

Cases #2

Kathryn Fowler, MD

Professor Diagnostic Radiology

University of California San Diego

75 yo man with HCV cirrhosis

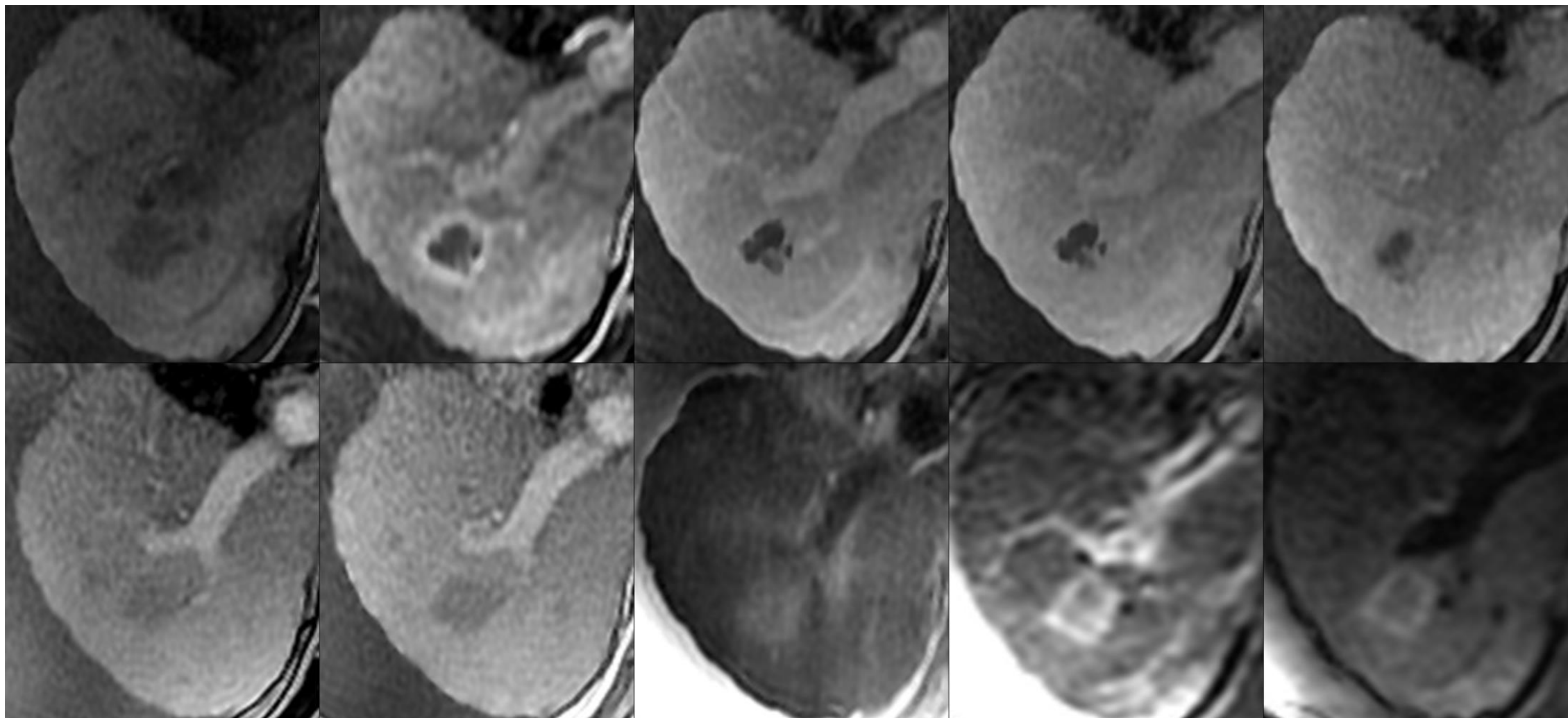
Pre

AP

PVP

