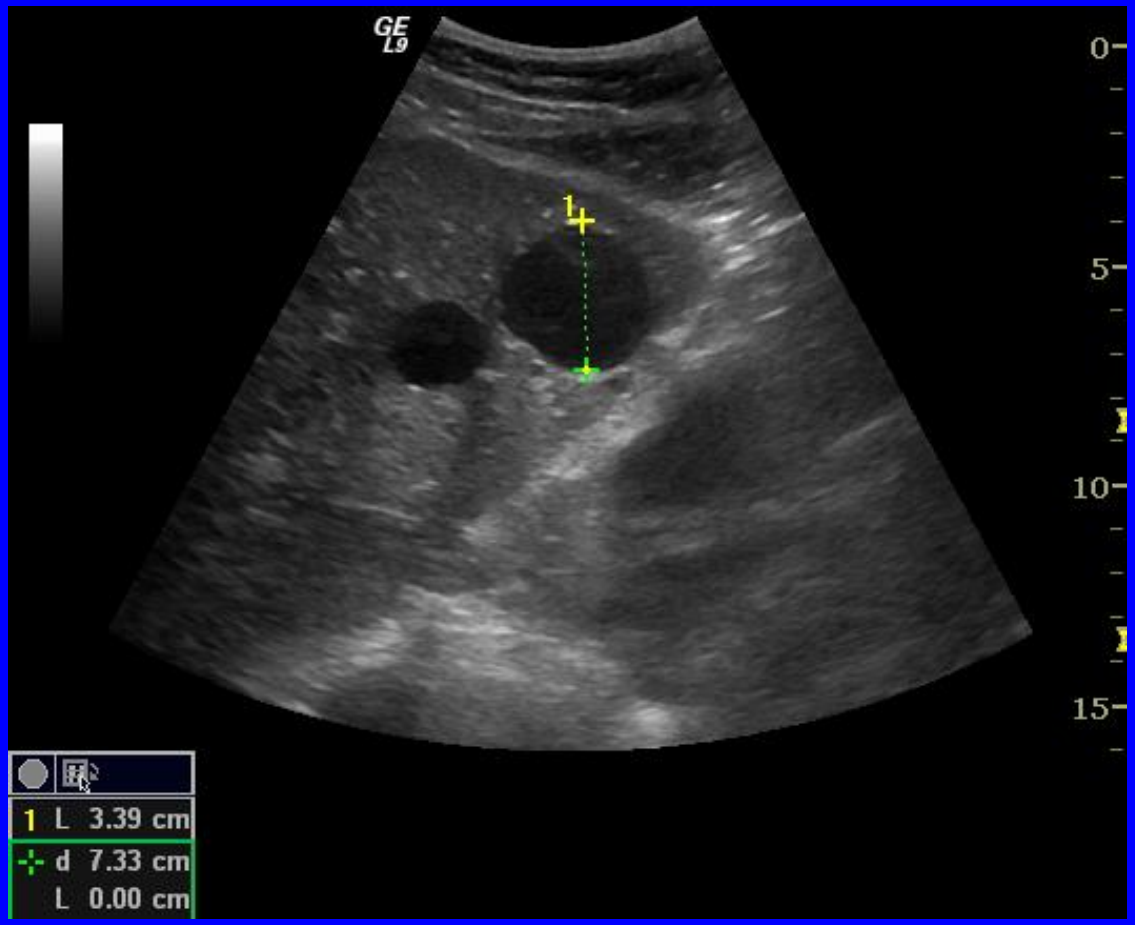
- Malignant focal liver lesions
  - Hepatocellular carcinoma (HCC)
  - Cholangiocarcinoma
  - Metastases
  - Lymphoma

Liver cysts

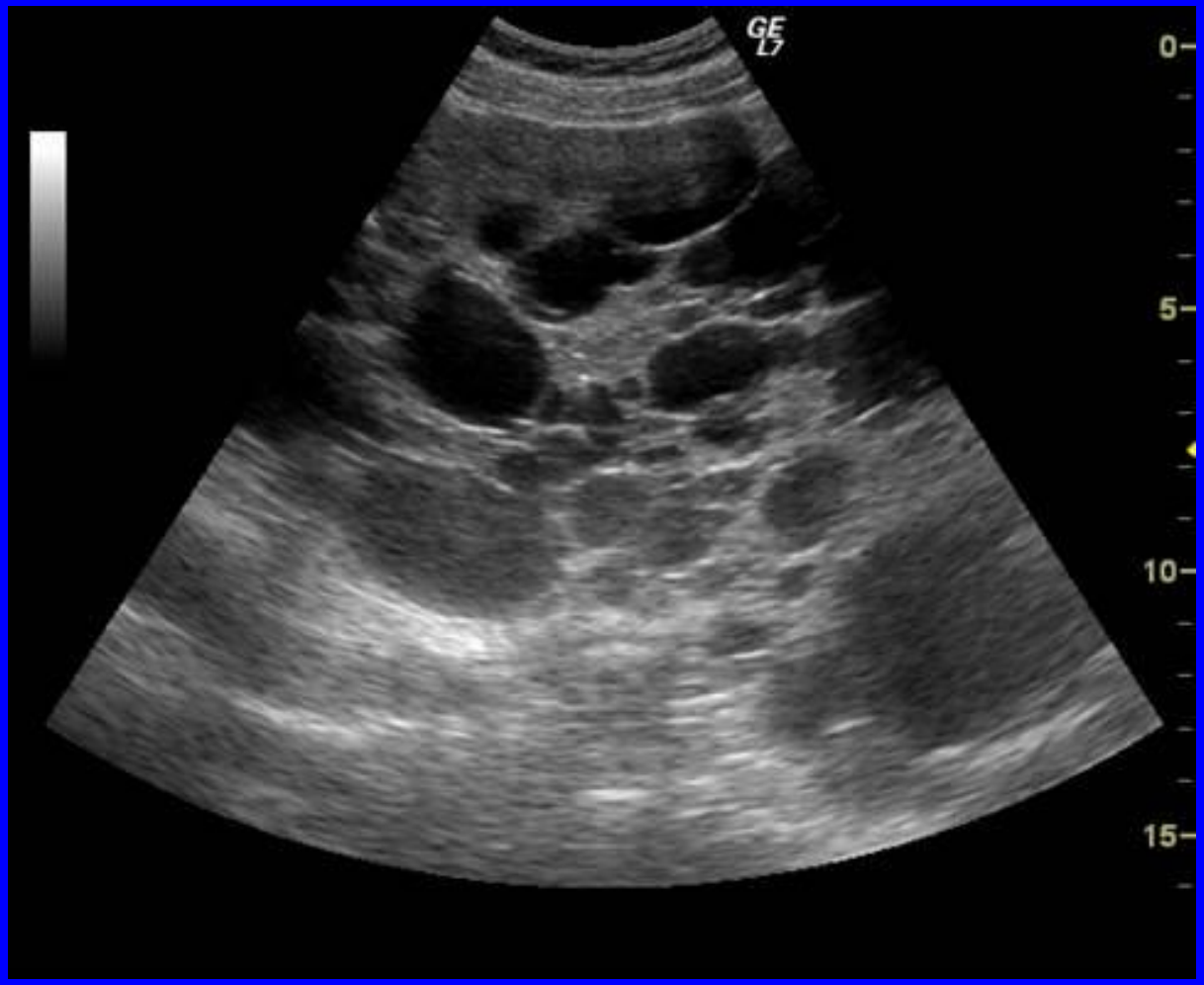
- ultrasound is highly accurate in diagnosing liver cysts
- anechoic with a clear posterior demarcation
- posterior enhancement
- often round in shape and smooth
- occasionally RUQ pain due to mass effect or bleeding

