Patient's Data

- Name: 黃○程
- Gender: Male
- Occupation: Computer engineer

History

- Chief complaint:
  a liver tumor was accidentally found for 1 week during routine physical check up

History

- Present illness:
  - 92-12-31:
    a liver tumor was accidentally found during routine physical check up
  - 93-01-06:
    came to Dr. 劉's OPD for further evaluation

History

- Present illness:
  - 93-01-06: liver function test
  - 93-01-06: abdominal sonography
  - 93-01-13: liver CT scan
  - 93-01-27: liver angiography
  - 93-02-09: liver and spleen scan + SPECT
  - 93-02-17: Ga-67 tumor survey

History

- Personal history:
  - Smoking: (+) ¾ PPD
  - Drinking: (+) social drinking
  - Betel-nut chewing: denied
  - Allergy: denied

History

- Past history:
  - HBV/HCV infection: denied
  - Liver disease: denied
  - Vascular malformation: denied
- Family history:
  - No liver disease
  - No vascular deformity

Physical Examination

- Sclera:
  - not icteric
- Abdomen:
  - no abdominal mass
  - no abdominal discomfort or pain
- Skin:
  - no petechiae or ecchymosis
  - not yellowish or icteric

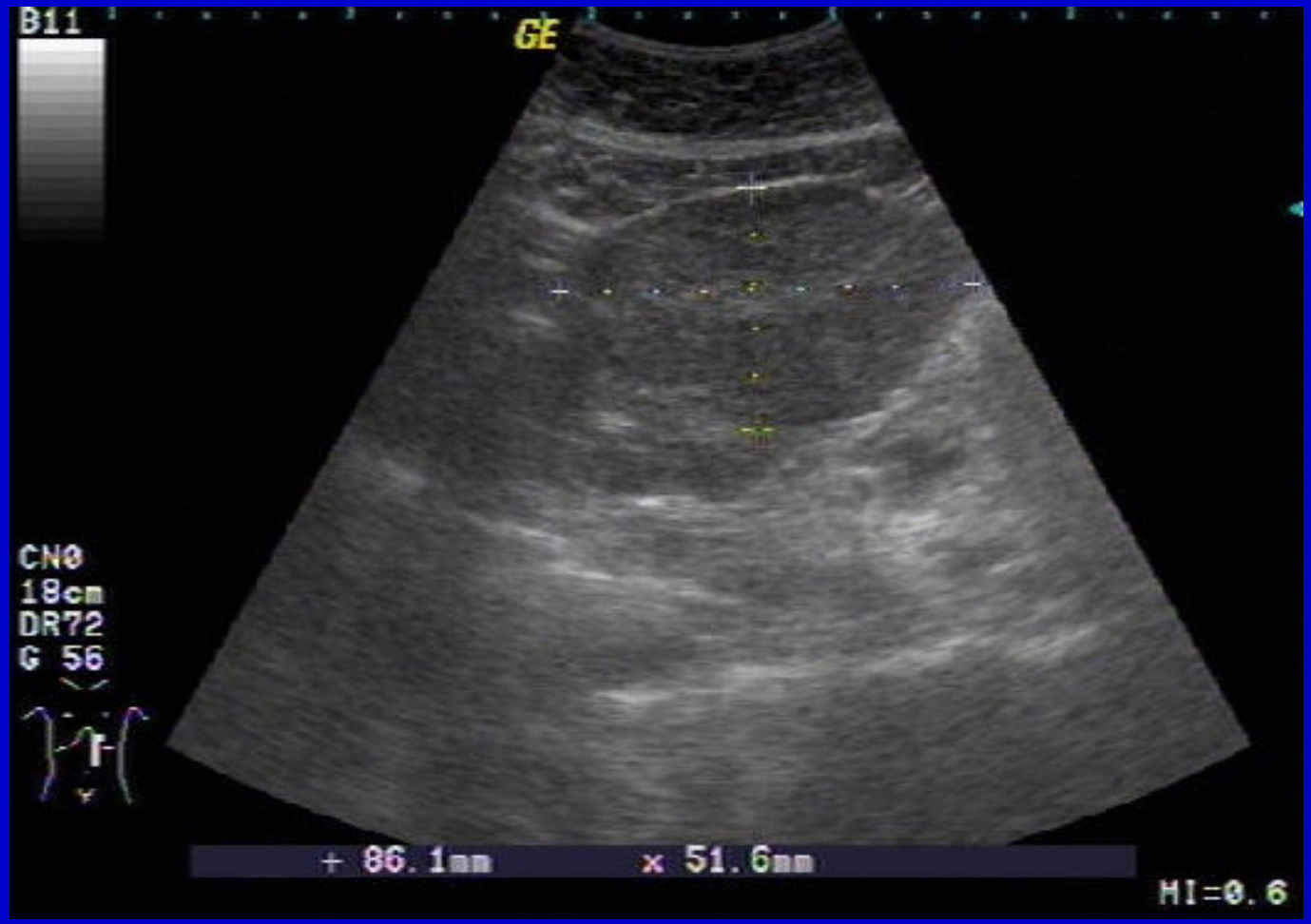
Lab Data

- Liver function test: normal

	ALK-P (66 ~ 240 IU/L)	GOT (0 ~ 40 IU/L)	GPT (0 ~ 40 IU/L)	γ -GT (8 ~ 87 IU/L)	AFP (<10 ng/mL)
93-01-06	102	18	21	56	2.3
95-06-20	62	35	21	90	1.46

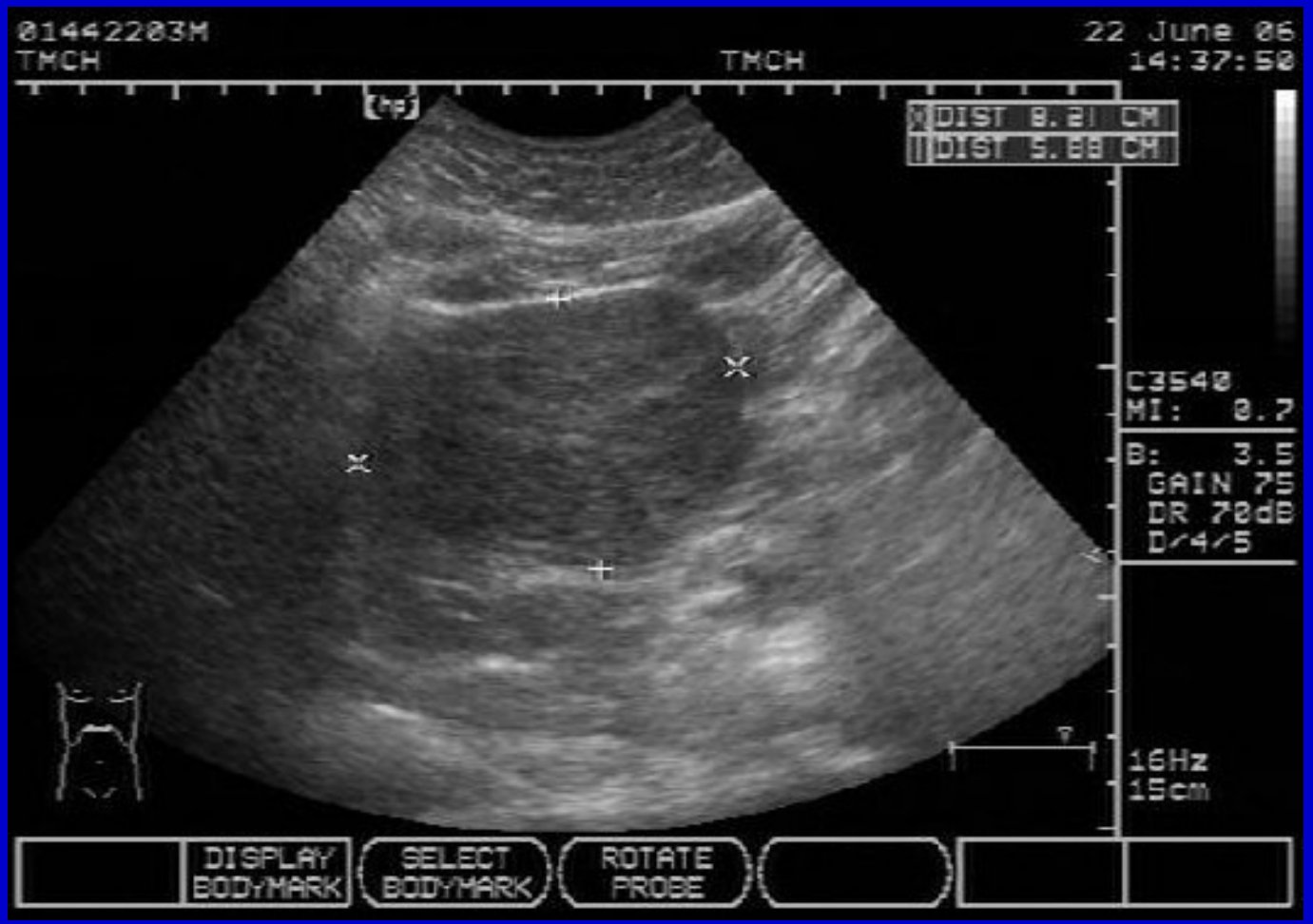
Ultrasonography

- 93-01-06: a mix-echoic 8.6 X 5.2 cm liver nodule



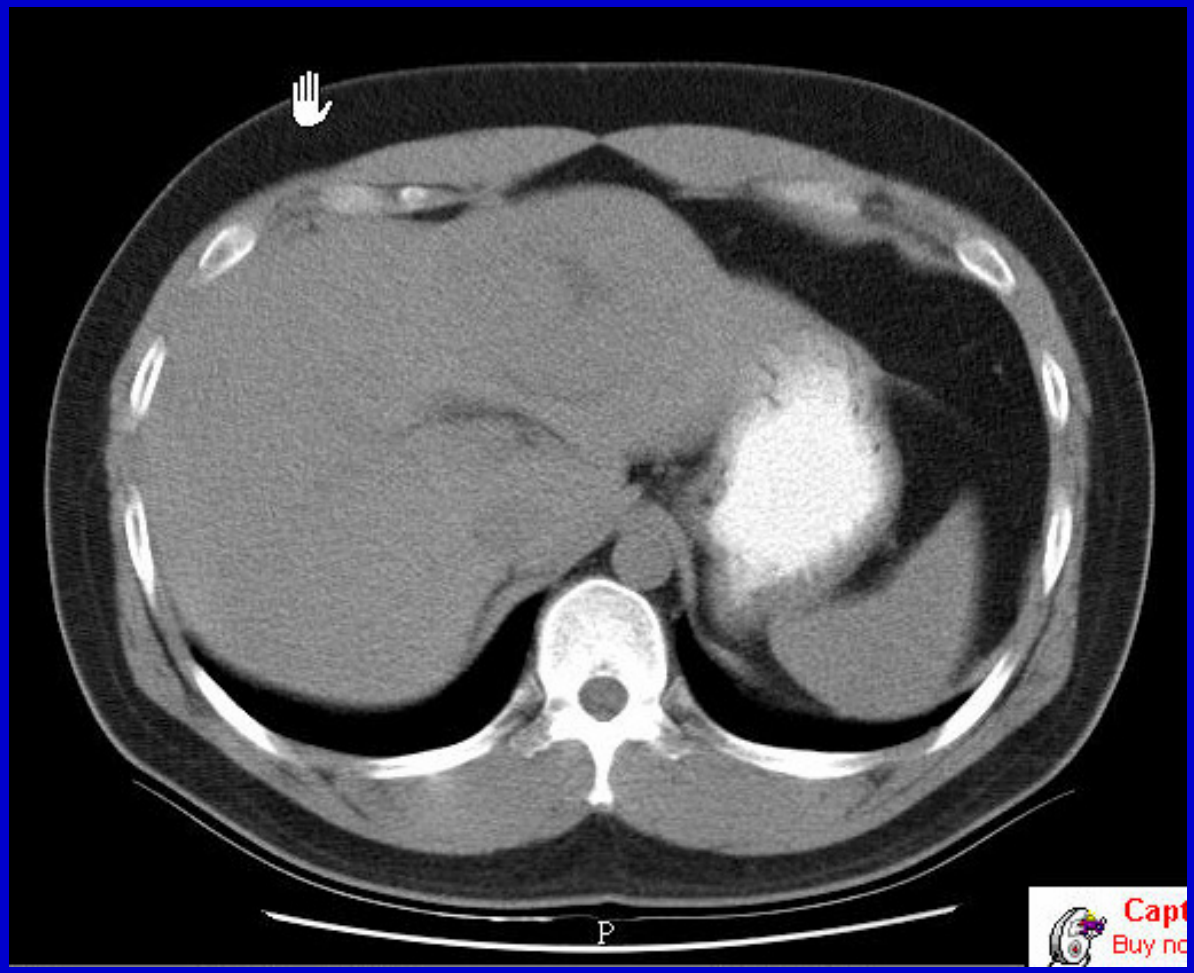
Ultrasonography

- 95-06-22: no obvious change within the liver nodule



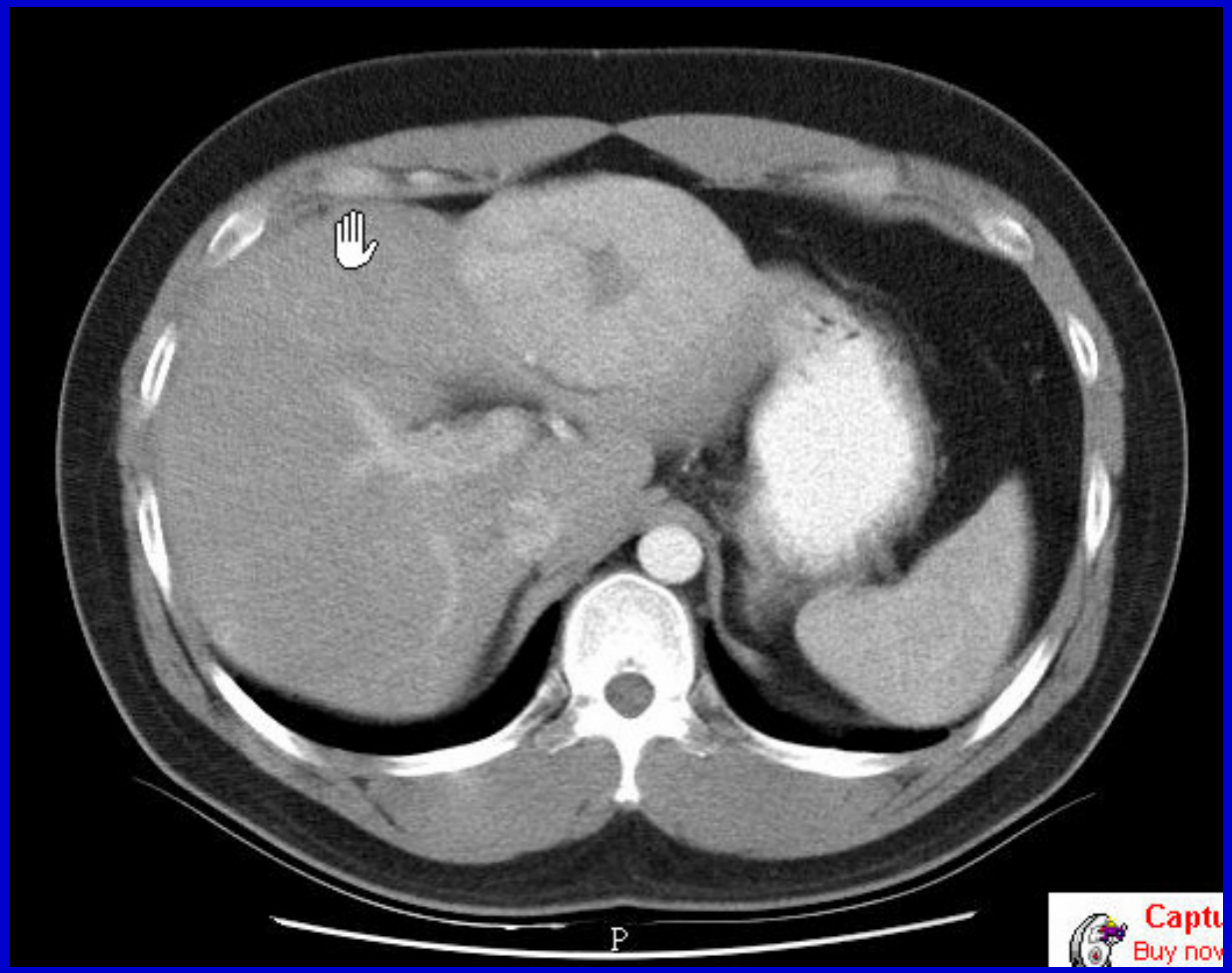
CT scan

- Pre contrast phase: a slightly hypo-dense liver mass with a more hypo-dense central scar