TP

HBP



T1w OP TE 2.3

T1w IP TE 4.6

T2w

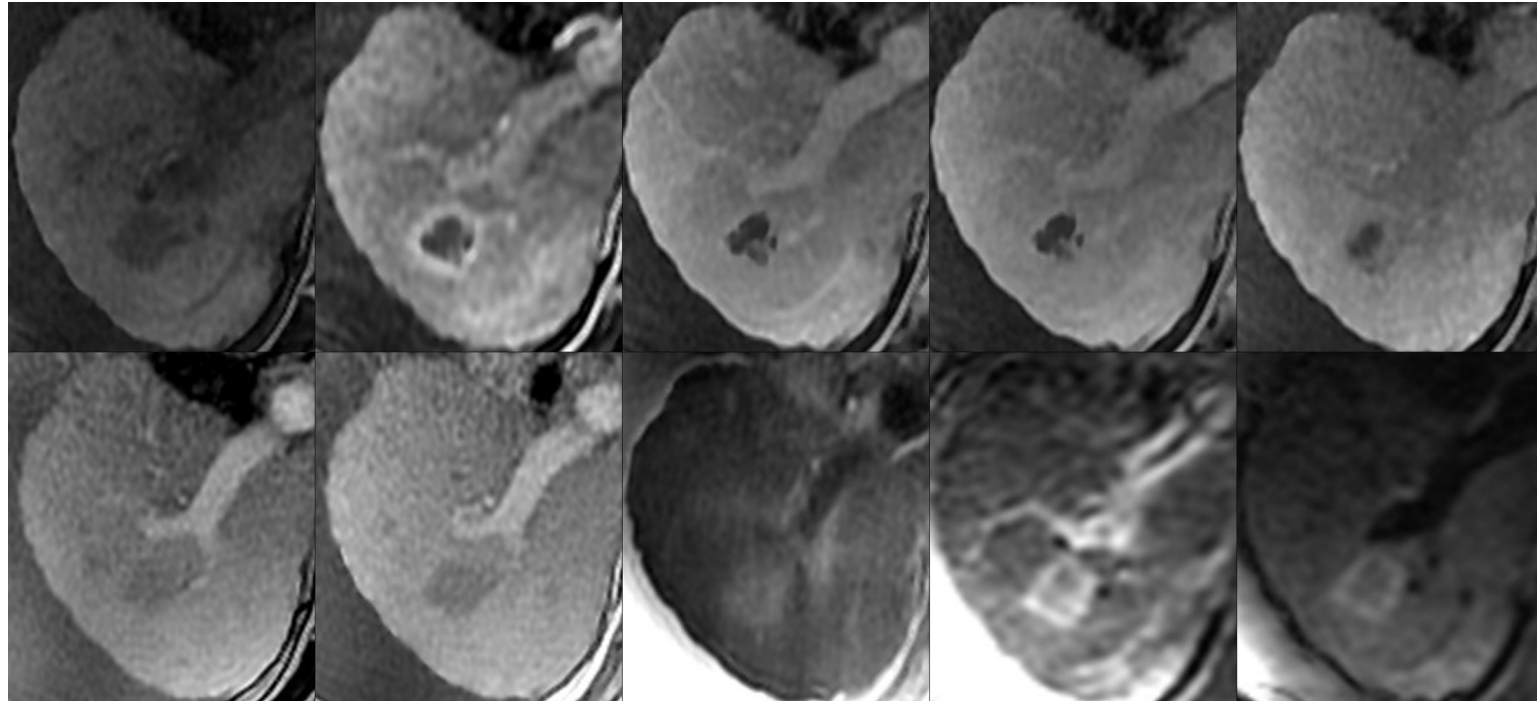
DWI b=0

DWI b=500

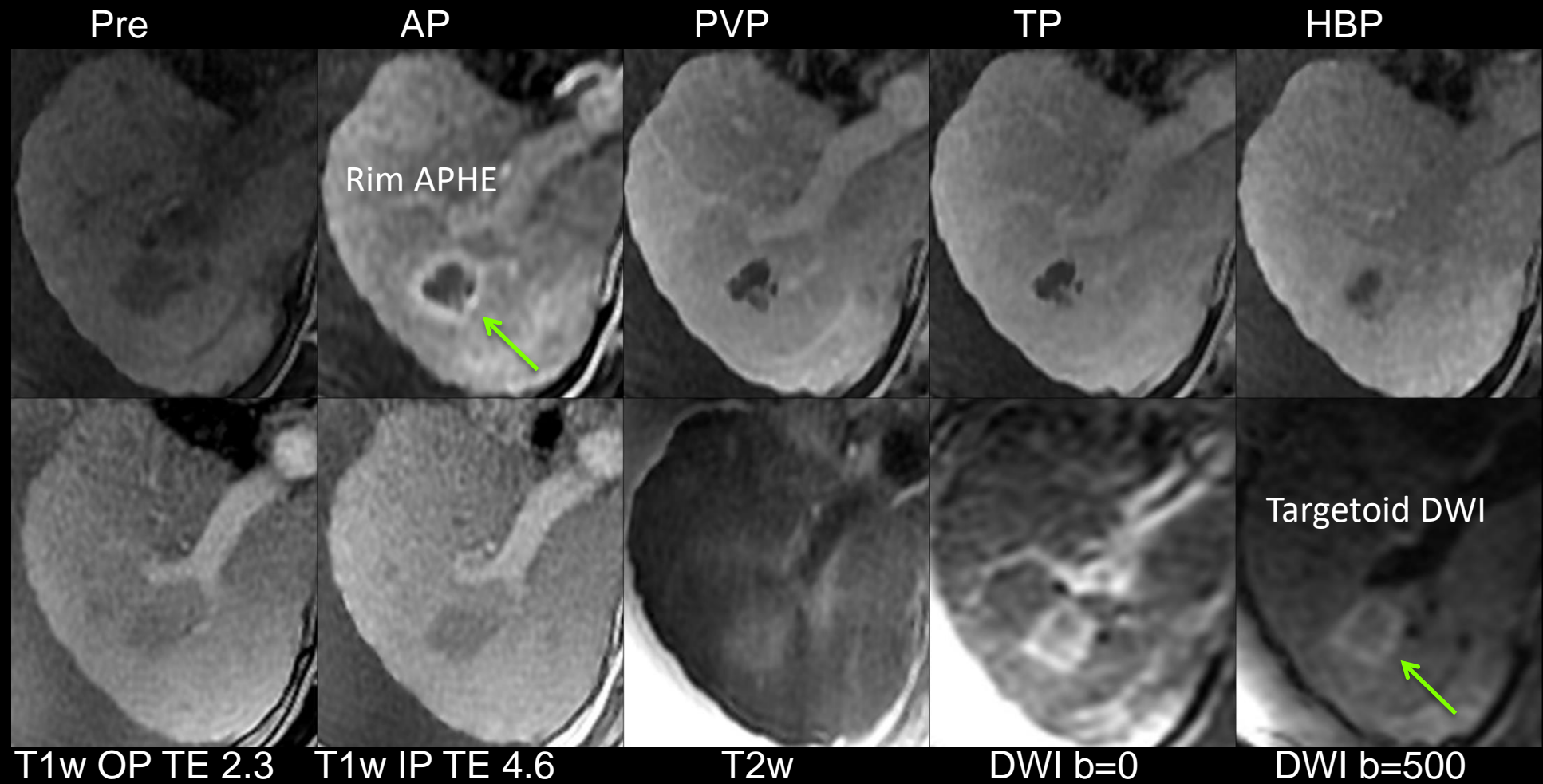
What is the most likely diagnosis?