- polycystic liver disease
  - autosomal dominant disorder (ADPLD)
  - often multiple renal cysts (>50%)
  - hepatomegaly, cholestasis and portal hypertension (PHT)

Liver cysts



Polycystic liver disease

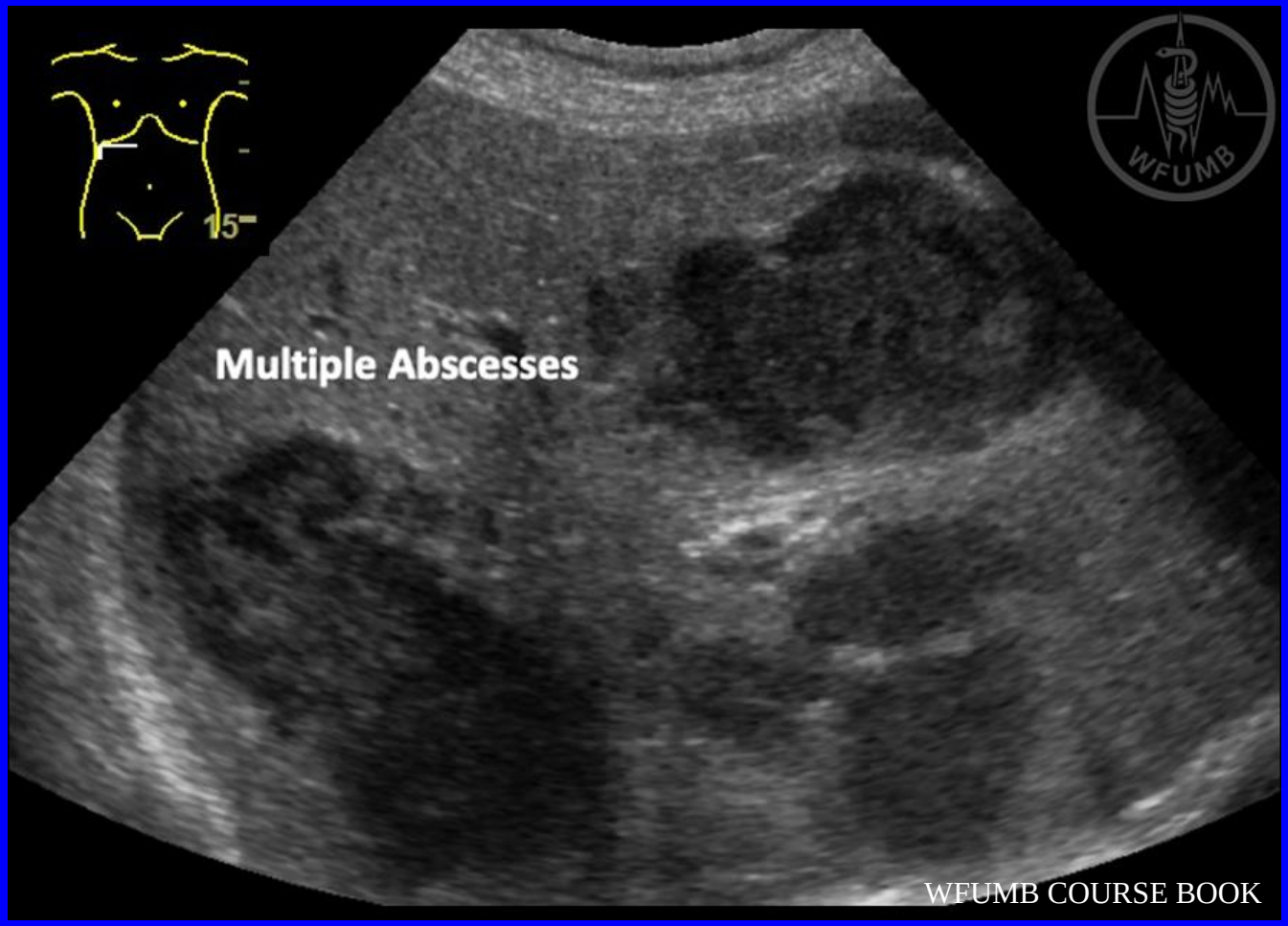


Liver abscess

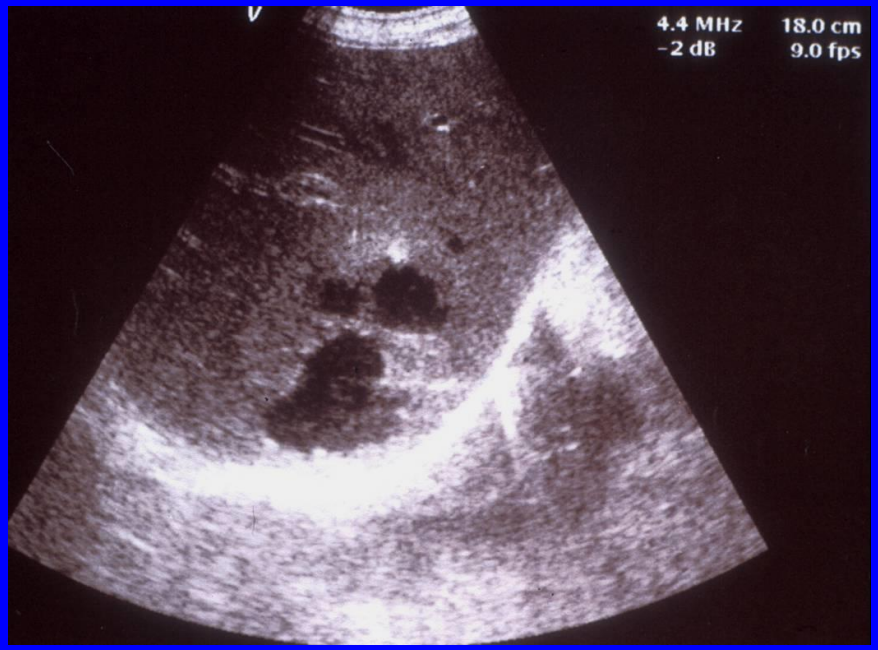
- slightly irregular, cystic lesions on ultrasound
- often contain echogenic material including bubbles of gas
- HISTORY!
- fever, leucocytosis, CRP elevation and elevated LFT`s