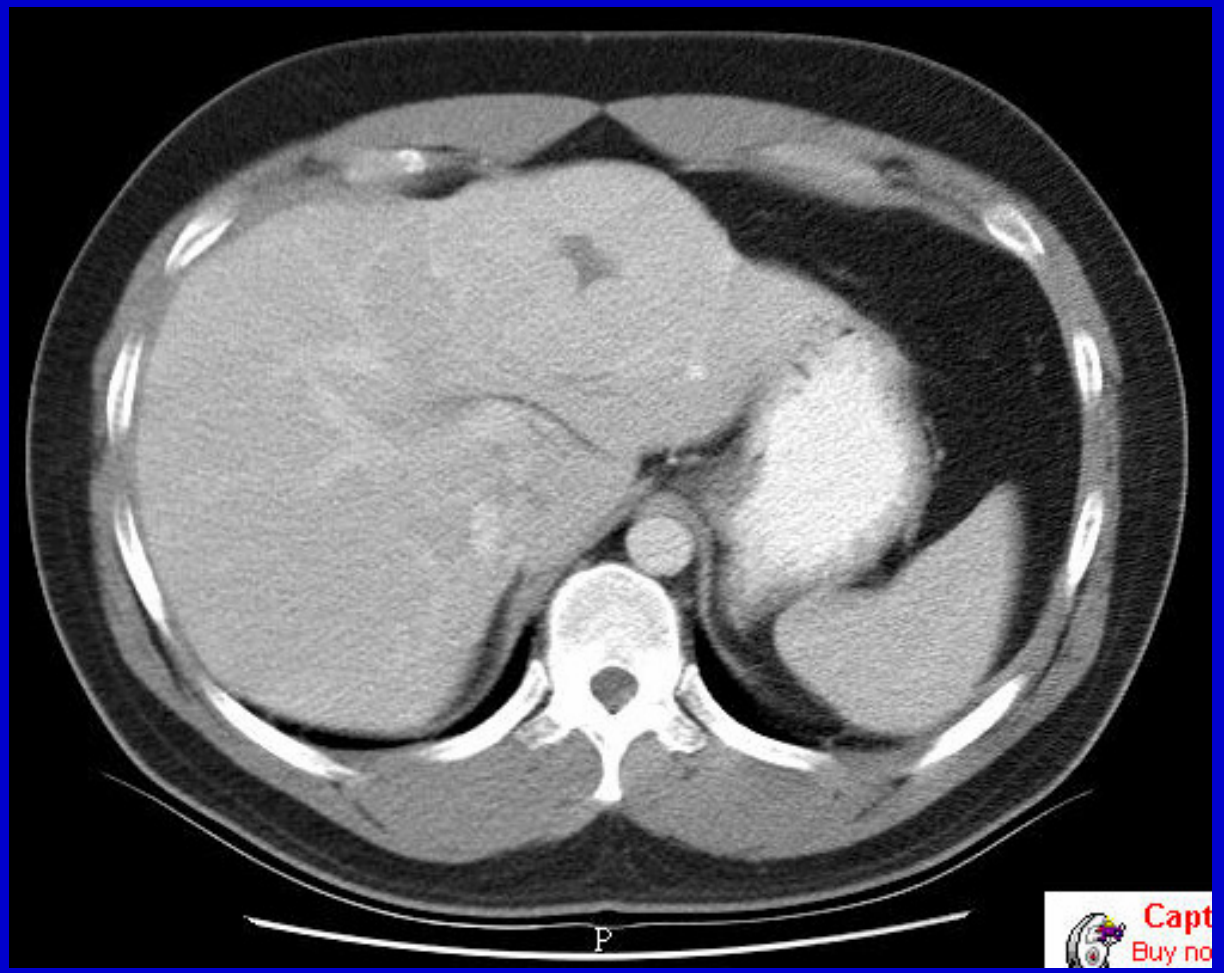
CT scan

- Arterial phase: a hyper-dense liver mass with central hypo-dense scaring



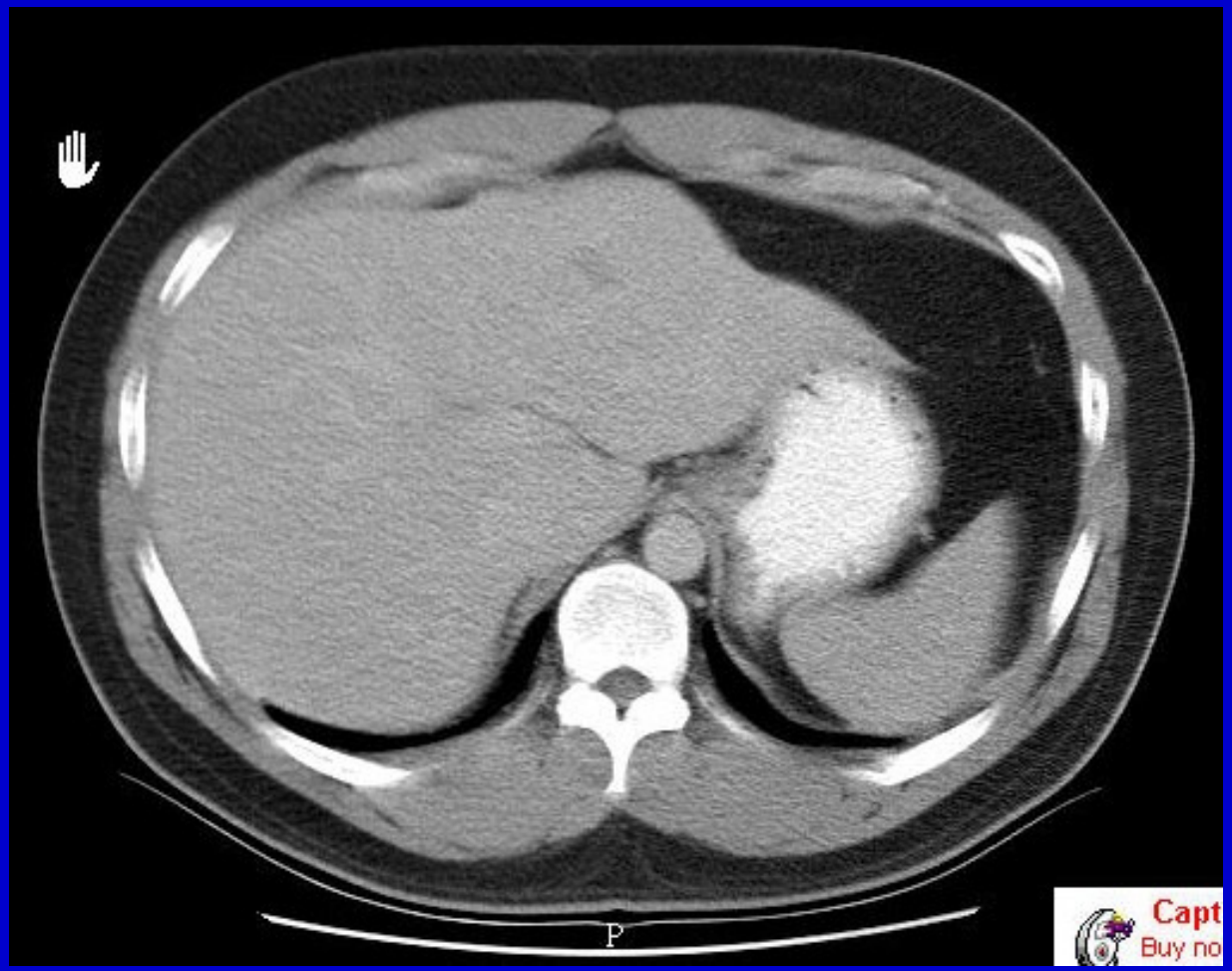
CT scan

- Portal venous phase: the liver mass become iso-dense to the rest of the liver, with still hypo-dense central scar



CT scan

- Delayed phase: an iso-dense liver tumor with less hypo-dense central scar



Differential diagnosis

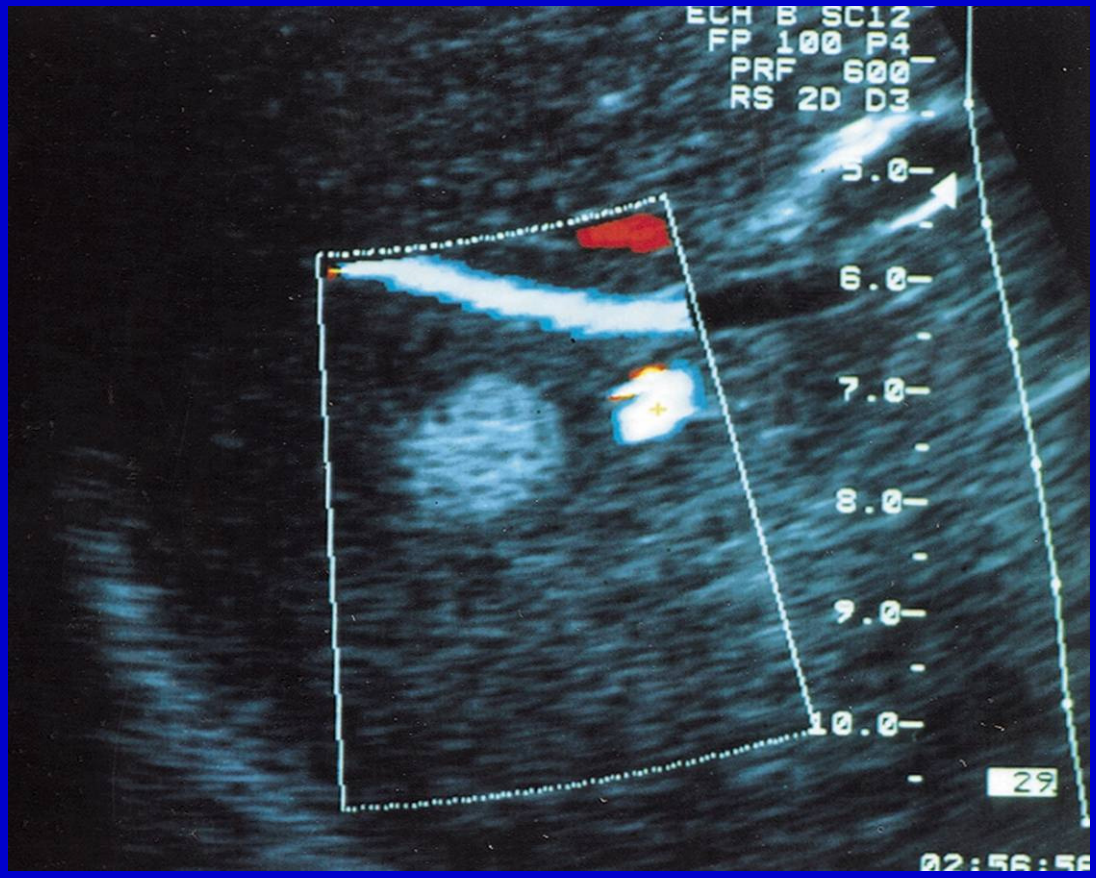
- A relatively well-defined, homogenous hepatic mass with a central scar:
  - Cavernous hemangioma
  - Cholangiocarcinoma
  - Hepatic adenoma
  - Focal nodular hyperplasia
  - Hepatocellular carcinoma, fibrolamellar

Cavernous Hemangioma

- Ultrasonography
  - well-circumscribed, uniformly hyperechoic lesions
  - Posterior acoustic enhancement
- CT scan
  - Hypo-dense in pre contrast phase
  - Delayed enhancement
- MRI
  - Low intensity in T1WI
  - Uniform very high intensity in T2WI