- a. HCC
- b. Hemangioma
- c. Regenerative nodule
- d. Cholangiocarcinoma

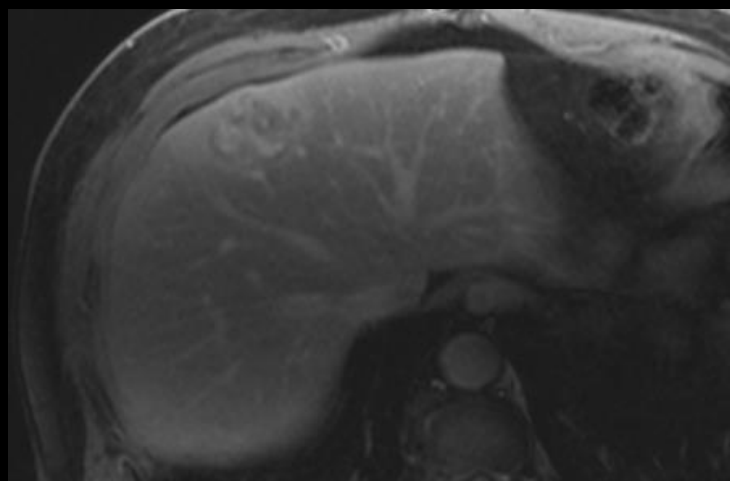
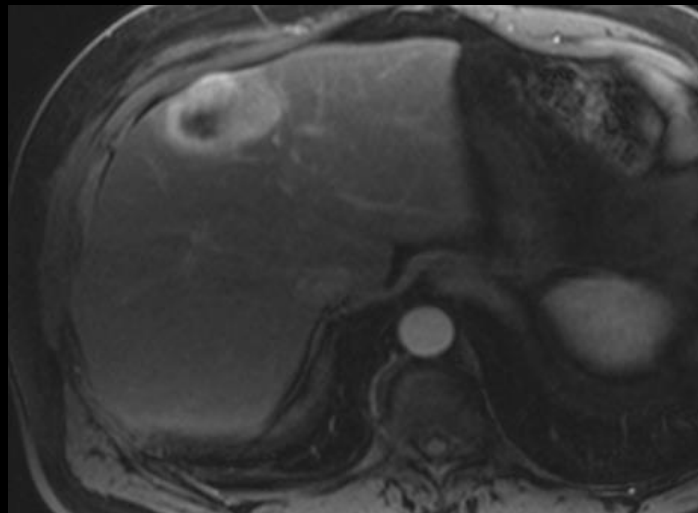
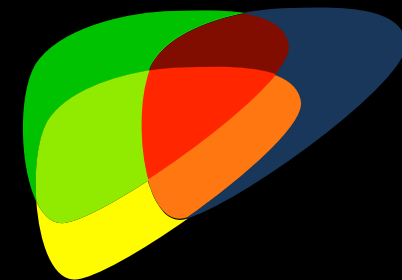
75 yo man with HCV cirrhosis




LR-M (path proven combined HCC-CC)



Malignant, maybe not HCC



 **CT/MRI LI-RADS® v2018**

Untreated observation without pathologic proof in patient at high risk for HCC

- If cannot be categorized due to image degradation or omission → LR-NC
- If definite tumor in vein (TIV) → LR-TIV
- If probably or definitely malignant but not HCC specific (e.g., if targetoid) → LR-M**

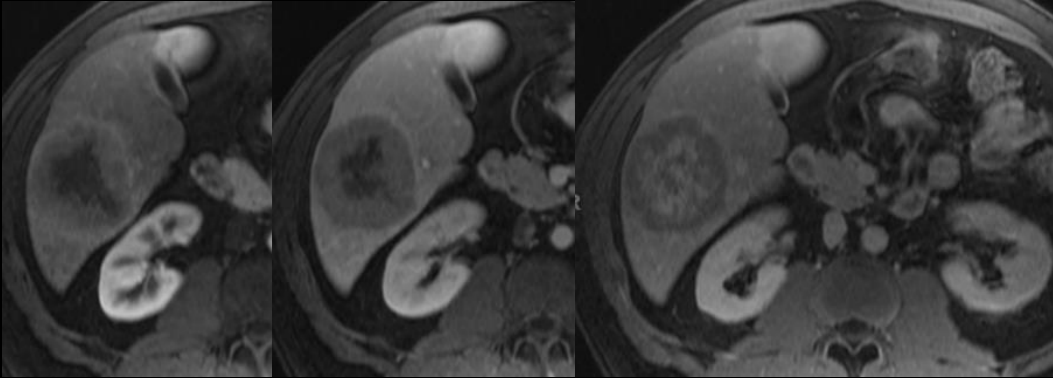
Otherwise, use CT/MRI diagnostic table below

- If intermediate probability of malignancy → LR-3
- If probably HCC → LR-4
- If definitely HCC → LR-5