- ultrasound for percutaneous abscess drainage

Liver abscess



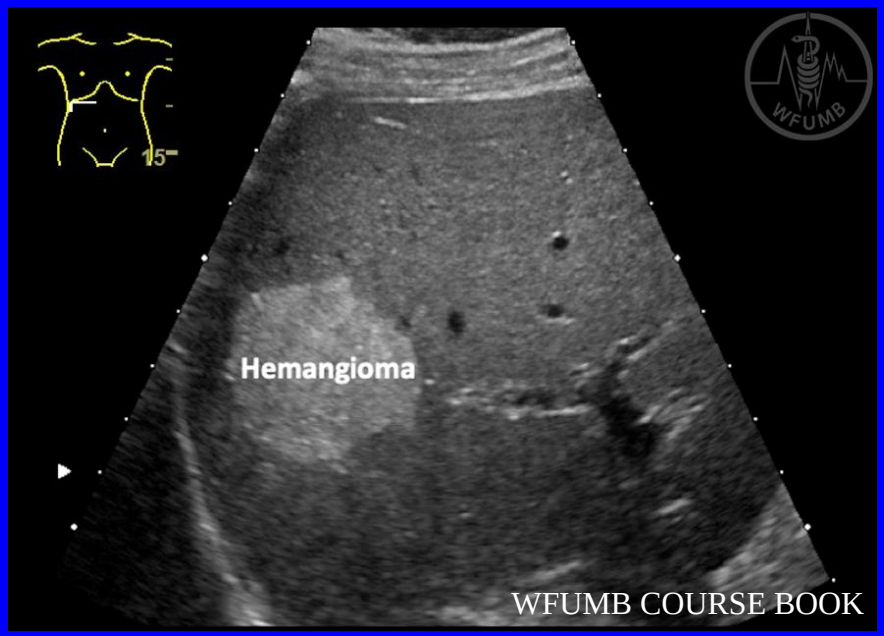
Liver abscess

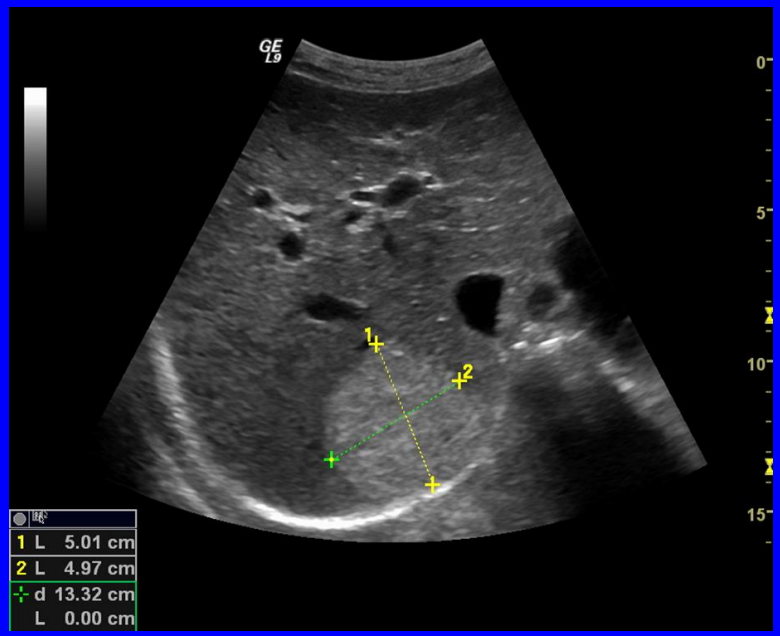


Hemangioma

- most common benign tumour of the liver (prevalence 5-10%)
- small (< 2-3 cm)
  - homogeneous and hyperechogenic lesion
  - well defined, often with irregular margins
  - often found in a subcapsular or perivascular position
- most often discovered by coincidence
- larger hemangiomas can be atypical with heterogeneous echogenicity
- typical vascular pattern
  - peripheral nodular arterial enhancement followed by centripetal filling
- contrast-enhanced ultrasonography (CEUS), CT and MRI

Hemangioma



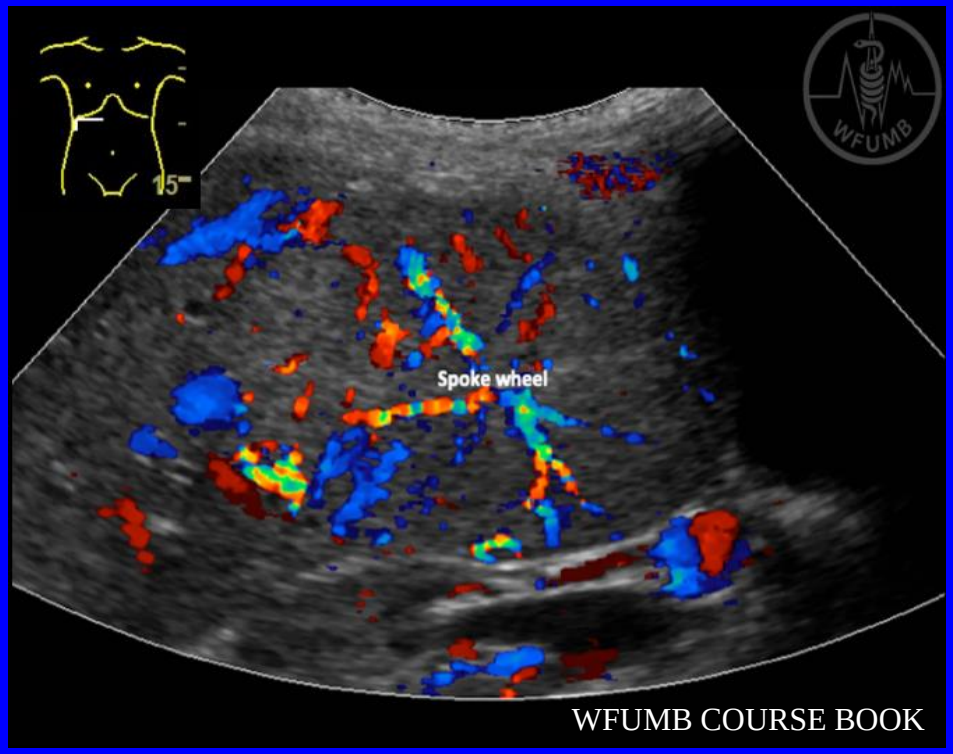


Focal nodular hyperplasia/ Adenoma

- FNH
  - second most common benign liver tumour (prevalence 1-3%)
  - often almost isoechoic with a central stellate scar
  - non-encapsulated, but well defined
  - typical centrifugal vascular filling to the periphery in the arterial phase on Color Doppler(CDS), CEUS, CT and MRI

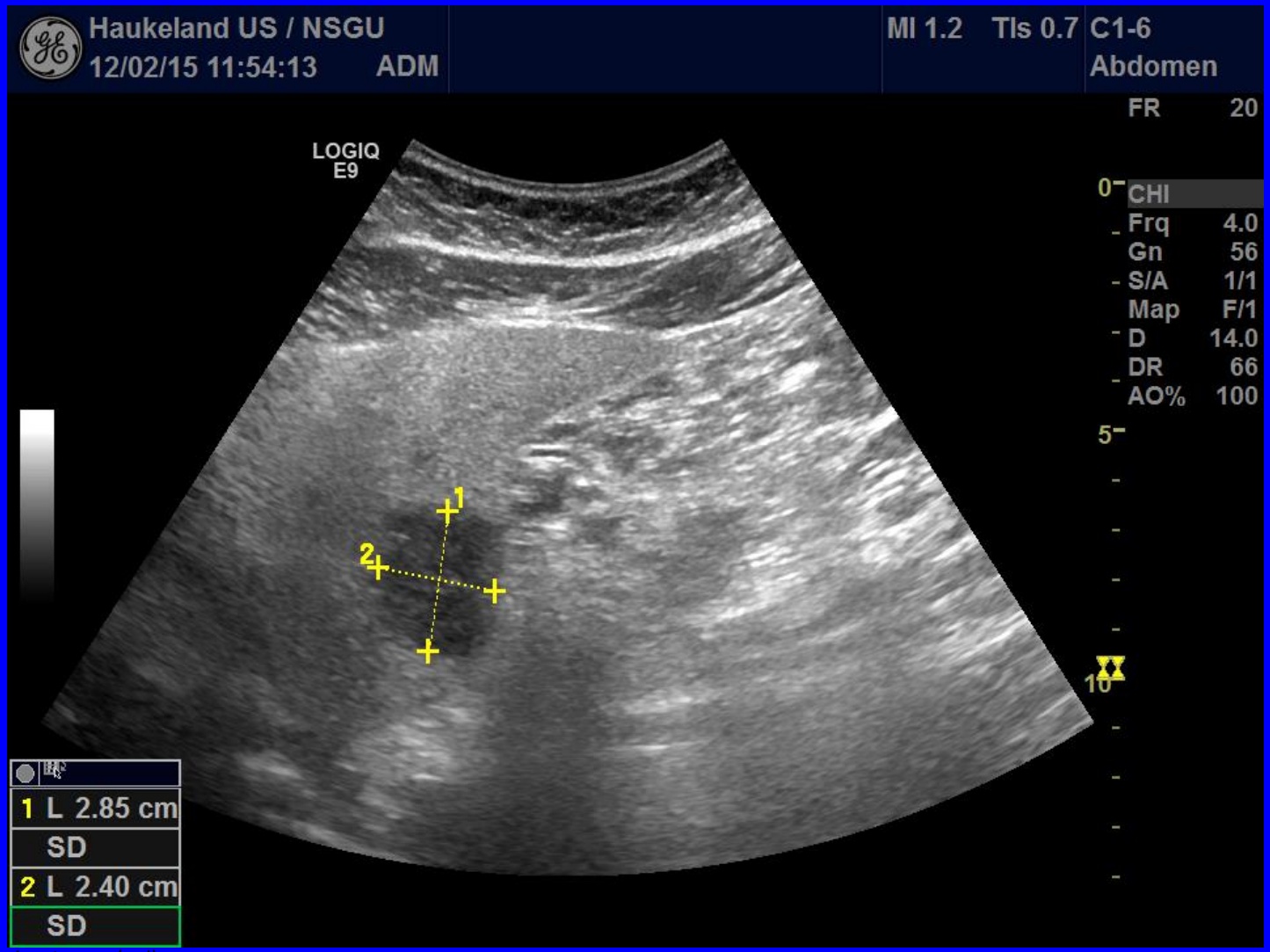
- Liver cell adenoma
  - adenomas less frequent than FNH
  - encapsulated
  - larger adenomas often inhomogeneous due to bleeding, necrosis and fibrosis
  - RUQ pain due to mass effect or bleeding
  - CEUS