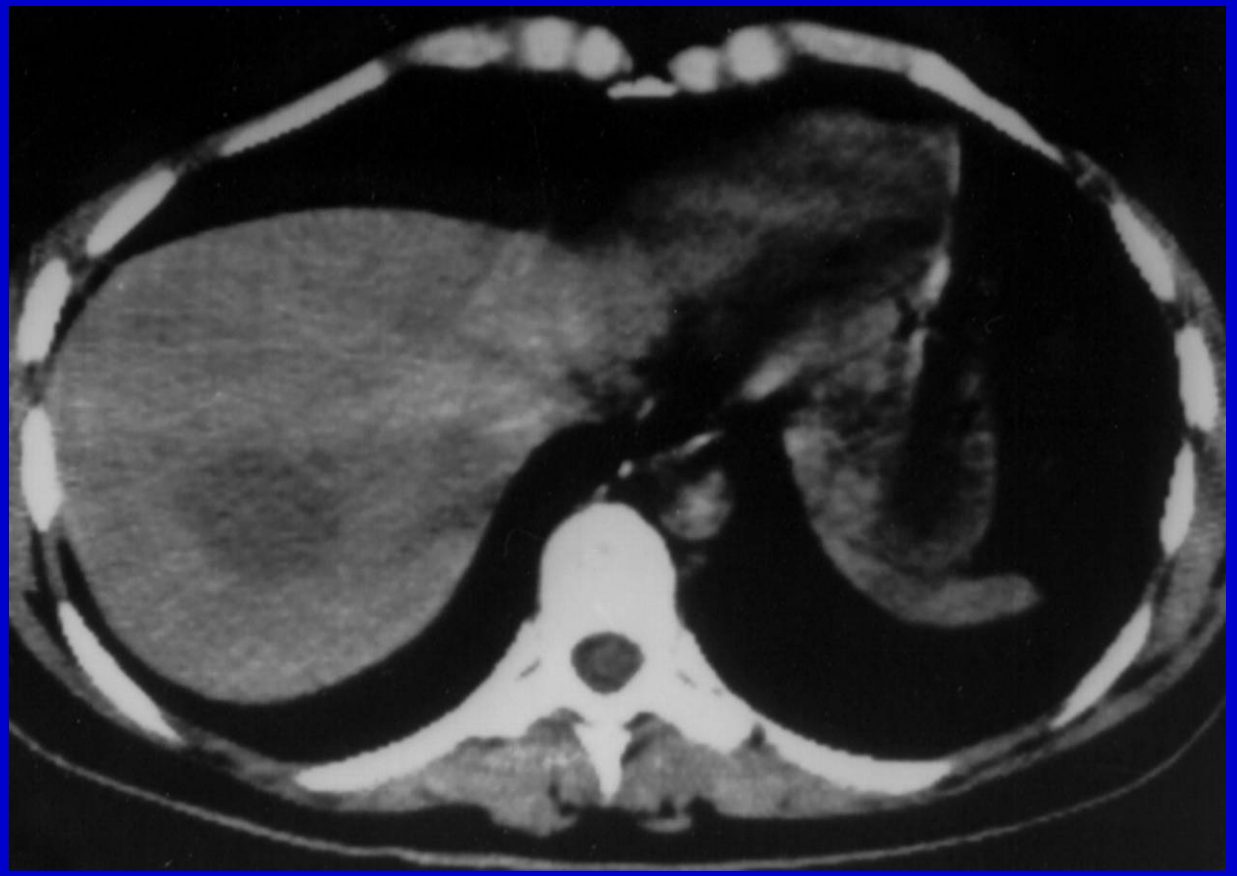
Cavernous Hemangioma

- Ultrasonography: doppler US scan shows a homogeneous, hyperechoic lesion of the right hepatic lobe.



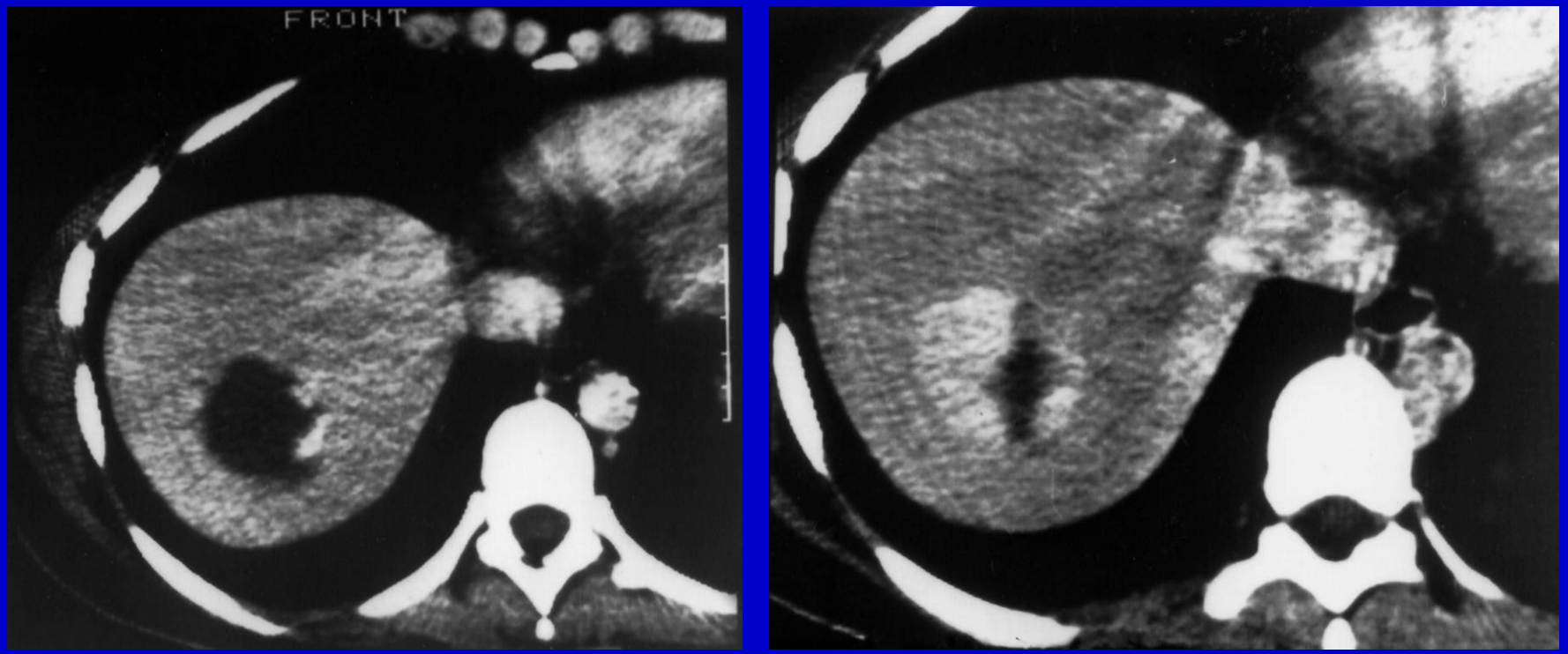
Cavernous Hemangioma

- Pre contrast CT scan: showing a hypo-dense lesion of the right hepatic lobe.



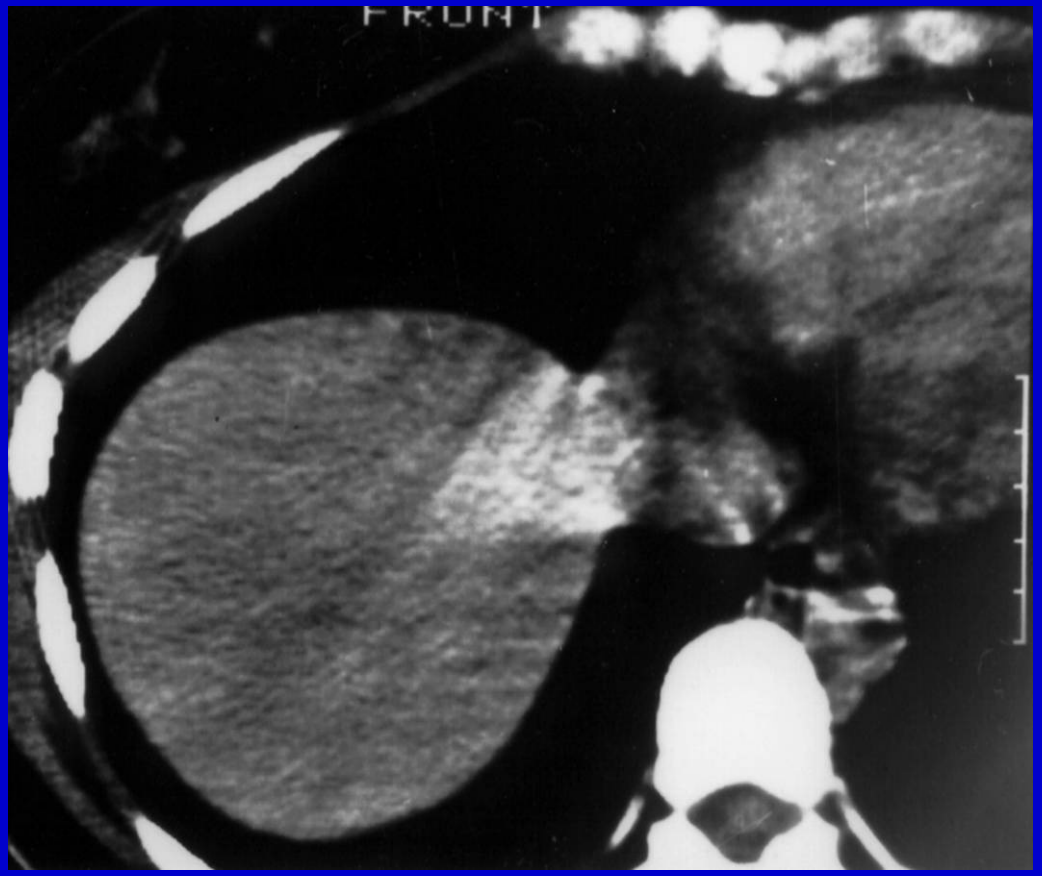
Cavernous Hemangioma

- Post contrast CT scan: Arterial-phase (left) and venous-phase (right) show progressive, peripheral, globular enhancement. (delayed enhancement)



Cavernous Hemangioma

- Delayed-phase: the lesion is iso-dense relative to the liver, an appearance that suggests persistence of contrast material within the lesion

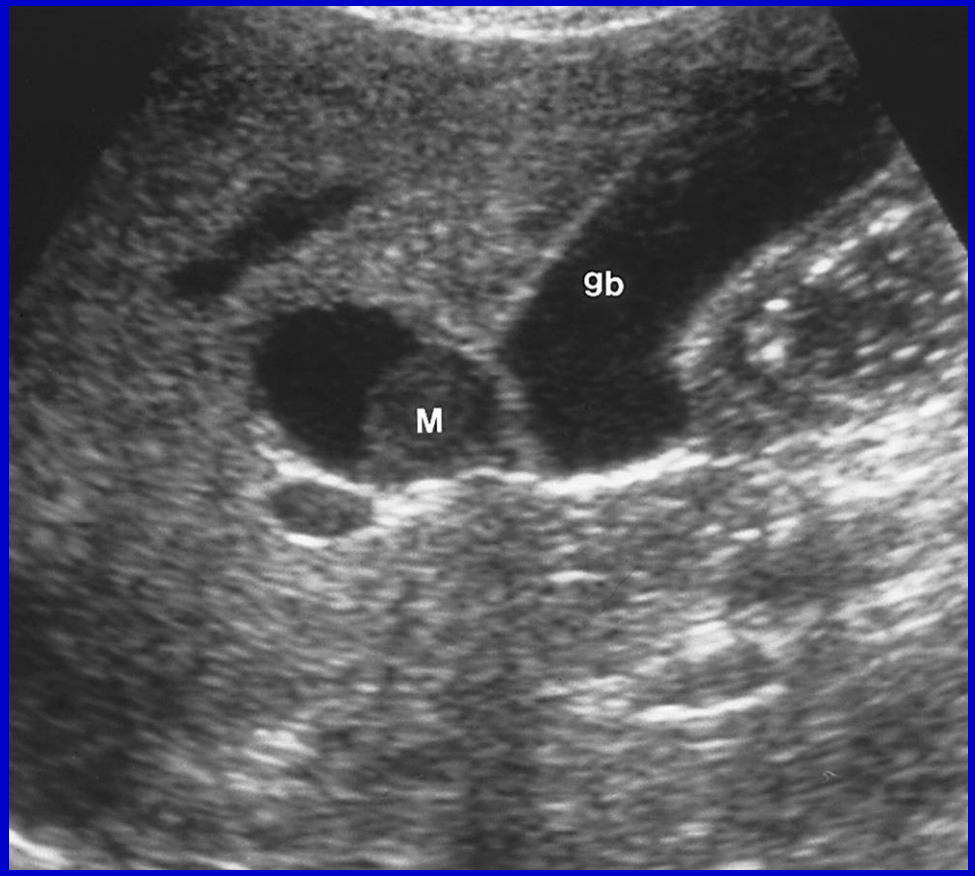


Cholangiocarcinoma

- Ultrasonography
  - Hyperechoic irregular mass
  - Dilatation of the intrahepatic bile ducts
- CT scan
  - Pre contrast:
    - Hypo-dense lesion with irregular margin
    - Dilatation of bile duct may be found
  - Post contrast:
    - Delayed enhancement with increasing attenuation
    - The chronic inflammatory biliary ducts may show intense enhancement in the early phase

Cholangiocarcinoma

- Ultrasonography: Cholangiocarcinoma in a preexisting choledochal cyst, and there is a soft-tissue mass (*M*) within a focal sacculation of the common hepatic duct.



Cholangiocarcinoma

- Post contrast CT scan: Arterial-phase shows a low-dense mass (marker) with rim enhancement. Note the dilatation of the peripheral intrahepatic ducts (arrows).

Cholangiocarcinoma

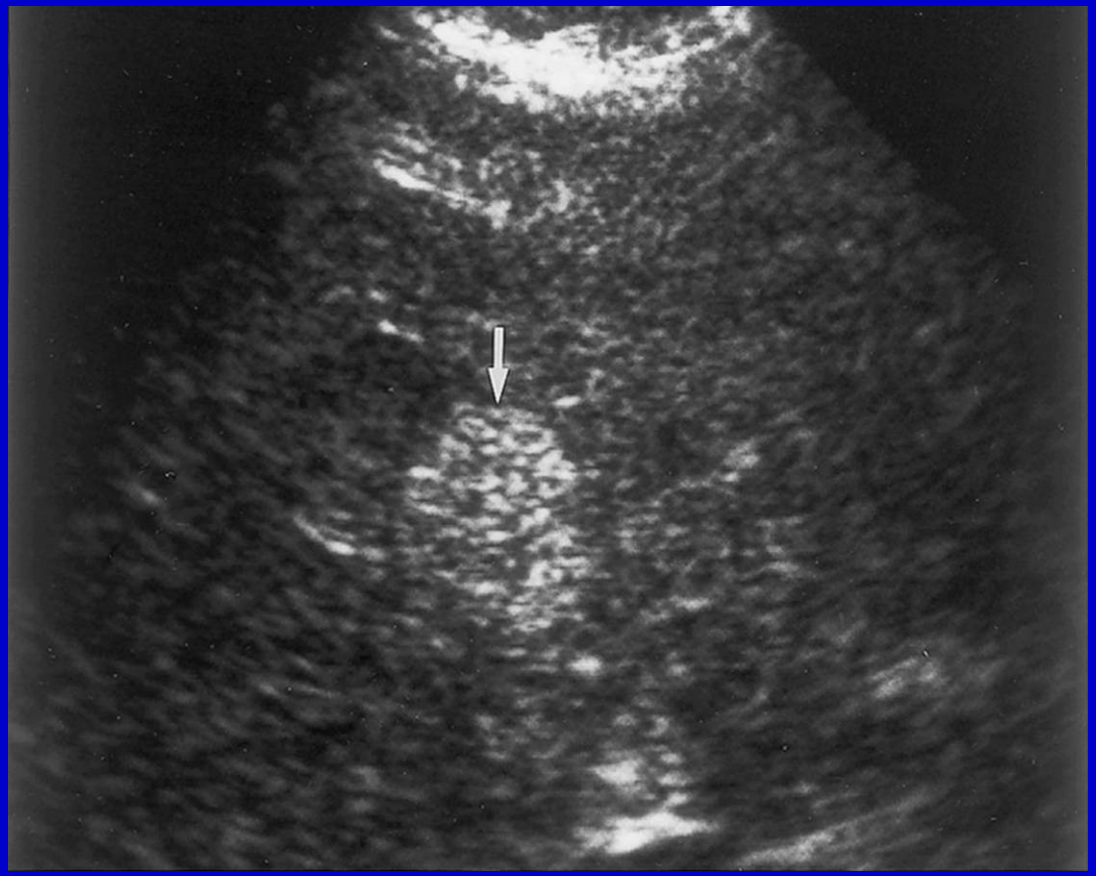
- Post contrast CT scan: during portal venous phase, the more enhanced central portion of the mass. The rim enhancement is partially washed out. Capsular retraction is also noted (arrow).