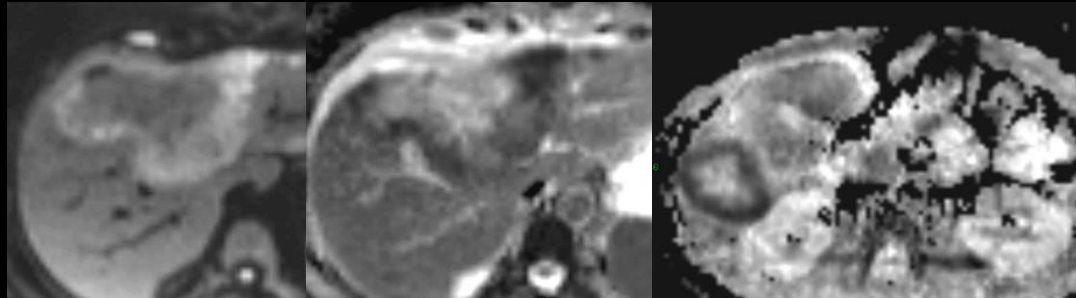


LR-M: Probably or definitely malignant, not HCC specific

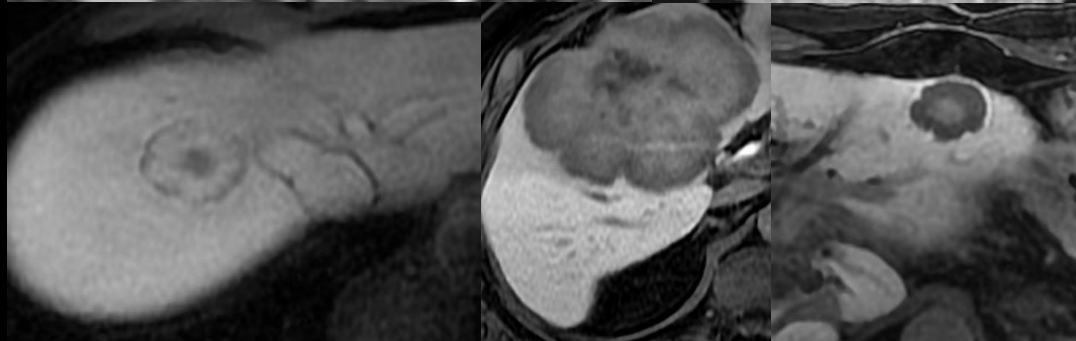
Targetoid Features



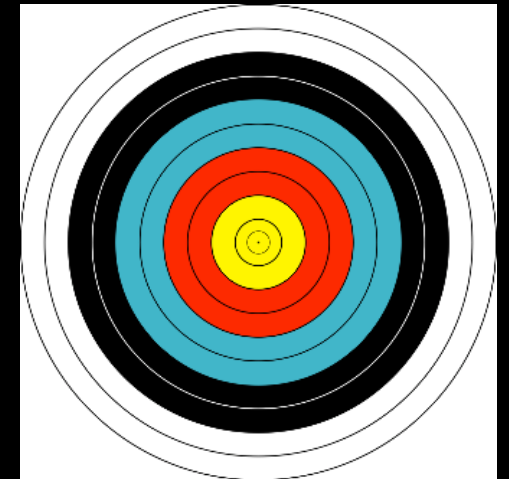
Targetoid dynamic
enhancement pattern



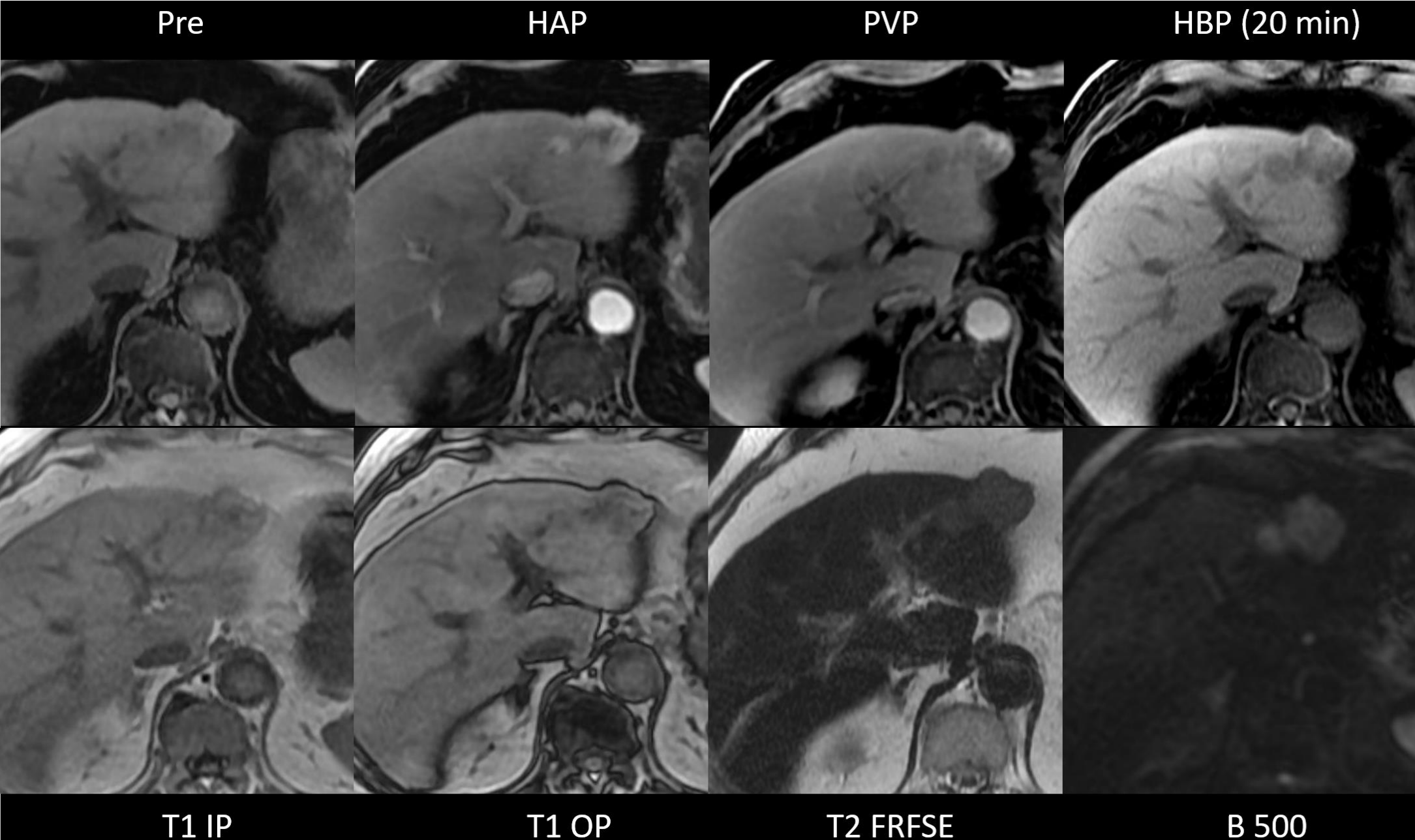
Targetoid DWI



Targetoid HBP



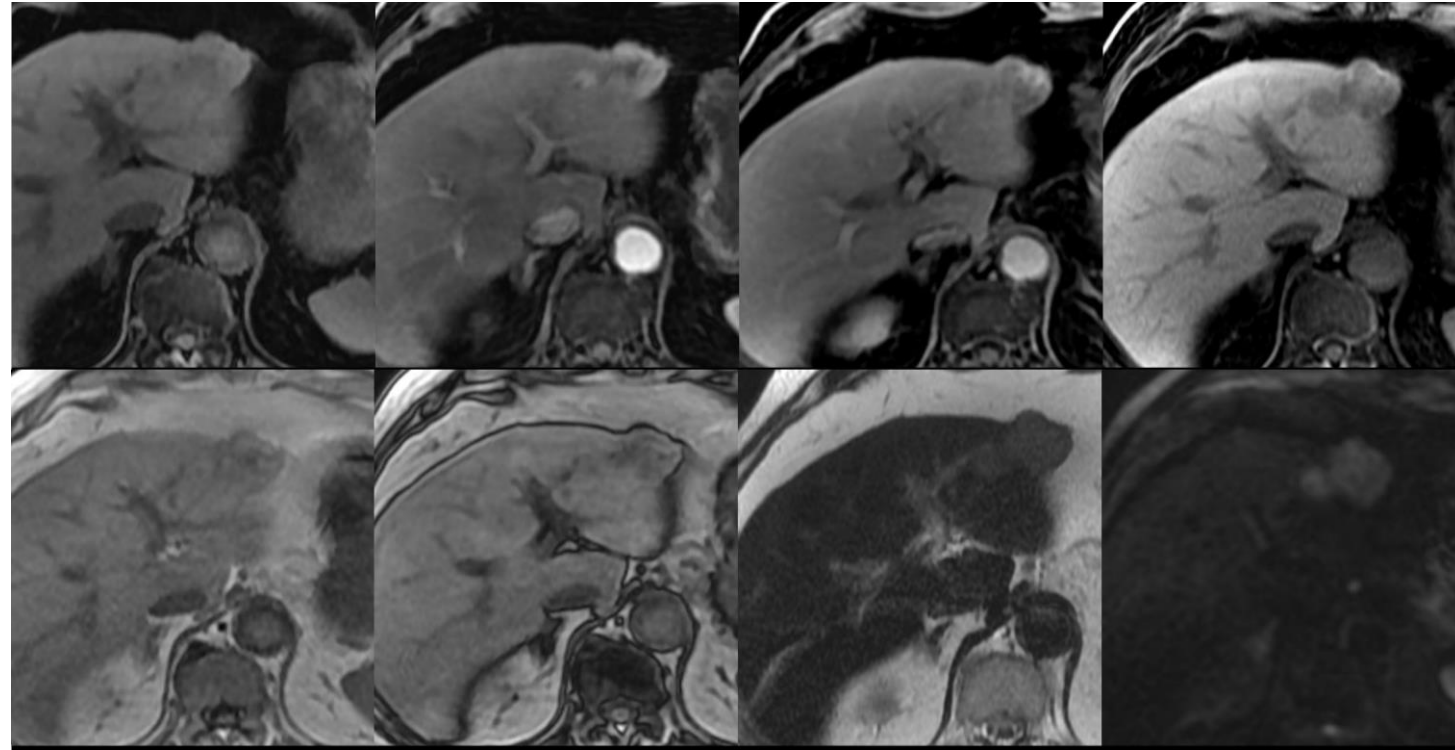