FNH

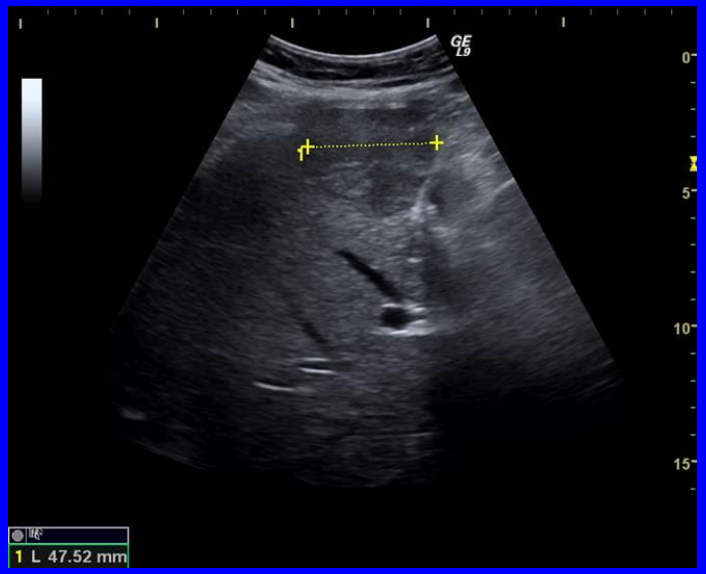


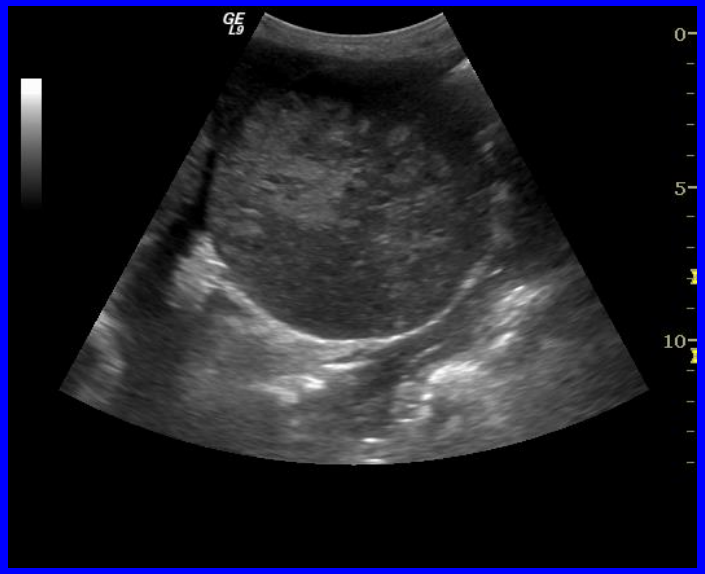
WFUMB COURSE BOOK

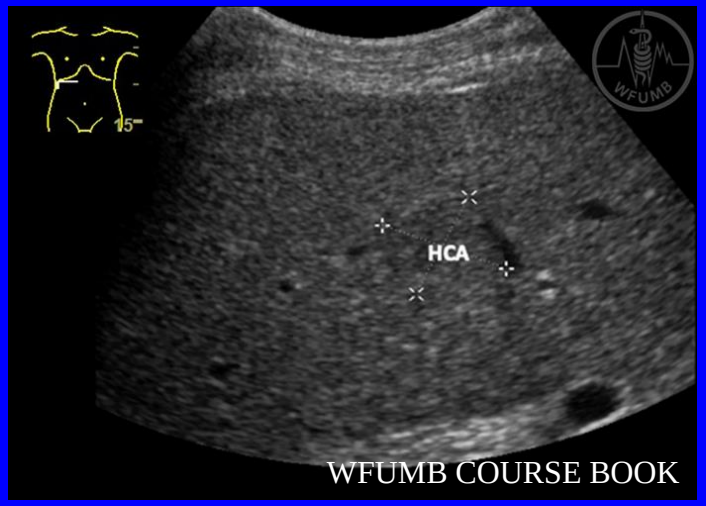
FNH

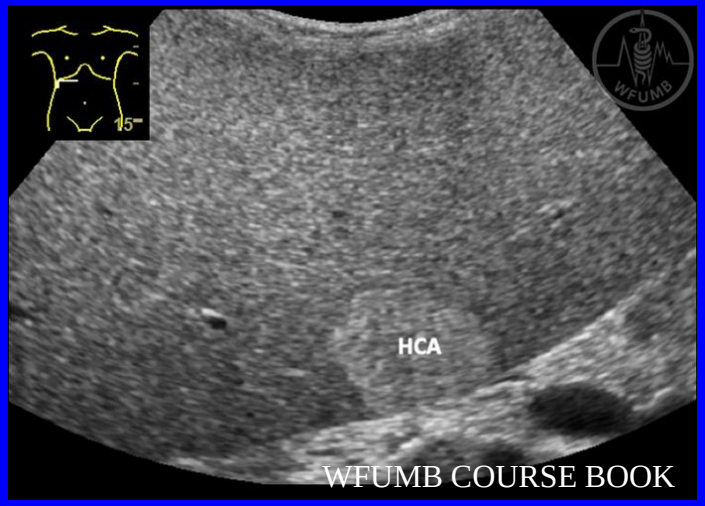


Adenoma









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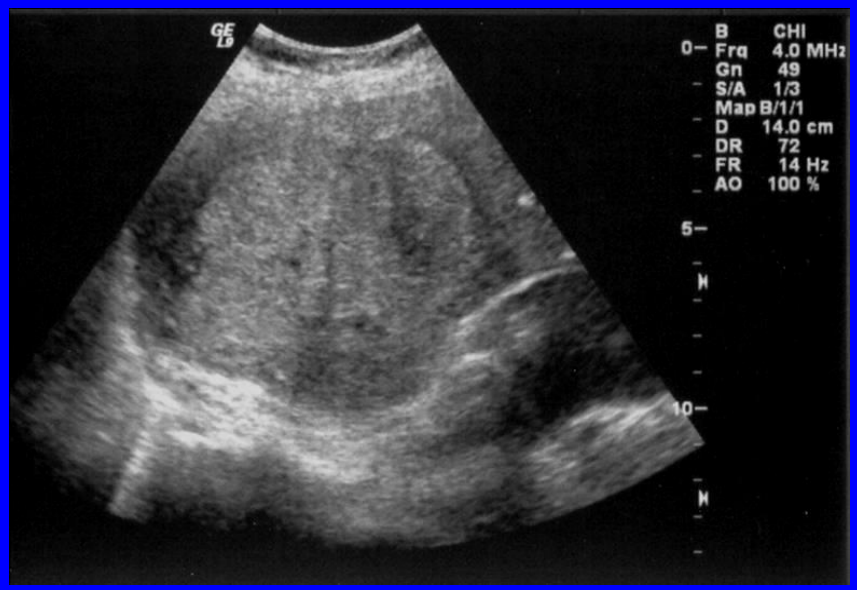
- Benign focal liver lesions
  - Liver cysts
  - Liver abscess
  - Hemangioma
  - FNH
  - Adenoma
  - Other benign focal liver lesions

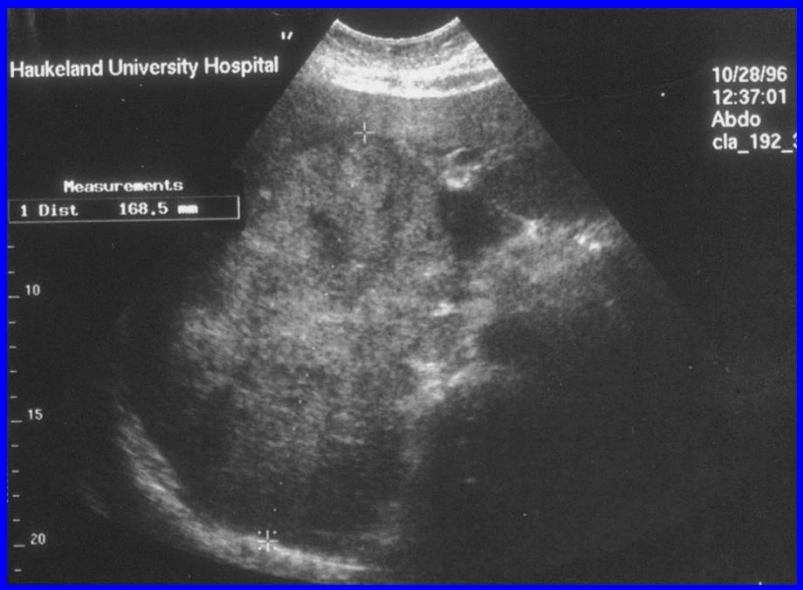
- Malignant focal liver lesions
  - Hepatocellular carcinoma (HCC)
  - Cholangiocarcinoma
  - Metastases
  - Lymphoma

Hepatocellular carcinoma (HCC)

- high prevalence in Africa and South-east Asia (HBV)
- strongly associated with cirrhosis and viral hepatitis
- blood supply almost exclusively from an abnormal artery
- < 2cm often hypoechogenic
- large HCC (> 5 cm) often inhomogeneous with mixed echogenisity
  - bleeding, thrombosis, necrosis and fibrosis
- diffuse infiltration (DD: cirrhosis)
- tumour thromb in the portal vein in about 35% using US
- increased vascularity with CDS and CEUS
  - ”feeding artery” and ”basket sign”
- most often ”wash out” in sinusoidal phase with CEUS
  - can be isoechoic