Hepatic Adenoma

- Ultrasonography
  - Variable echogenicity
- CT scan
  - Pre contrast: variable dense, central necrosis with hemorrhage, and probably a low dense capsule
  - Post contrast: homogeneous enhancement during the arterial phase

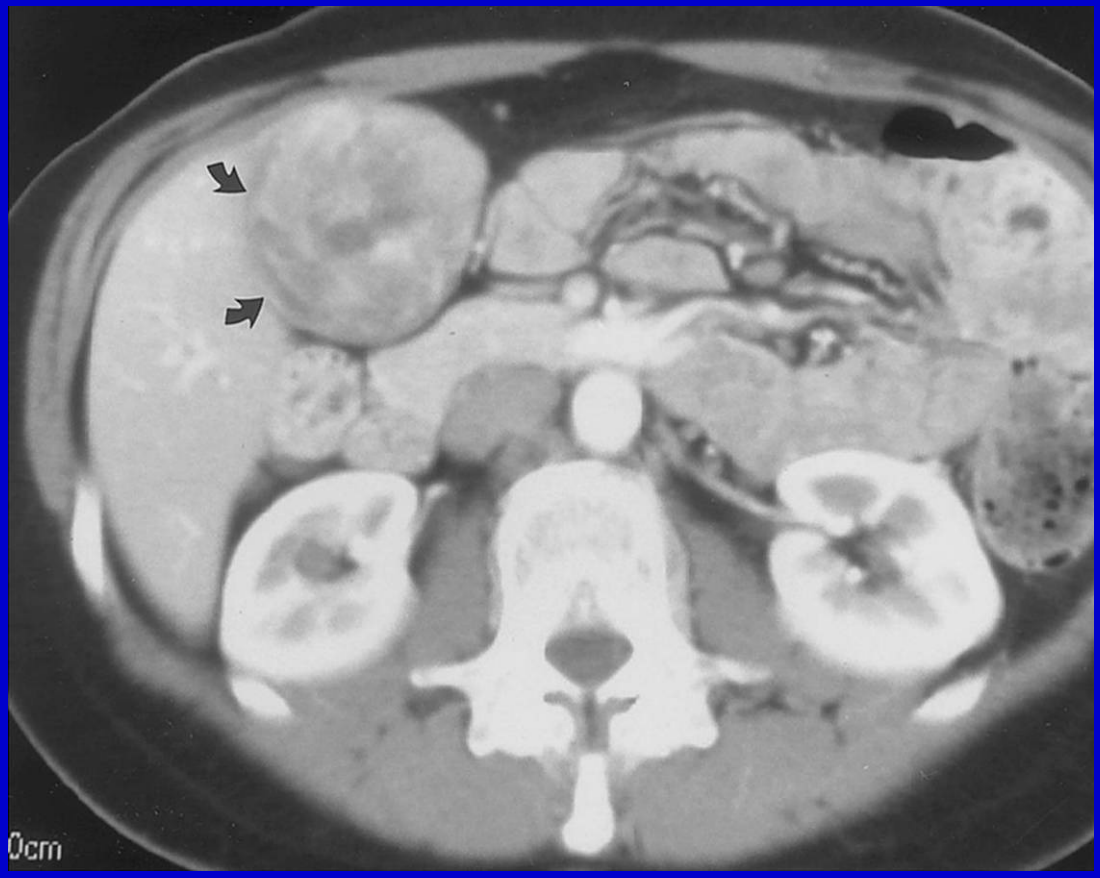
Hepatic Adenoma

- US: increased intralesional venous structures with a paucity of intra-arterial structures



Hepatic Adenoma

- CT: homo- to hetero-geneous enhancement in the arterial phase, with possible central necrosis or calcification

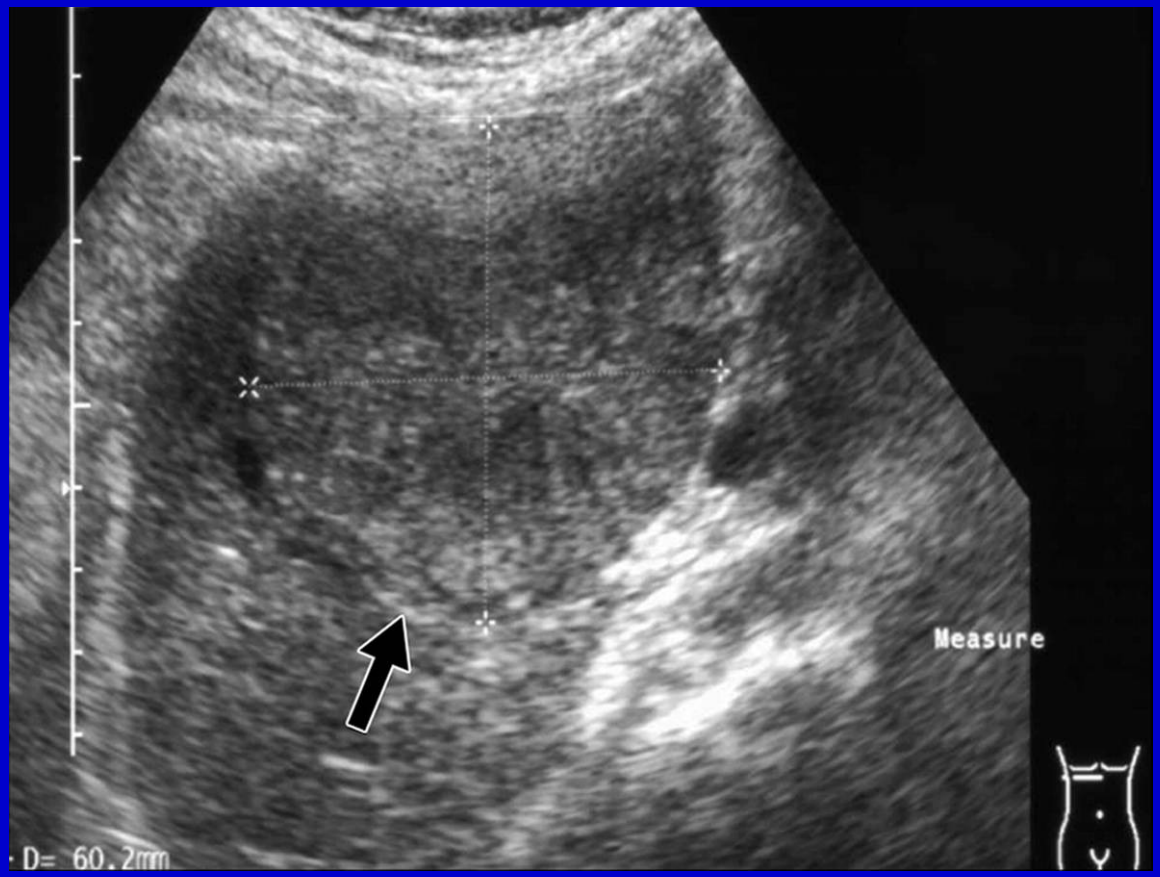


Focal Nodular Hyperplasia

- Ultrasonogaphy
  - Mix-echoic mass (slightly hypoechoic to isoechoic parenchyma with a slightly hyperechoic central scar
- CT scan
  - Pre contrast: wheel sign
  - Post contrast: dynamic parenchymal change with always hypo-dense central scar
- MRI
  - Pre contrast: minimal difference in signal intensity between FNH and the normal liver parenchyma apart the central scar
  - Post contrast: dynamic parenchymal change with hyper-intense central scar during delayed phase

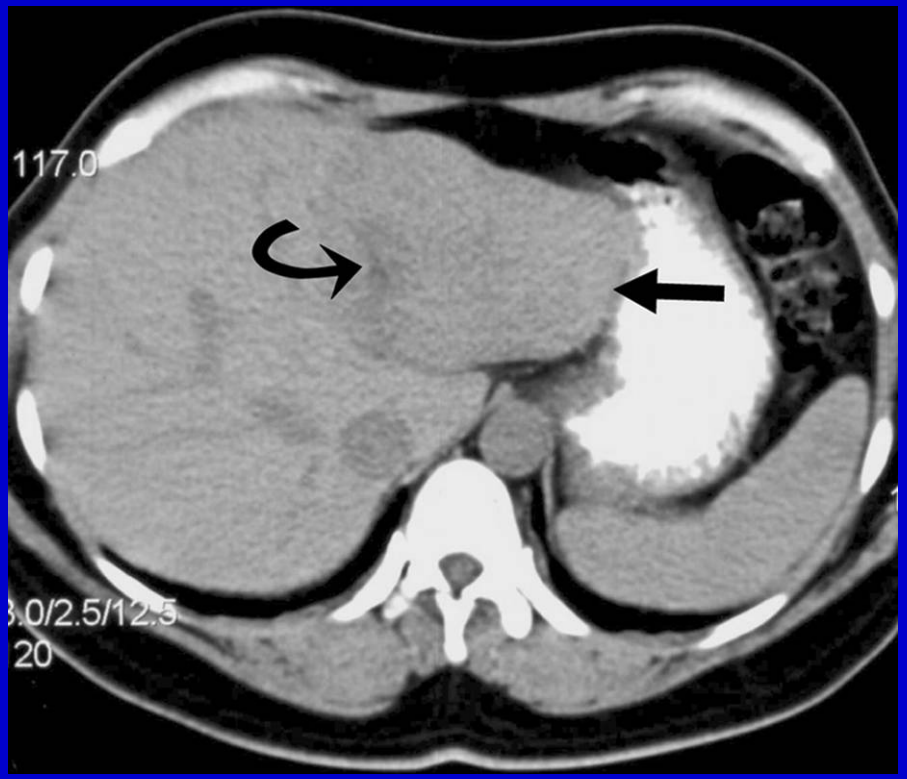
Focal Nodular Hyperplasia

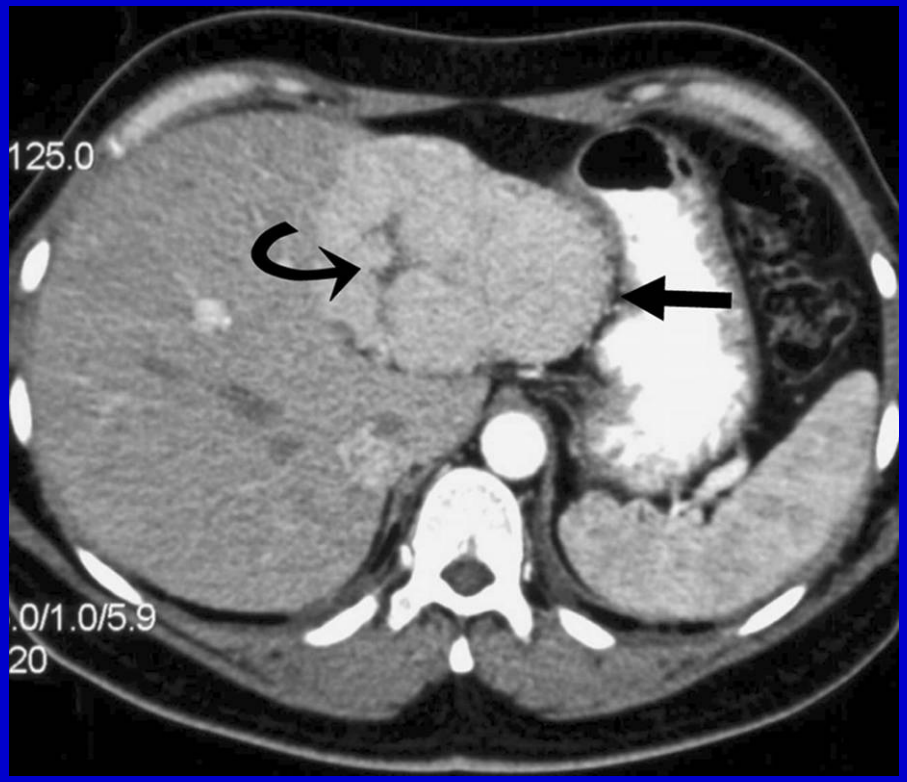
- Ultrasonography: a slightly hypoechoic mass with iso- to hyper-echoic septa/central scar



Focal Nodular Hyperplasia

- CT scan: wheel sign, C- (left) and C+ (right)