65 yo man with HIV and HBV cirrhosis



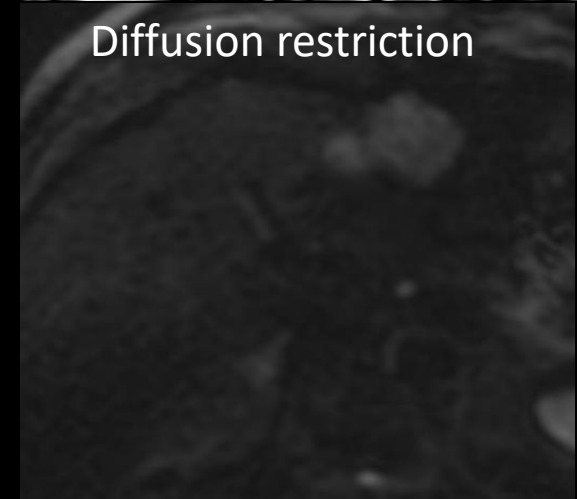
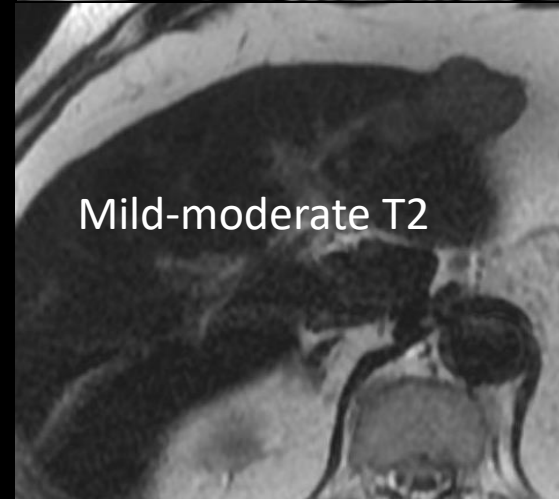
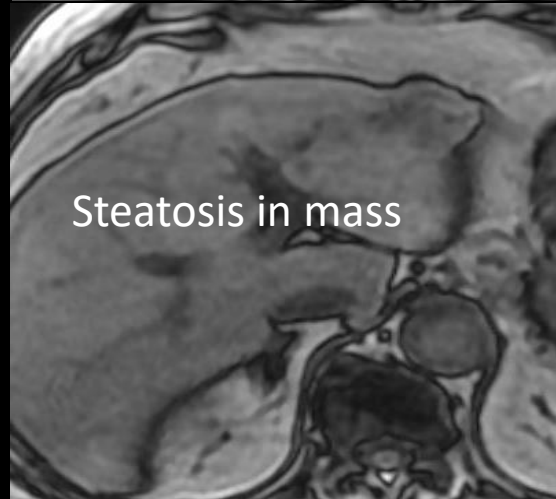
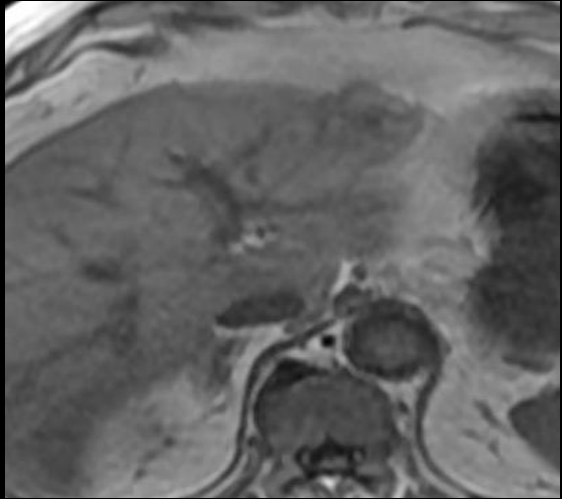
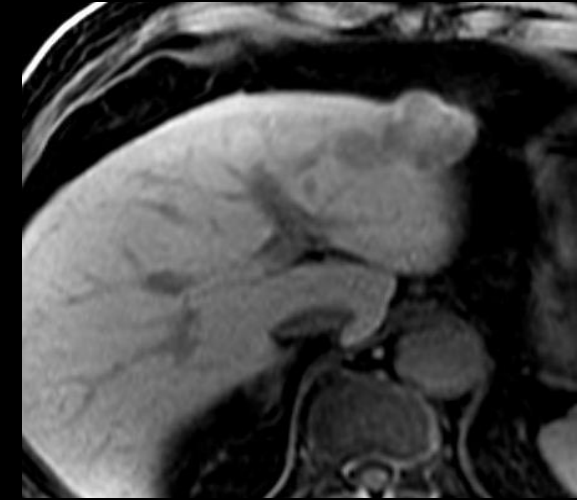
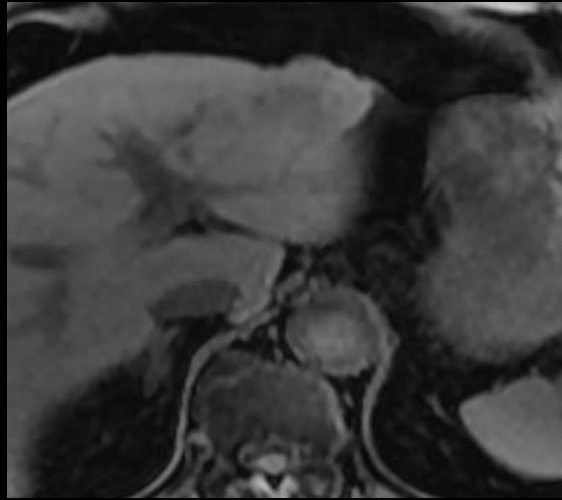
What is the most likely diagnosis?