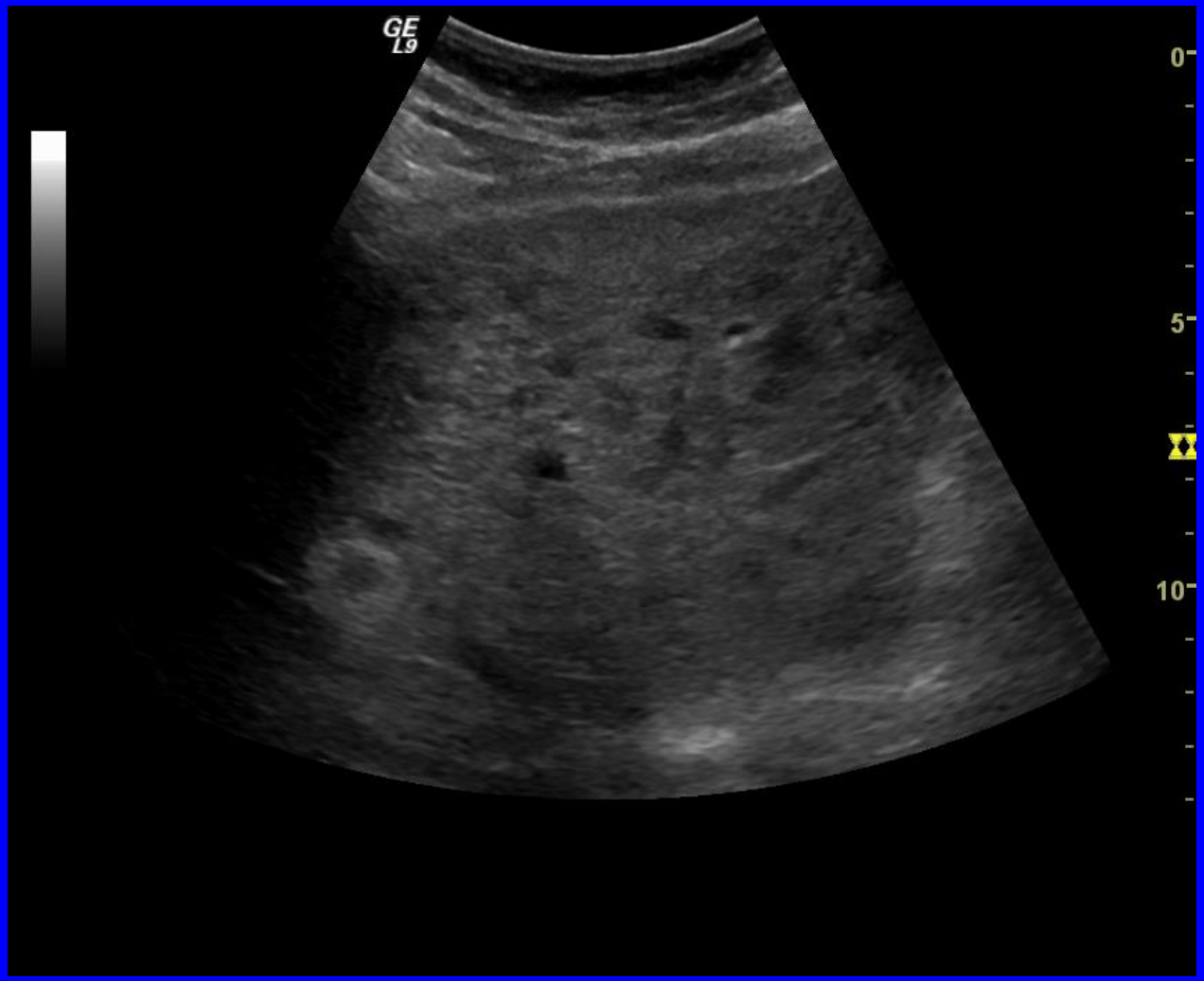
HCC



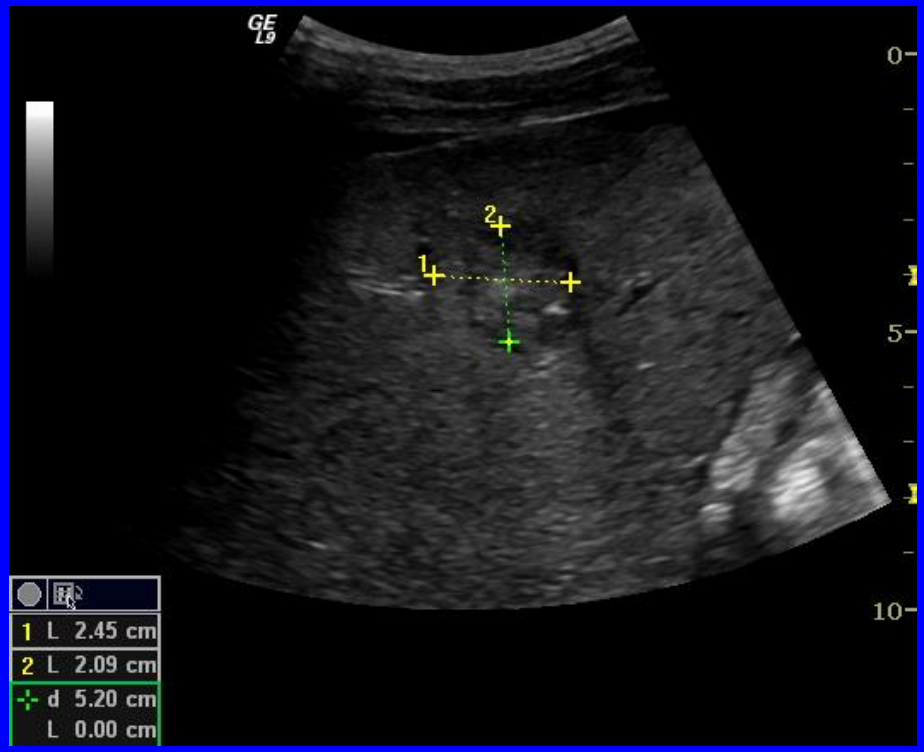


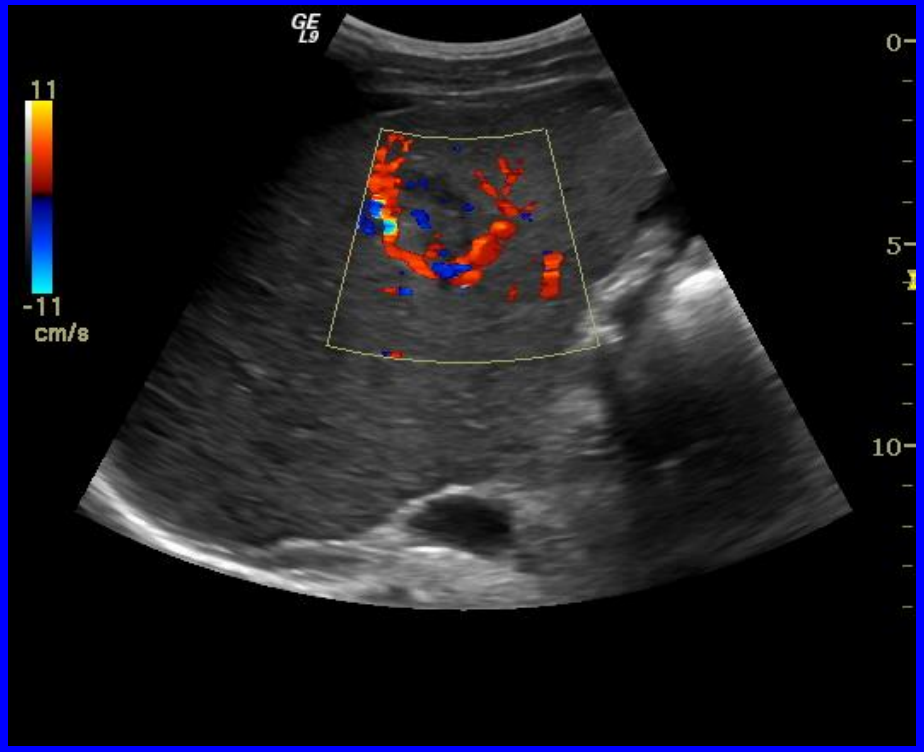