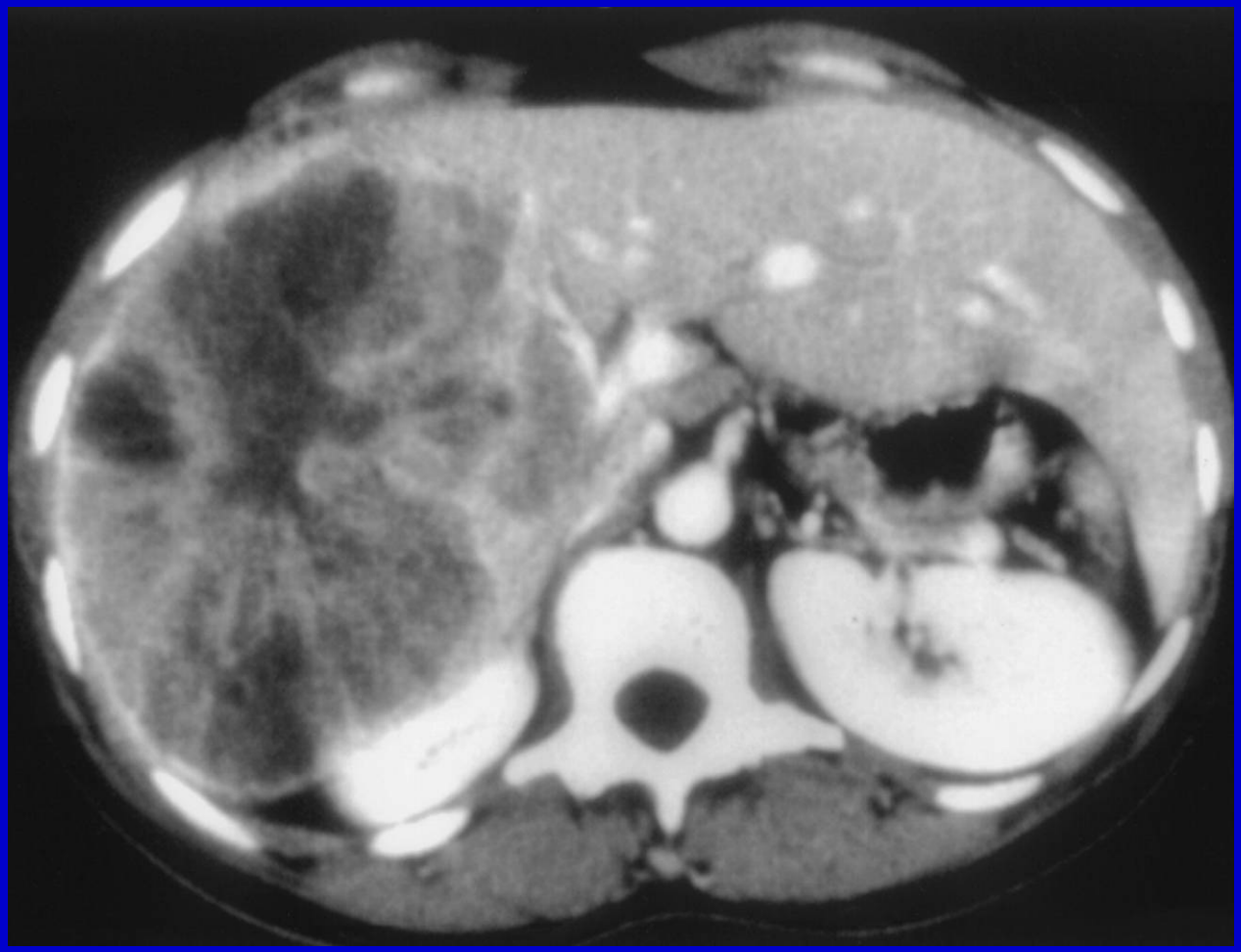


Hepatocellular carcinoma, Fibrolameller

- Ultrasonography
  - a solitary, well-defined hepatic mass with a heterogeneous echotexture.
  - a central hyperechoic scar may be seen
- CT scan
  - Pre contrast: large, solitary, hypo-dense mass with well-circumscribed and lobulated margins
  - Post contrast: dynamic change within the lesion with delayed enhancement of the central scar and peripheral enhancement of the pseudo-capsule
- MRI
  - Heterogenous intense of the lesion with an usually hypointense central scar on all images

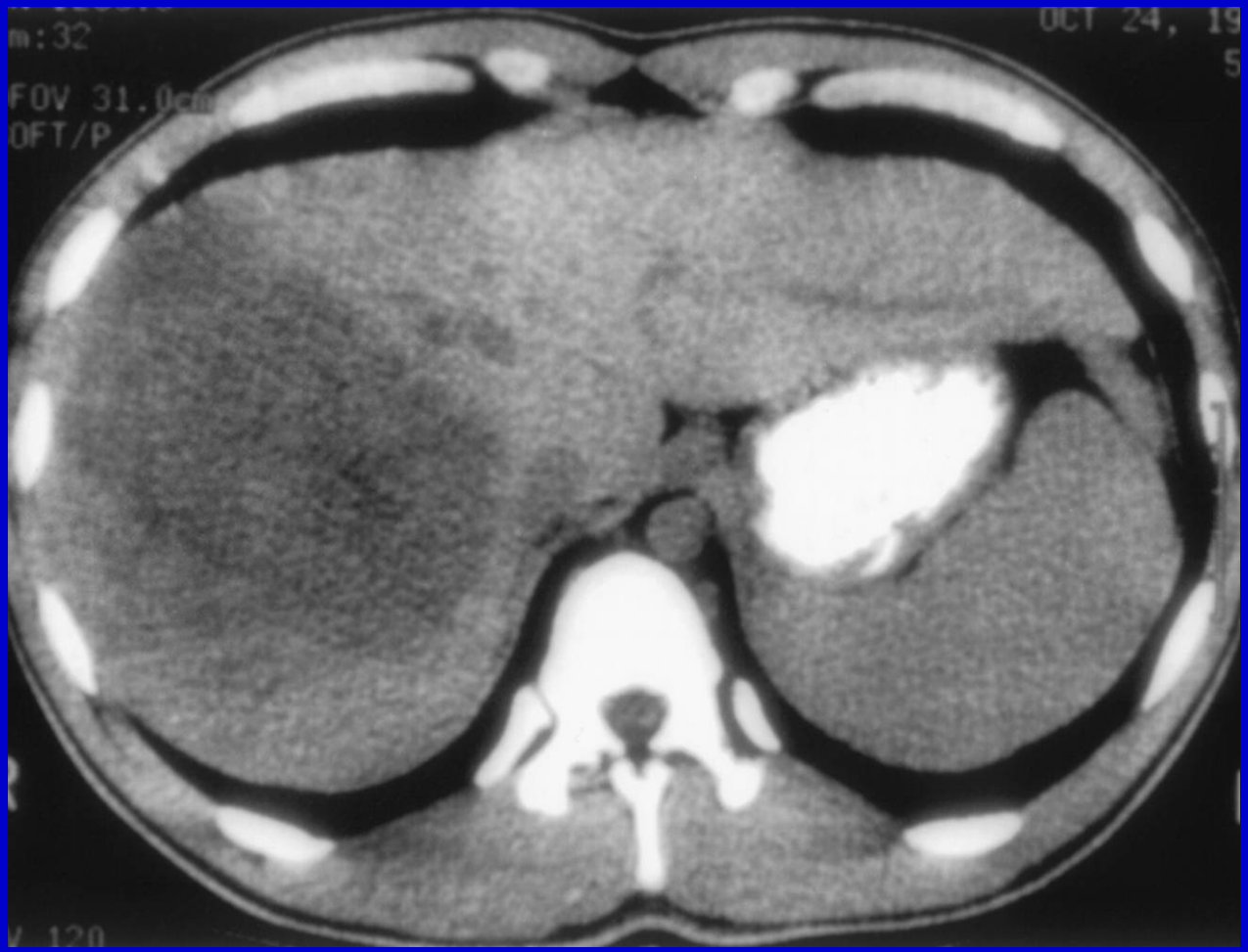
Hepatocellular carcinoma, Fibrolameller

- CT: prominently enhanced and heterogeneous cellular part, consistent with its vascular characteristics



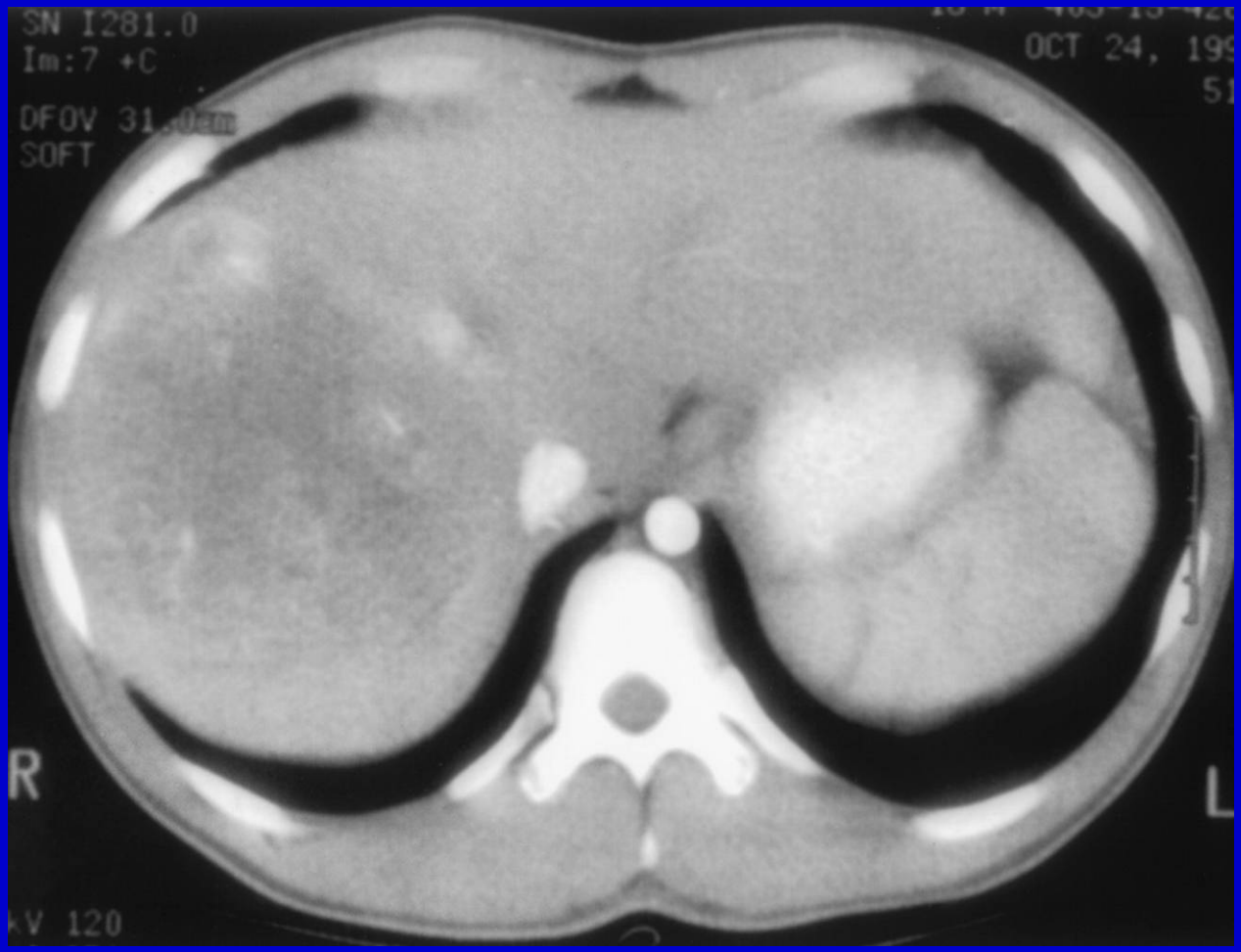
Hepatocellular carcinoma, Fibrolameller

- Nonenhanced CT scan shows a large hypo-dense mass



Hepatocellular carcinoma, Fibrolameller

- Arterial phase: irregular heterogeneous enhancement of the lesion and fails to show a scar

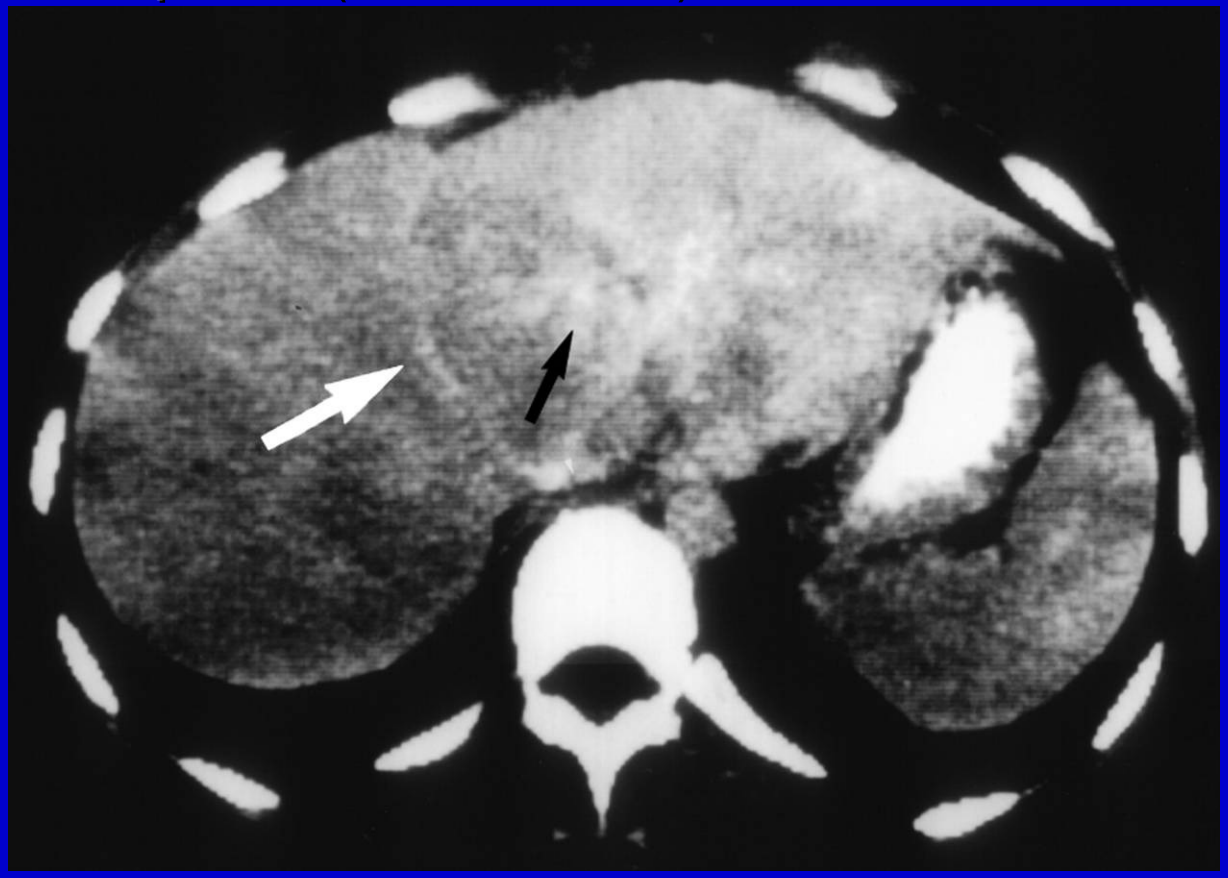


Hepatocellular carcinoma, Fibrolameller

- Portal venous phase: the tumor has become more homogeneous and has evidence of a central scar