- a. HCC
- b. Hemangioma
- c. Regenerative nodule
- d. Cholangiocarcinoma

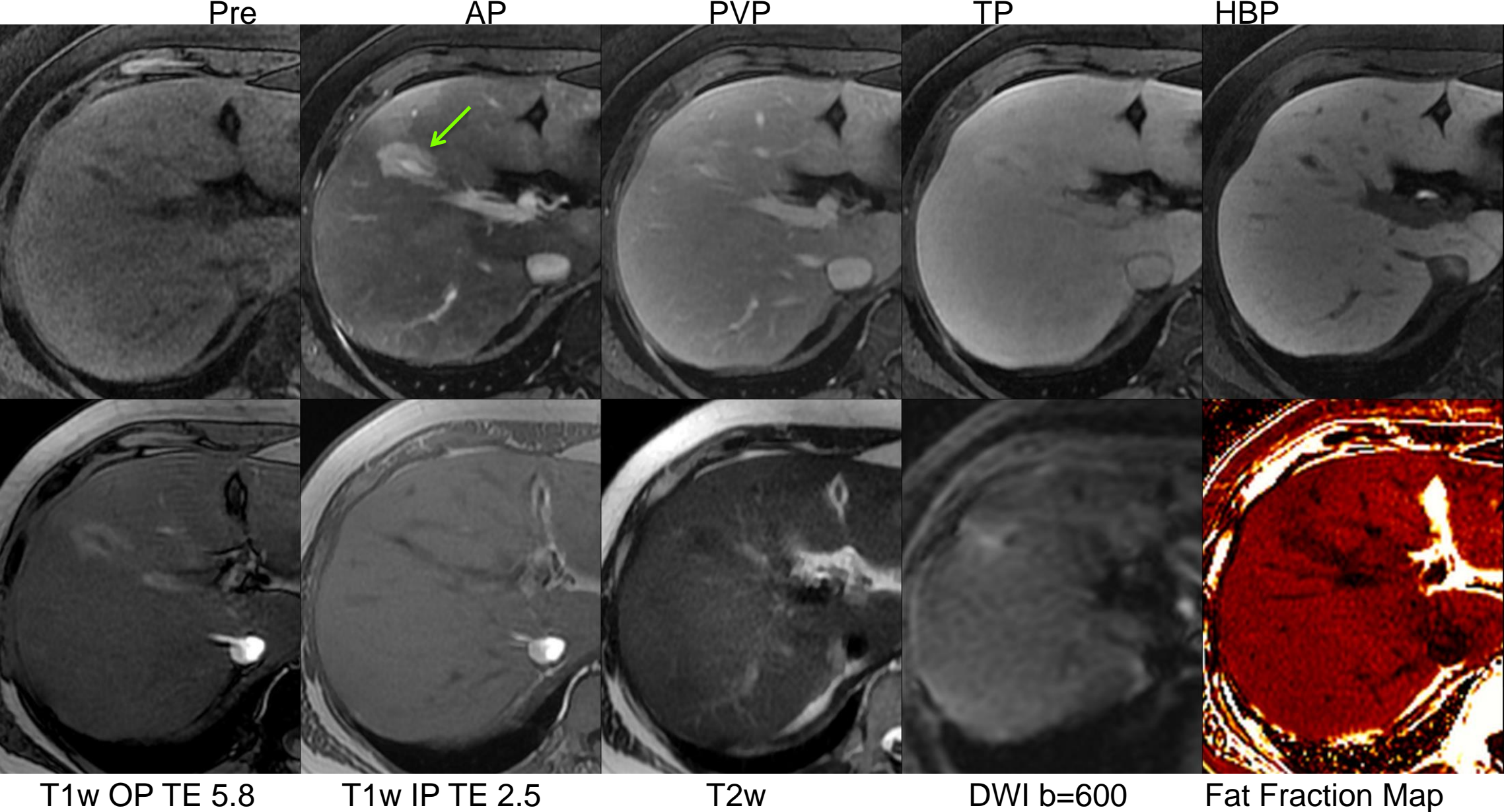
65 yo man with HIV and HBV cirrhosis



Hepatocellular Carcinoma (LR-5)