Large HCC with mixed echogenisity

HCC –diffuse infiltration

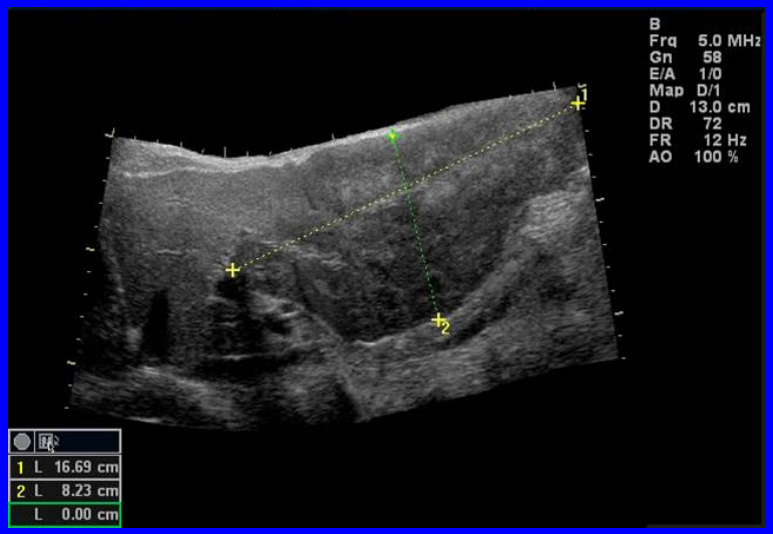


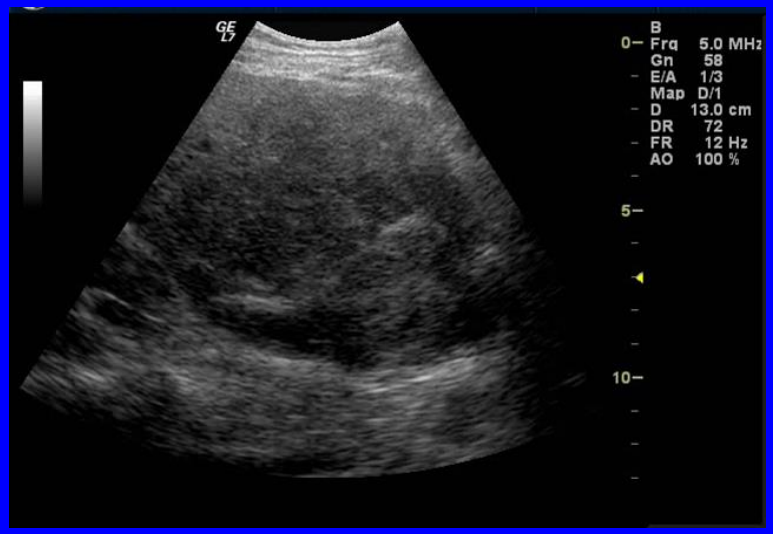
HCC –”basket sign”