Hepatocellular carcinoma, Fibrolameller

- Delayed phase: delayed enhancement of the central scar (black arrow) and peripheral enhancement of the pseudocapsule (white arrow)



Final Diagnosis

- Focal nodular hyperplasia

Discussion

- Focal nodular hyperplasia
  - Epidemiology
  - Clinical presentation
  - Lab
  - Key image
  - Treatment
  - Prognosis

FNH – Epidemiology

- 8% of all primary hepatic tumor
- The 2nd common benign liver tumor
- Most commonly in women (80 to 95% of all cases) in their 3rd to 4th decades of life

FNH – Clinical Presentation

- Asymptomatic (mostly)
- Vague abdominal symptoms
  - Mass effect
  - Hepatomegaly
- Hemorrhage or infarction with contraceptive pills using

FNH – Lab

- Blood liver function tests are usually normal
- Gamma-glutamyl-transpeptidase activity may slightly increase in half of the cases

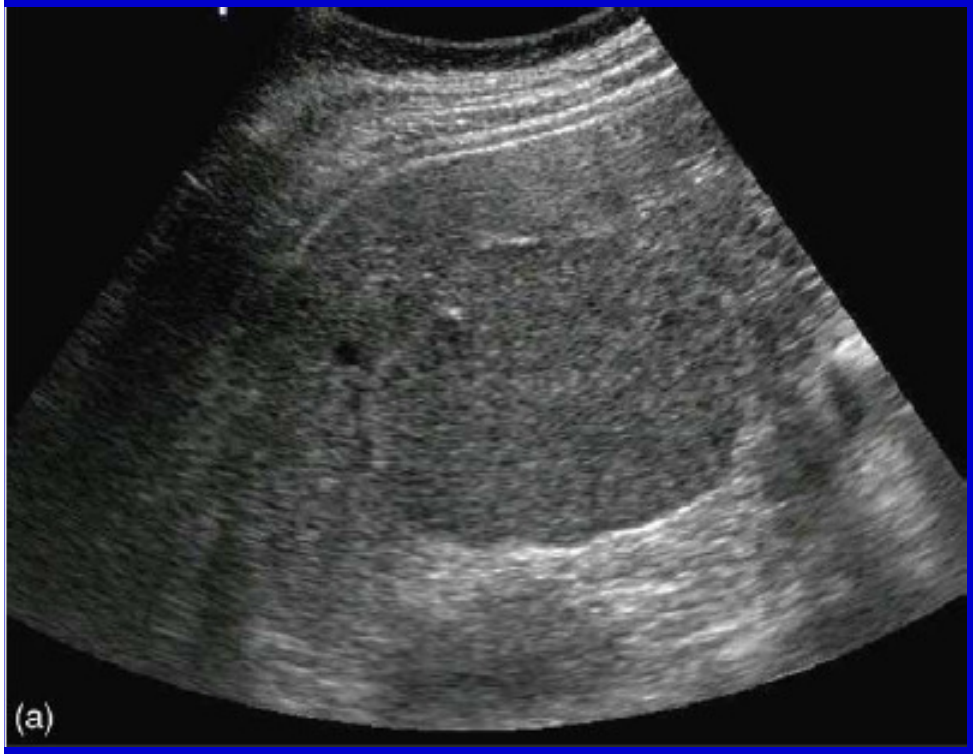
FNH – Key Image

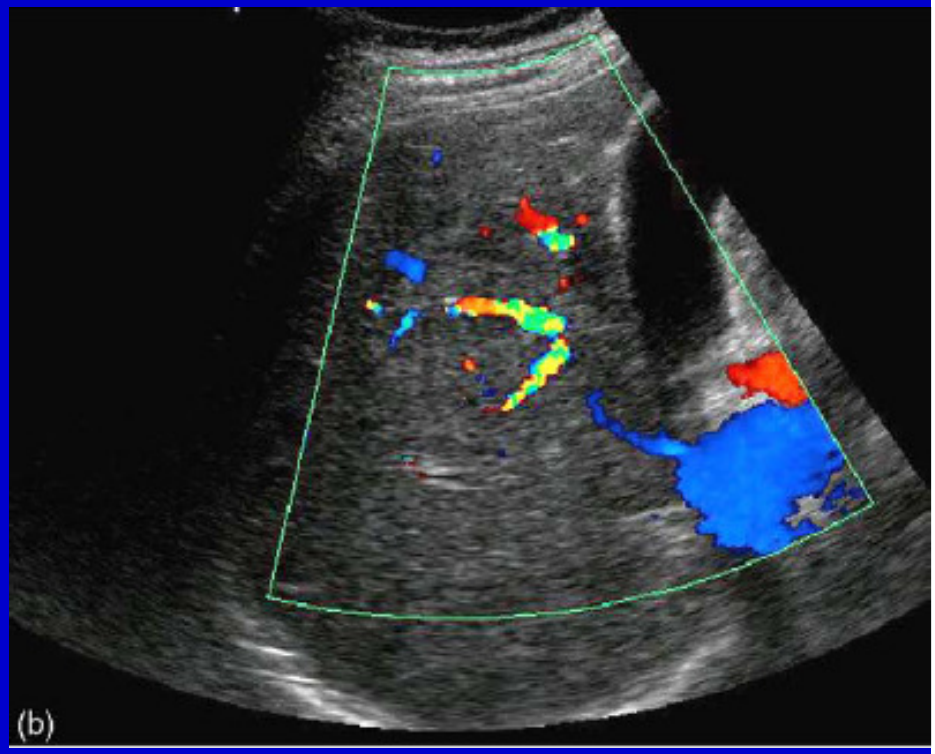
- Ultrasonography
- CT scan
- MRI
- Nuclear medicine

FNH – Ultrasonography

- Ultrasonogaphy
  - Usually slightly hypoechoic to isoechoic
  - Lobulated contours or hypoechoic halo
  - Slightly hyperechoic central scar
  - With color Doppler: central feeding artery with a stellate pattern

FNH – Ultrasonography



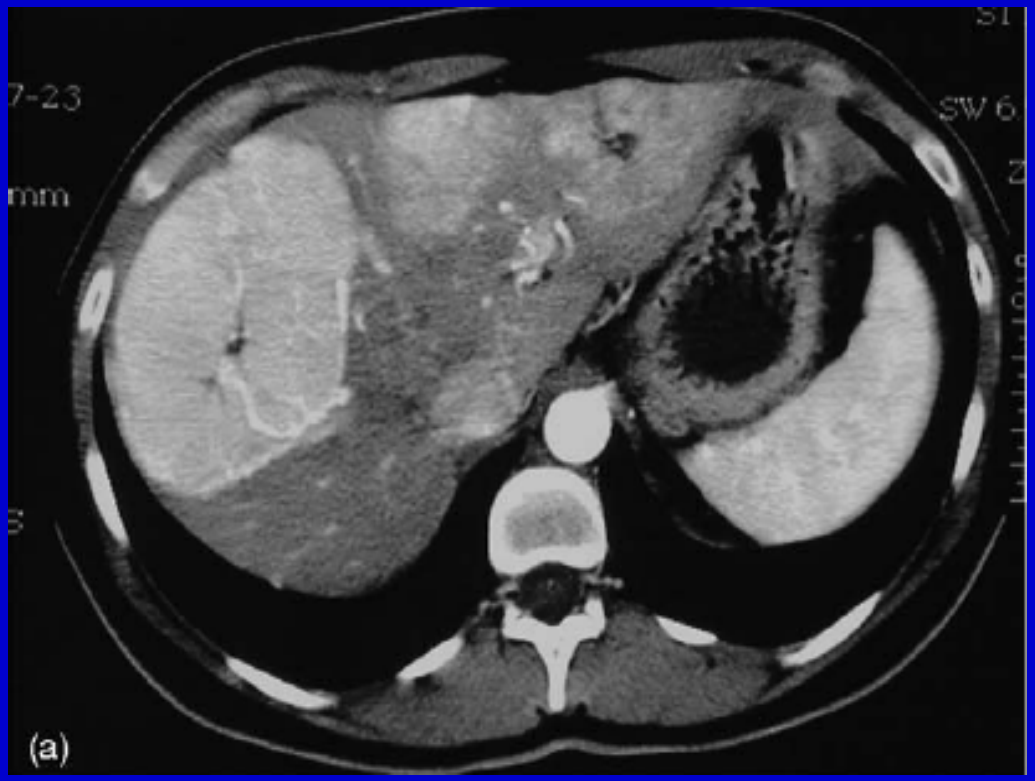


FNH – CT Scan

- Pre contrast image:
  - Hypo- to iso-dense mass
  - Central hypodense scar
- Post contrast image:
  - Arterial phase:
    - Rapidly enhanced lesion
    - More evident central hypodense scar
  - Portal venous phase:
    - iso- to slightly hyper-dense lesion
  - Delayed phase
    - Isodense lesion
    - Relatively hypo-attenuated central scar

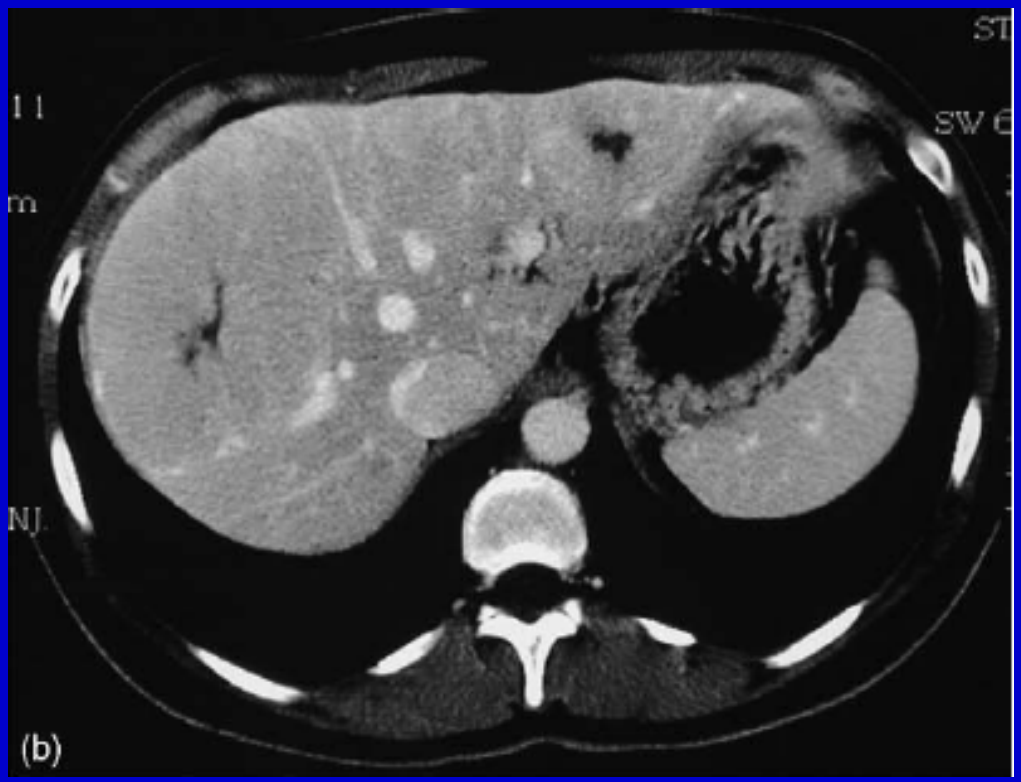
FNH – CT Scan

- Arterial phase:
  - Rapidly enhanced lesion
  - More evident central hypodense scar



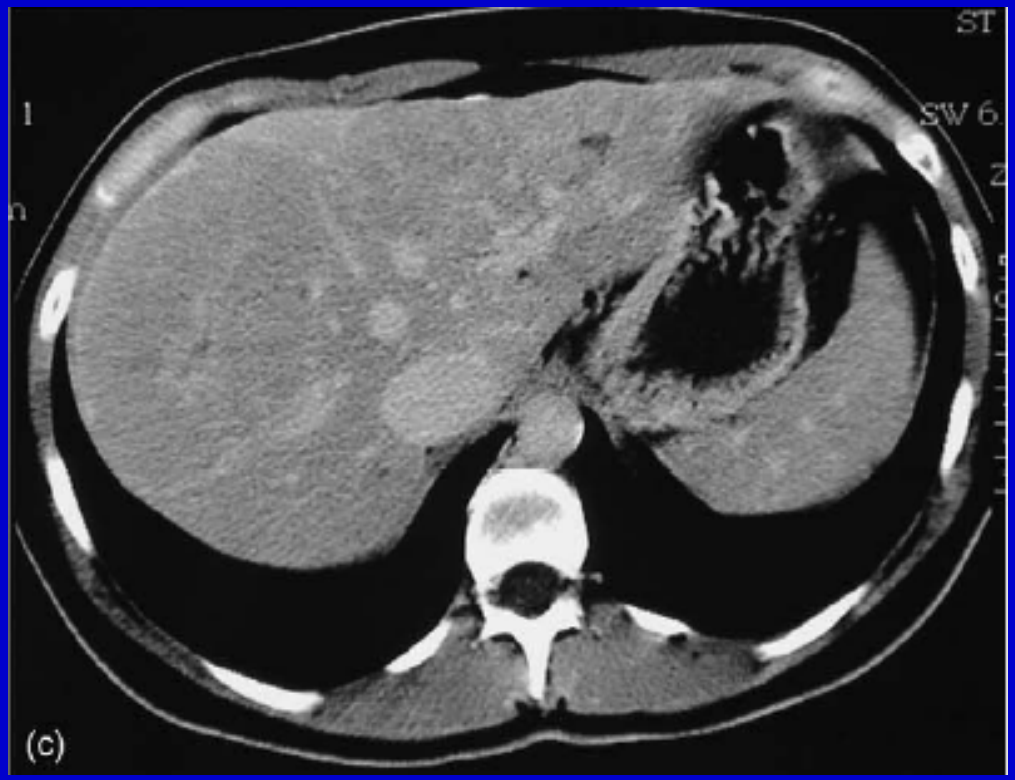
FNH – CT Scan

- Portal venous phase:
  - iso- to slightly hyper-dense lesion



FNH – CT Scan

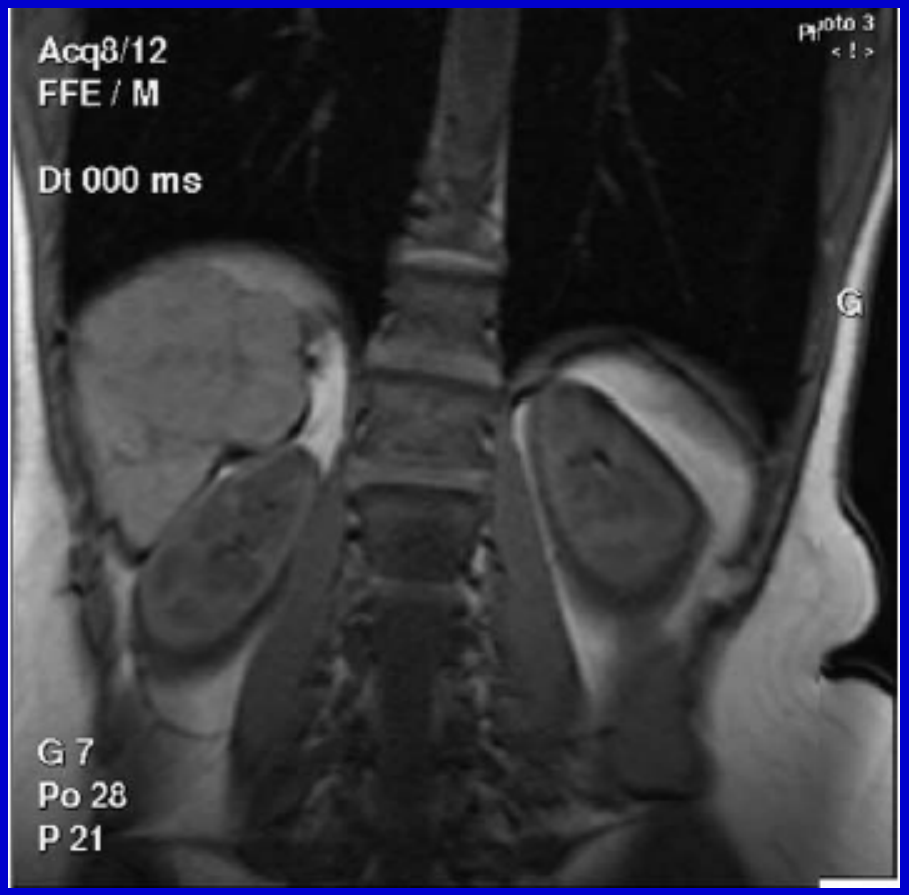
- Delayed phase
  - Isodense lesion
  - Relatively hypo-attenuated central scar