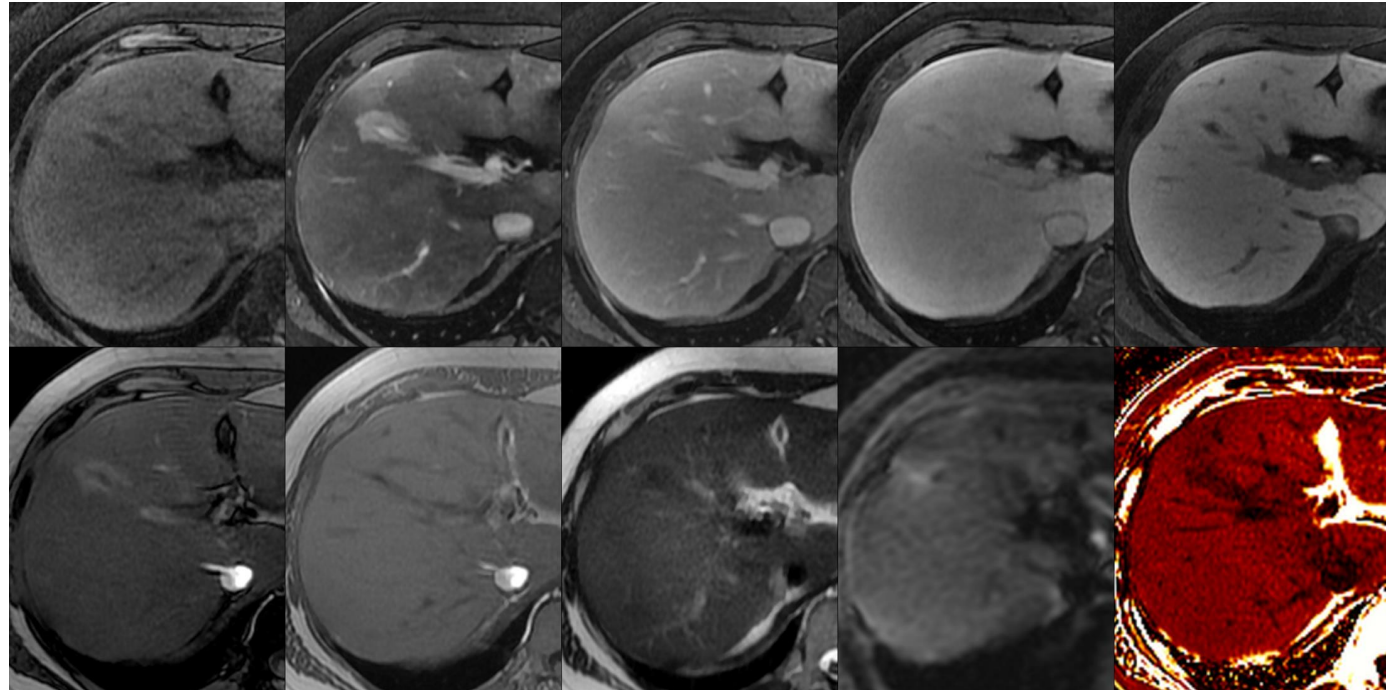
45 yo man with chronic HBV



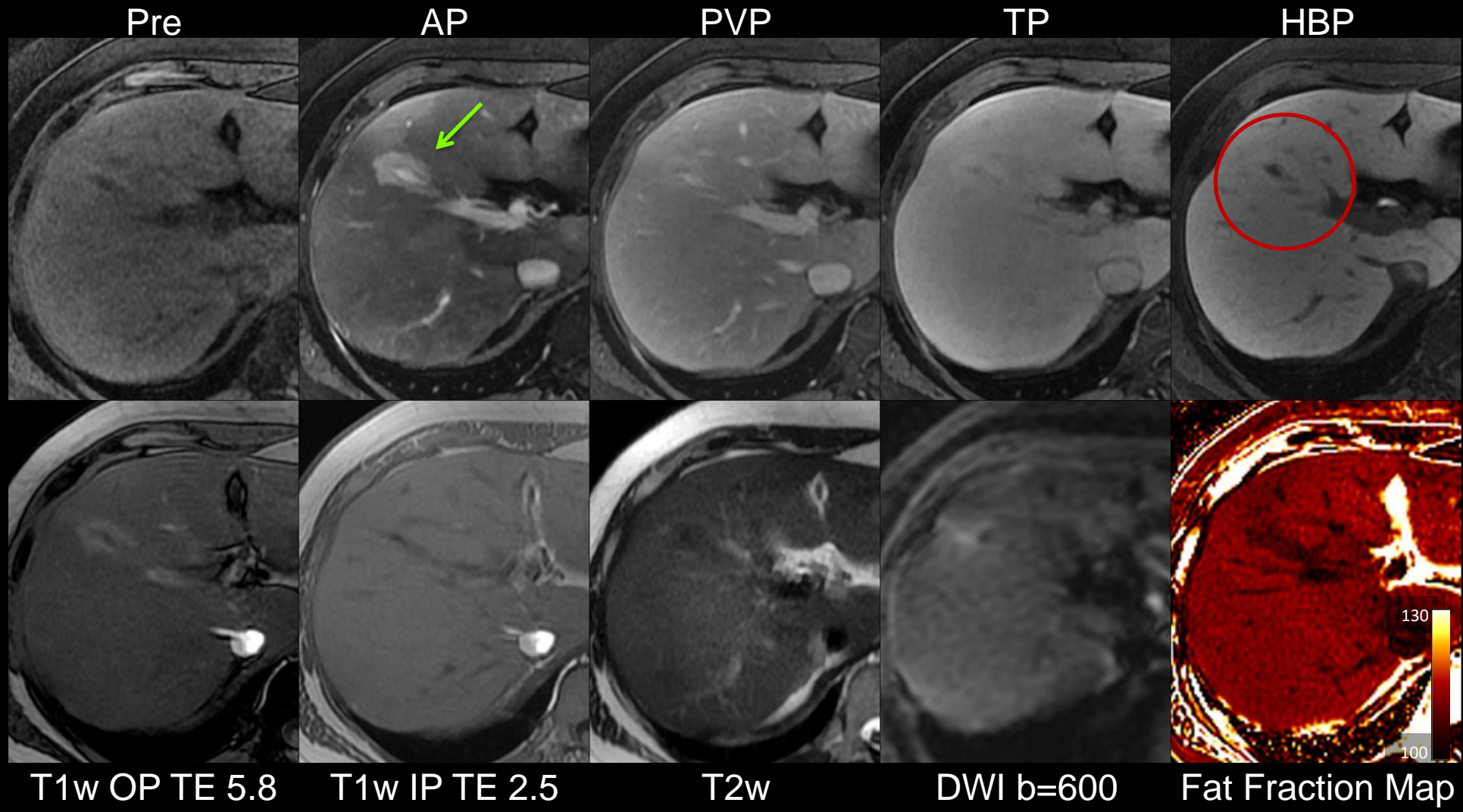
What is the most likely diagnosis?