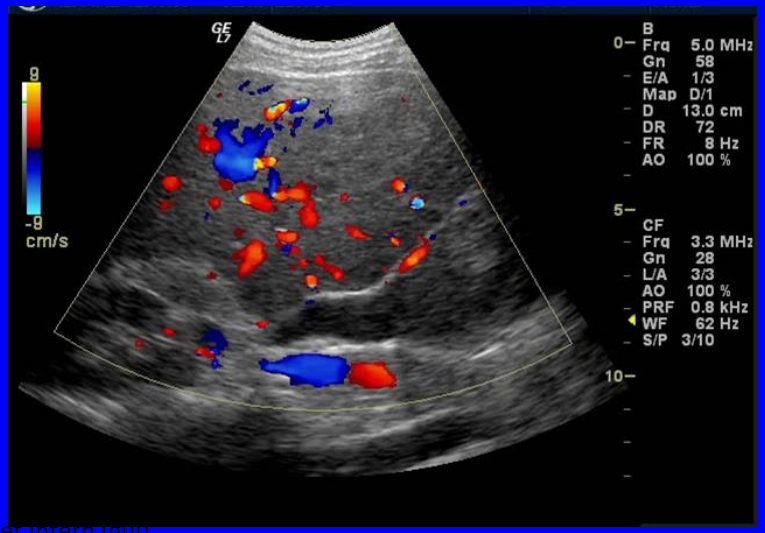


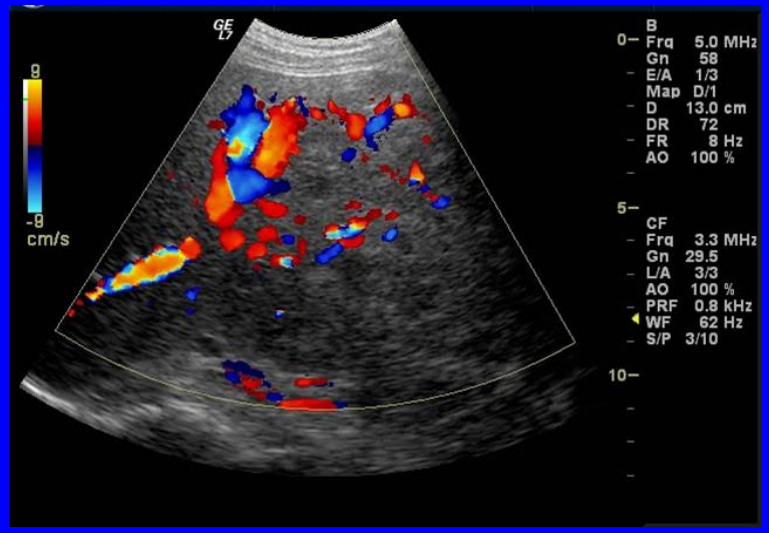


HCC -female 21 years of age with chronic HBV (Ethiopia 2012)





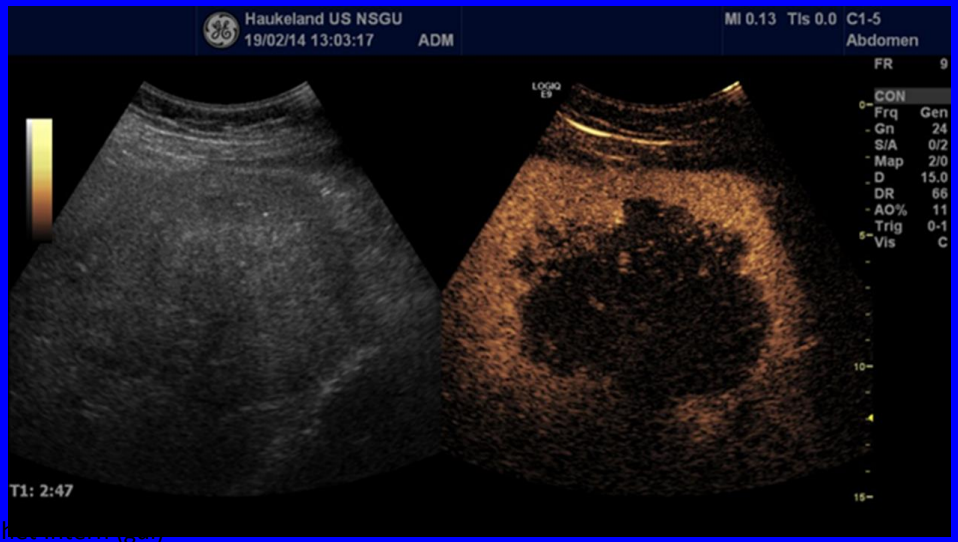




Cholangiocarcinoma

- can be difficult to identify by US or other imaging techniques
  - ill-defined and often isoechoic
  - dilated bile ducts proximal to tumour
    - » ”parallel sign”
  - localized thickening of the bile duct wall or just a ”major stricture”
- solitary tumour with a slightly inhomogeneous echogenicity