FNH – MRI

- MRI
  - Pre contrast sequence
    - Iso- or hypo-intense on T1WI
    - Slightly hyper- or iso-intense on T2WI
    - Hyper-intense central scar on T2WI
    - Minimal difference in signal intensity between FNH and the normal liver parenchyma
    - Lesion homogeneity apart the central scar
  - Post contrast sequence
    - Arterial phase: dramatic intense homogenous enhancement
    - Portal venous phase: iso-intensity of the lesion
    - Delayed phase: high intense enhancement of the central scar

FNH – MRI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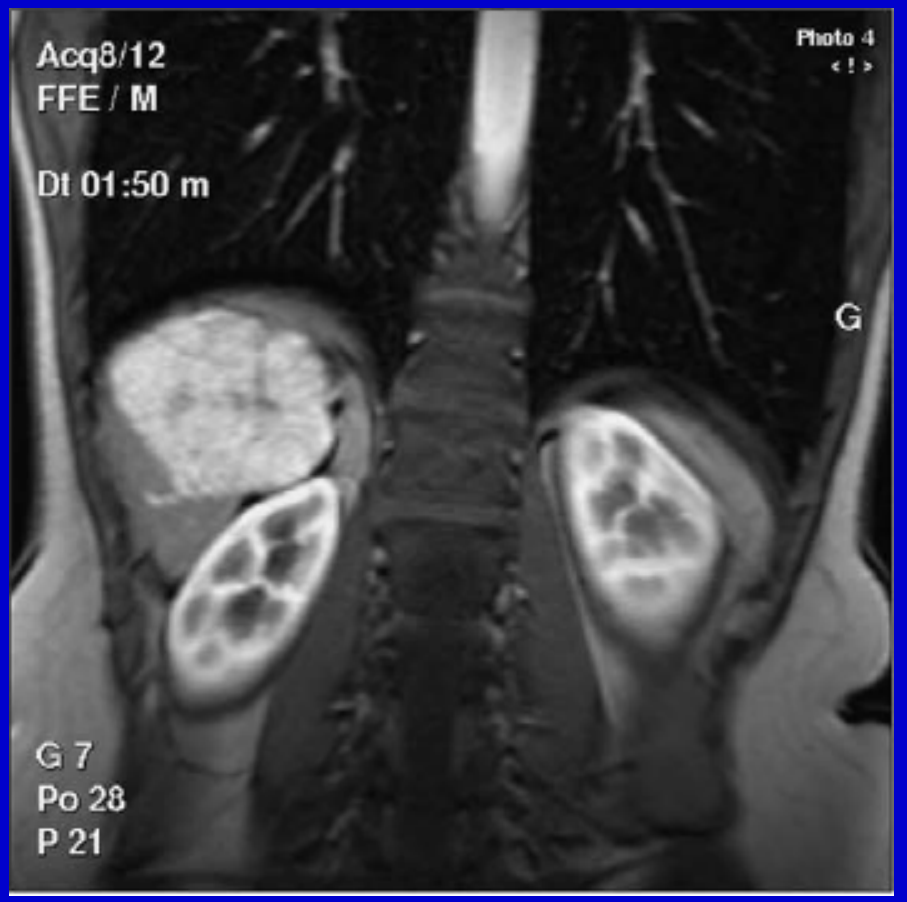
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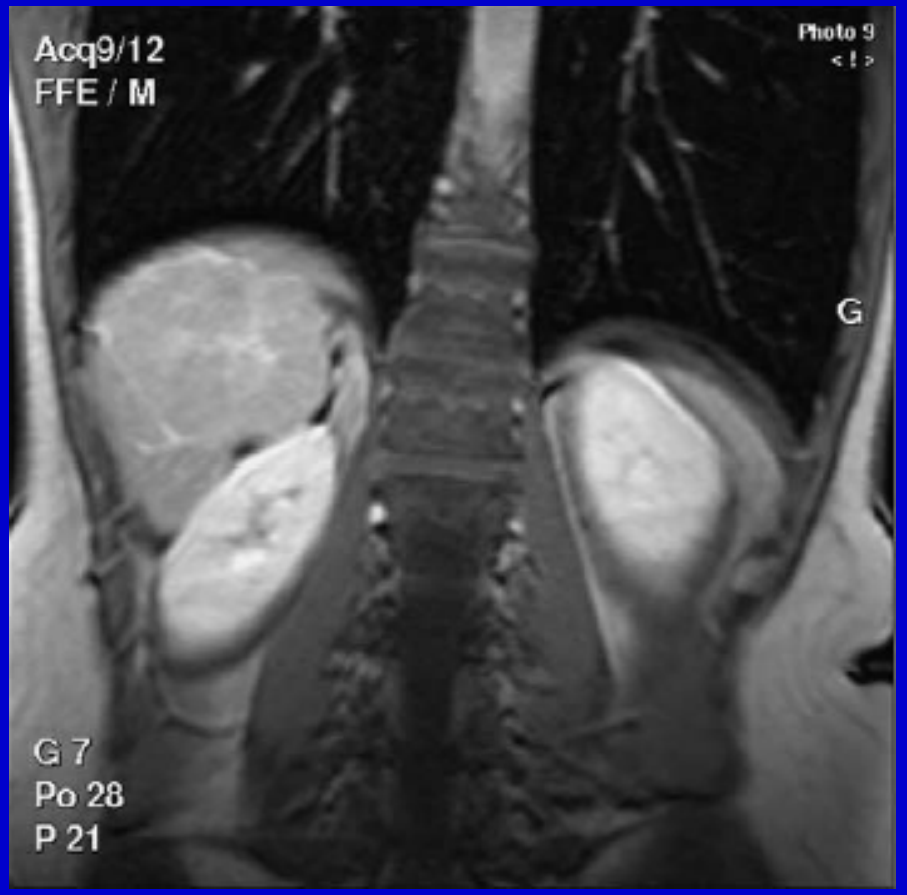
Po 28
P 21

FNH – MRI


Acq8/12
FFE / M
Dt 02:17 m
Photo 5
G
G 7
Po 28
P 21


Acq9/12
FFE / M
Photo 9
G
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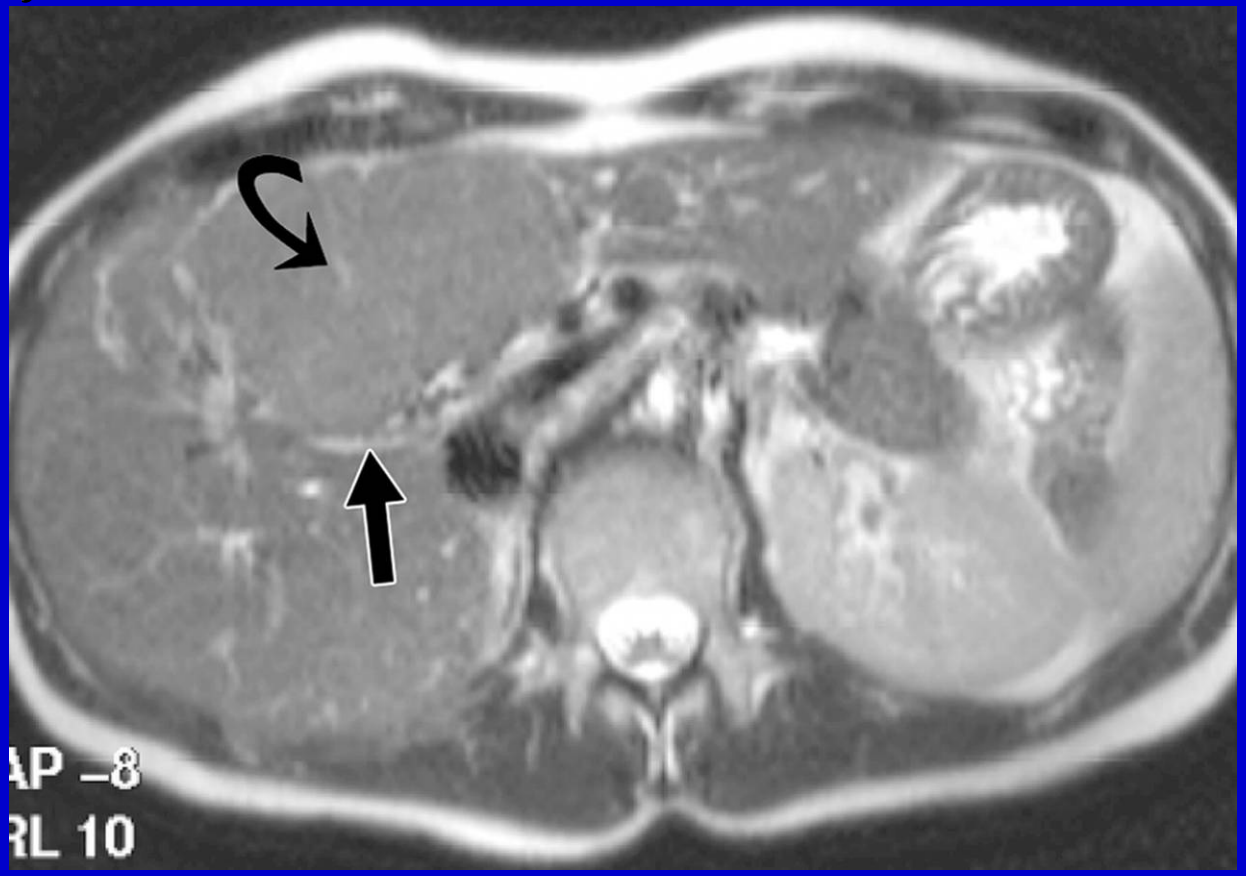
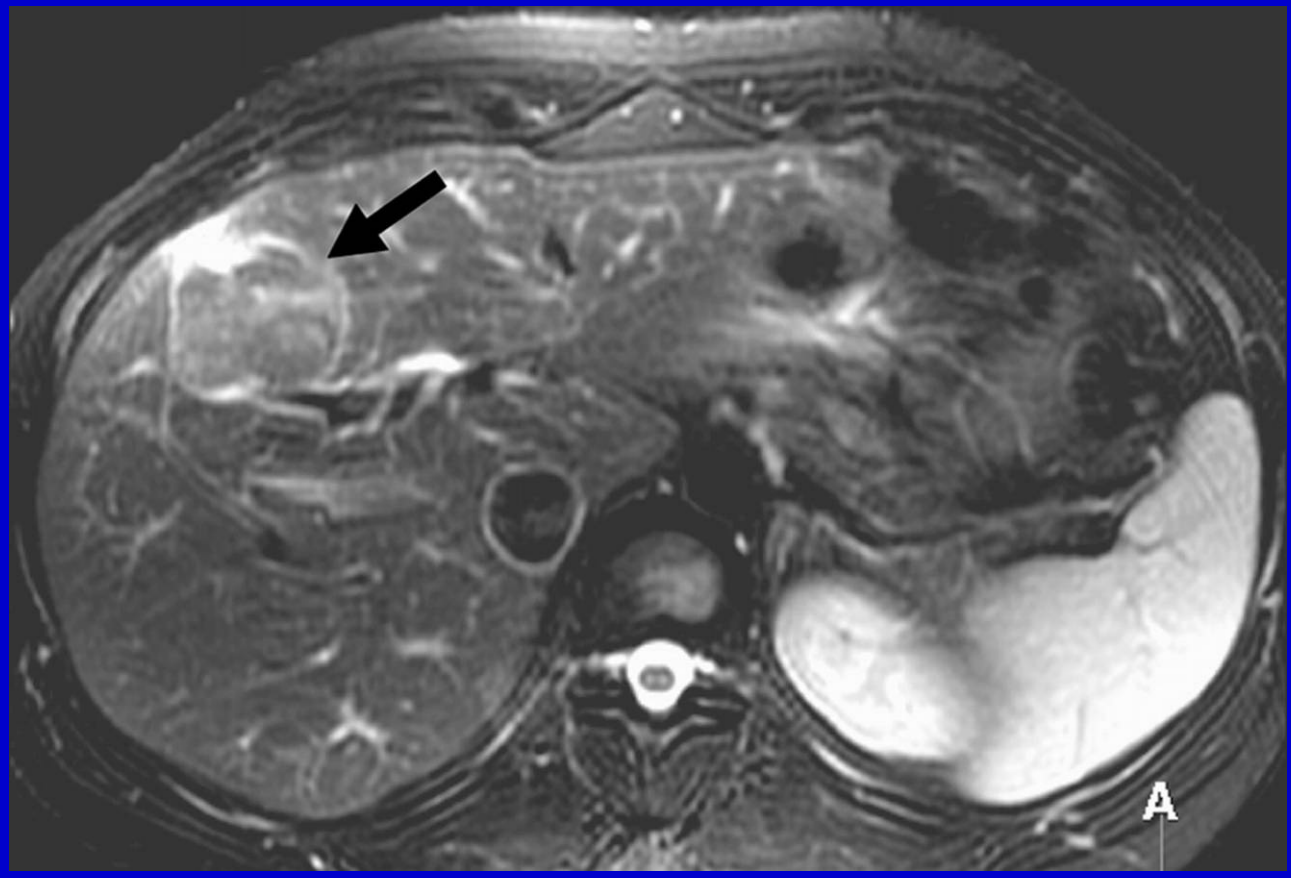
FNH – MRI