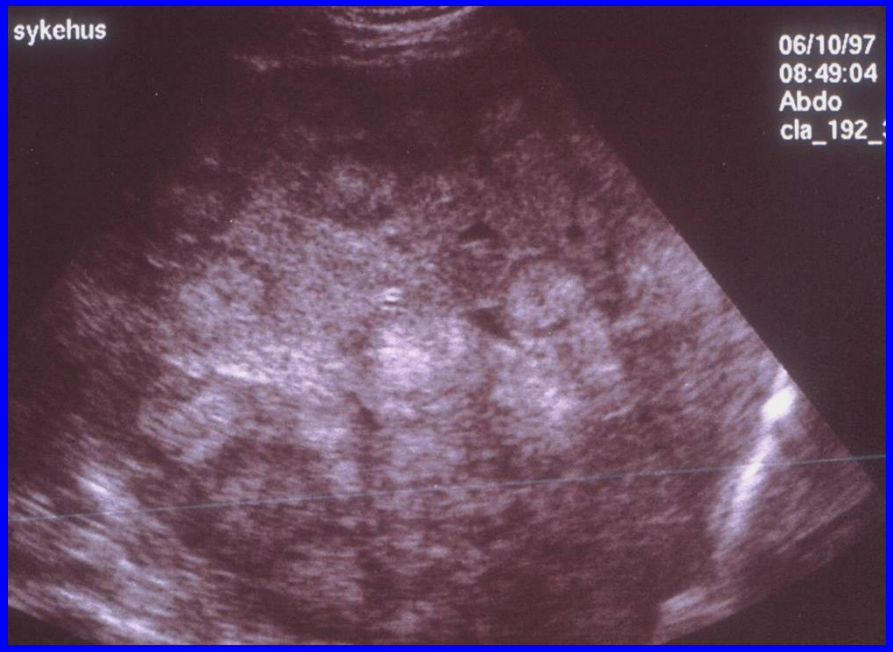
Cholangiocarcinoma

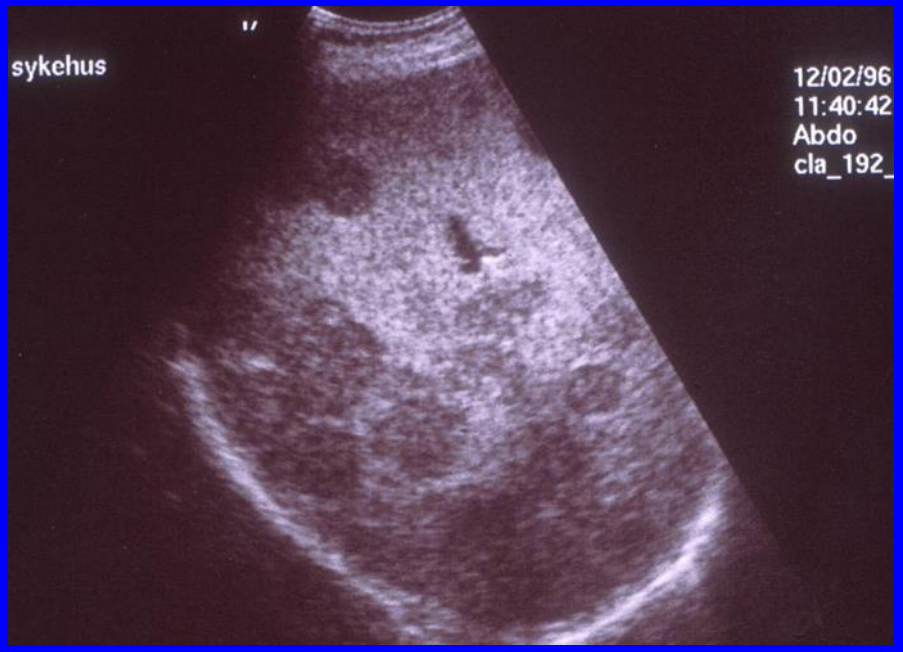


Metastases

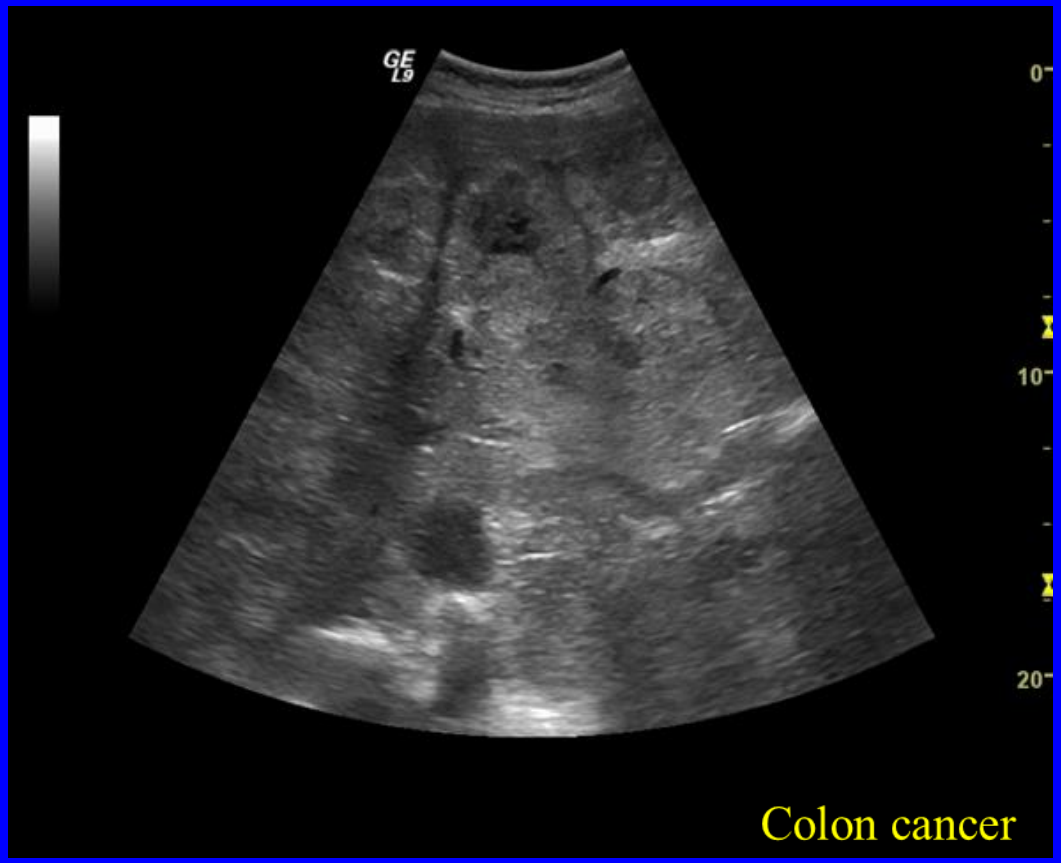
- often multiple
- hypo-, iso- and/or hyperechoic
- halo
- central necrosis
- wash-out in late phase with CEUS

Metastases



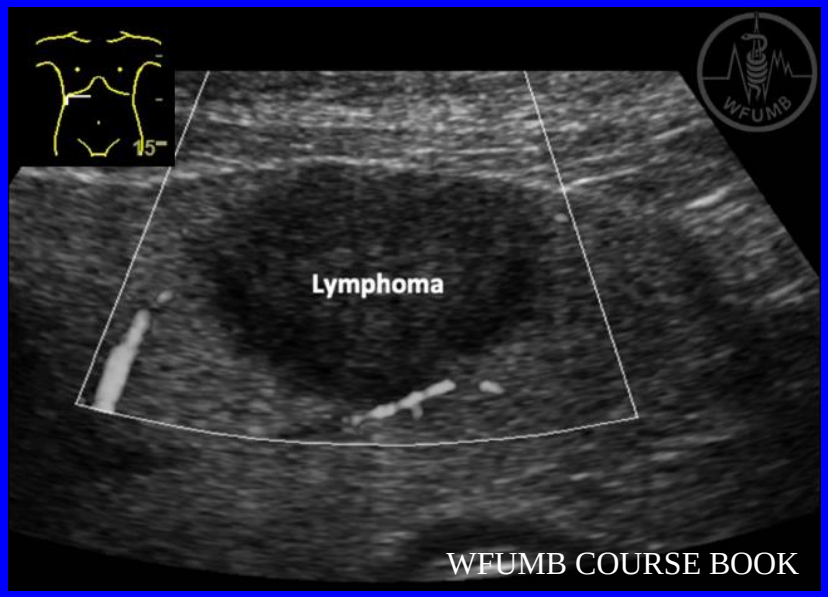


Liver metastases



Lymphoma

- most often a diffuse infiltration (abnormal echogenicity?)
- seldom localized (10%)
- biopsy
- enlarged lymph nodes?



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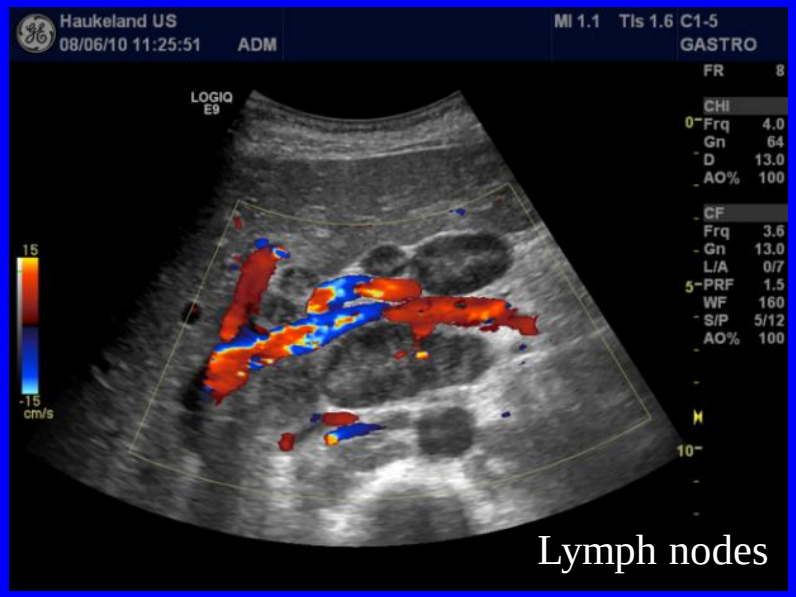

Lymph nodes