- T2WI shows a iso-intense FNH lesion (straight arrow). The central scar (curved arrow) has slightly higher signal intensity than the lesion



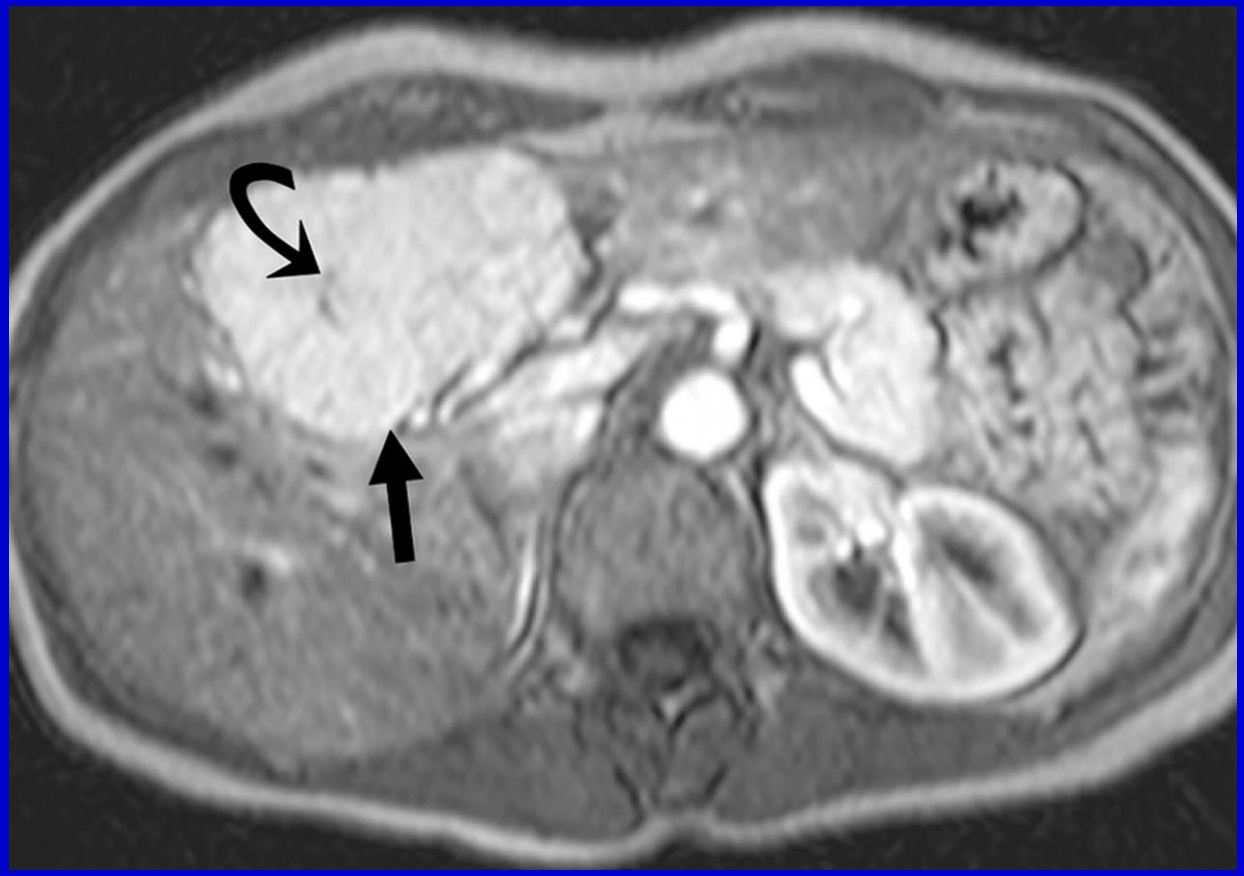
FNH – MRI

- T2WI shows a FNH (arrow) with a central scar, a pseudo-capsule, and septa, all of which are prominent and have high signal intensity.



FNH – MRI

- T1WI, C+, arterial phase: intense homogeneous enhancement of the entire lesion (straight arrow), except for the central scar (curved arrow)

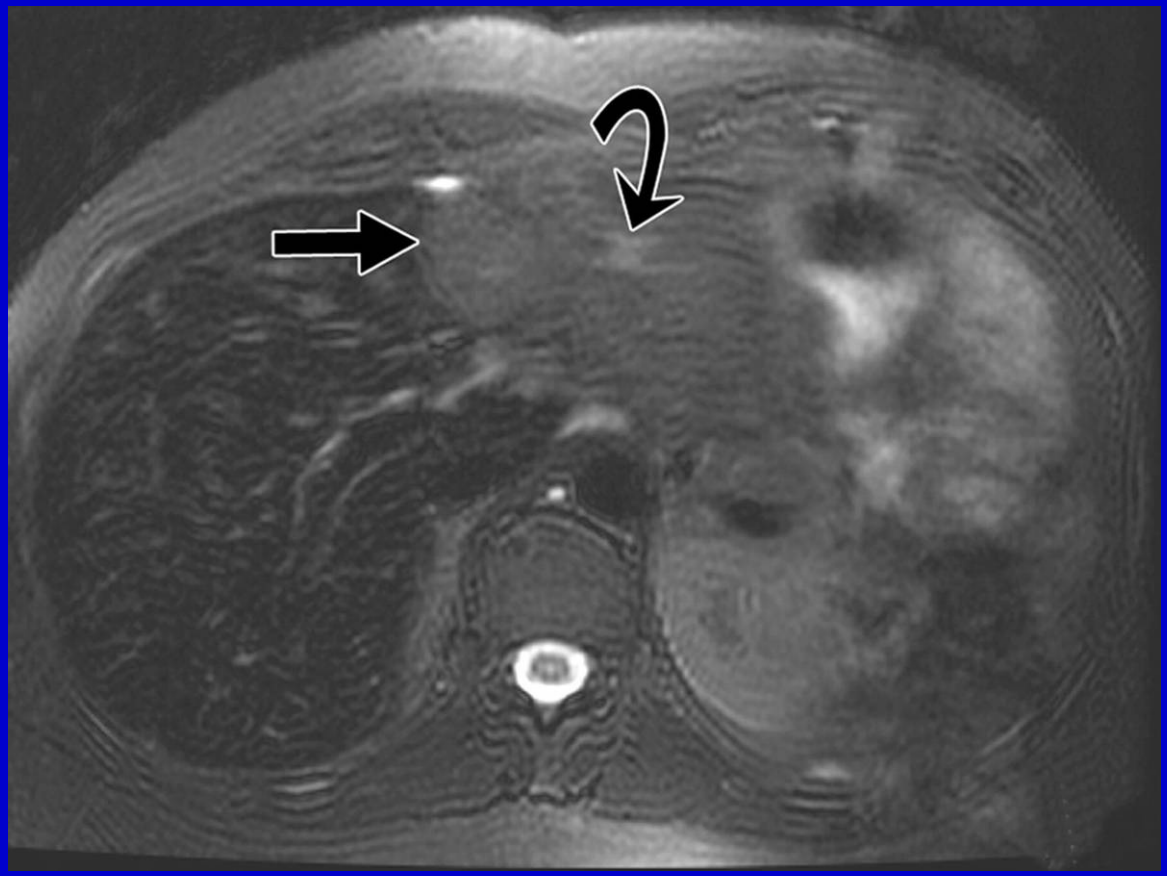


FNH – MRI

- T1WI, C+, portal phase: the iso-intense lesion (straight arrow), and the enhanced central scar (curved arrow).

FNH – MRI

- T2WI, C+: the lesion (straight arrow) as well as the liver have decreased signal intensity due to the uptake of ferucarbotran into Kupffer cells. The central scar (curved arrow) does not contain Kupffer cells and has relatively increased signal intensity

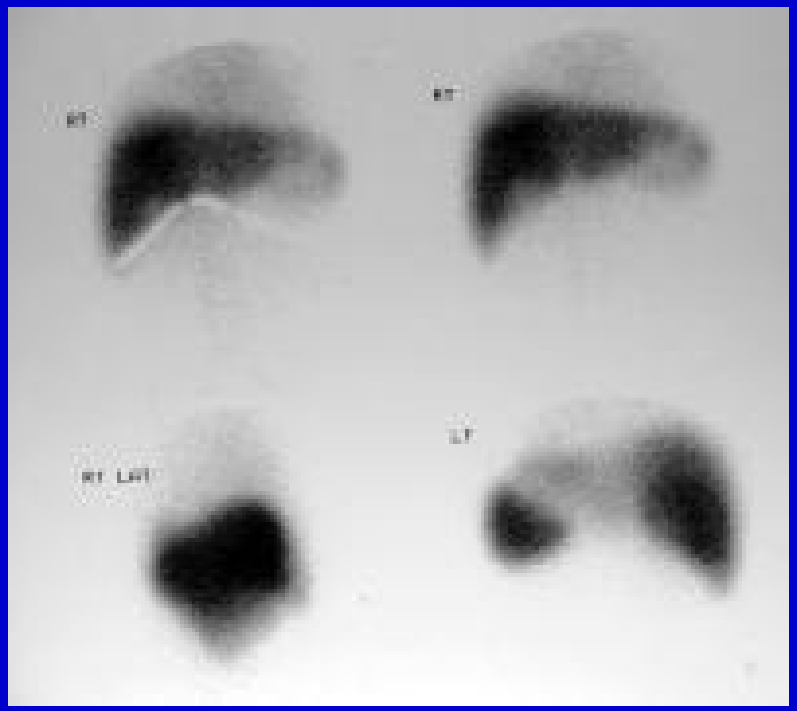


FNH – Nuclear Medicine

- ^{99m}Tc sulfur colloid scanning
  - Kupffer cell activity
  - 60 to 70% of FNH patients show homogenous uptake
- ^{99m}Tc hepatoiminodiacetic acid (HIDA)
  - 40 to 70% of FNH patients show normal to increased uptake
  - 60% of FNH patients may be photon deficiency
- ^{99m}Tc-tagged RBC scan
  - Increased uptake during the early phase, followed by diminished uptake in the lesion relative to the liver
- ^{99m}Tc-NGA
  - Almost all FNH patients show normal to even increased uptake

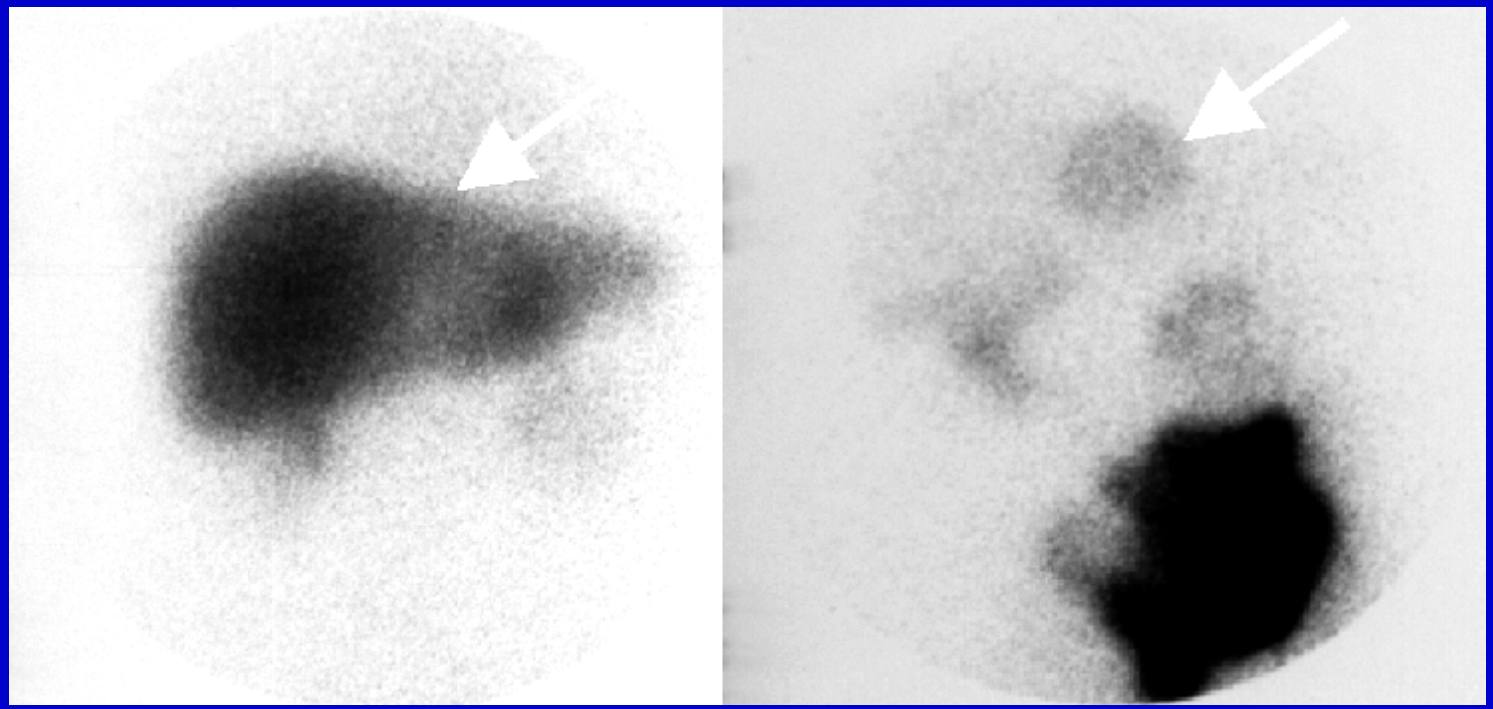
FNH – Nuclear Medicine

- ^{99m}Tc sulfur colloid scanning:
  - homogenous uptake in the lesion



FNH – Nuclear Medicine

- ^{99m}Tc HIDA scanning:
  - In the early phase (left), the activity is low.
  - In the late phase (right) a large area of increased residual activity marks the FNH in the right lobe.



FNH – Treatment

- No treatment is needed in asymptomatic patients
- Indication for surgical resection:
  - Symptomatic patients
  - Equivocal image finding or doubtful cases
- Discontinuation of oral contraceptives

FNH – Prognosis

- Benign tumor
- No malignant potential
- Spontaneous regression

Reference

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