- a. HCC
- b. Hemangioma
- c. Perfusion alteration
- d. Focal nodular hyperplasia

45 yo man with chronic HBV

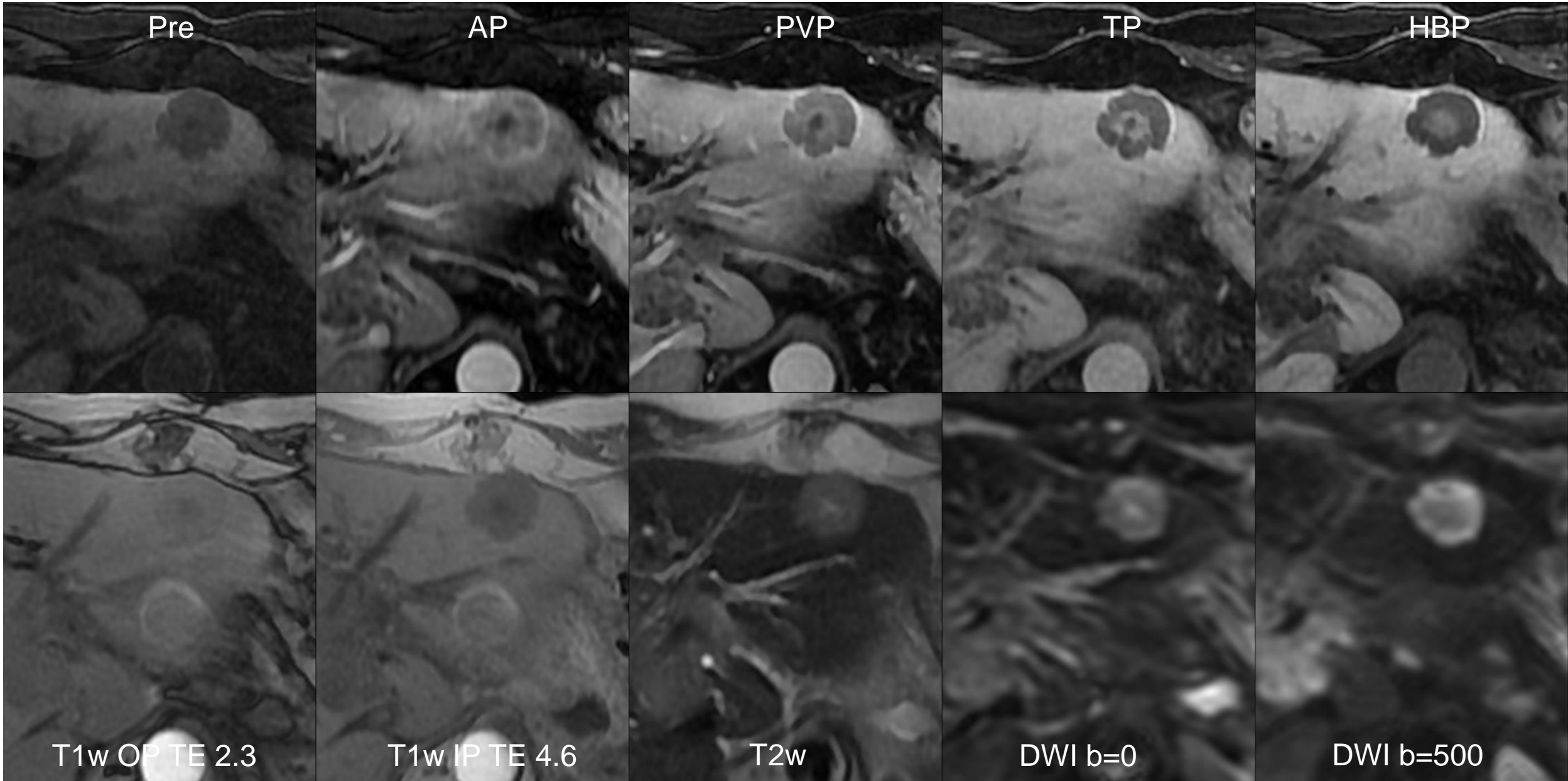


Perfusion alterations are iso in HBP



case courtesy of Eduardo Costa

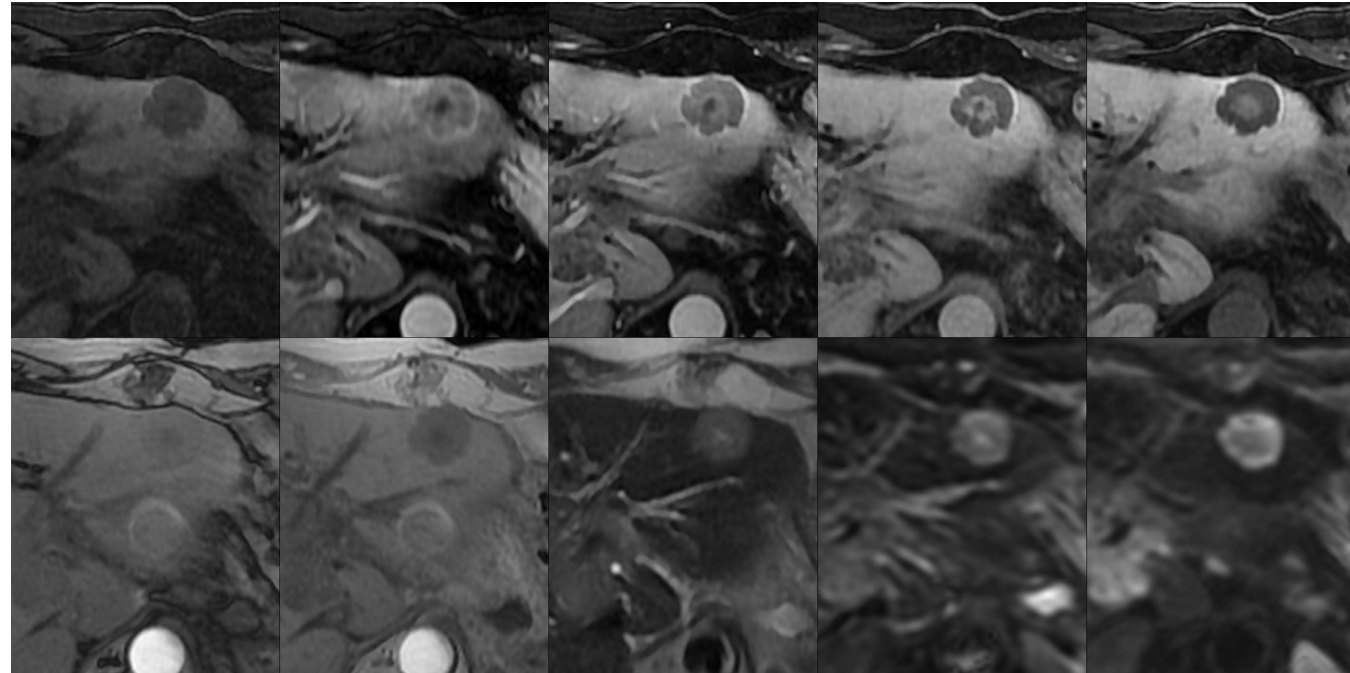
62 yo woman with alcoholic cirrhosis



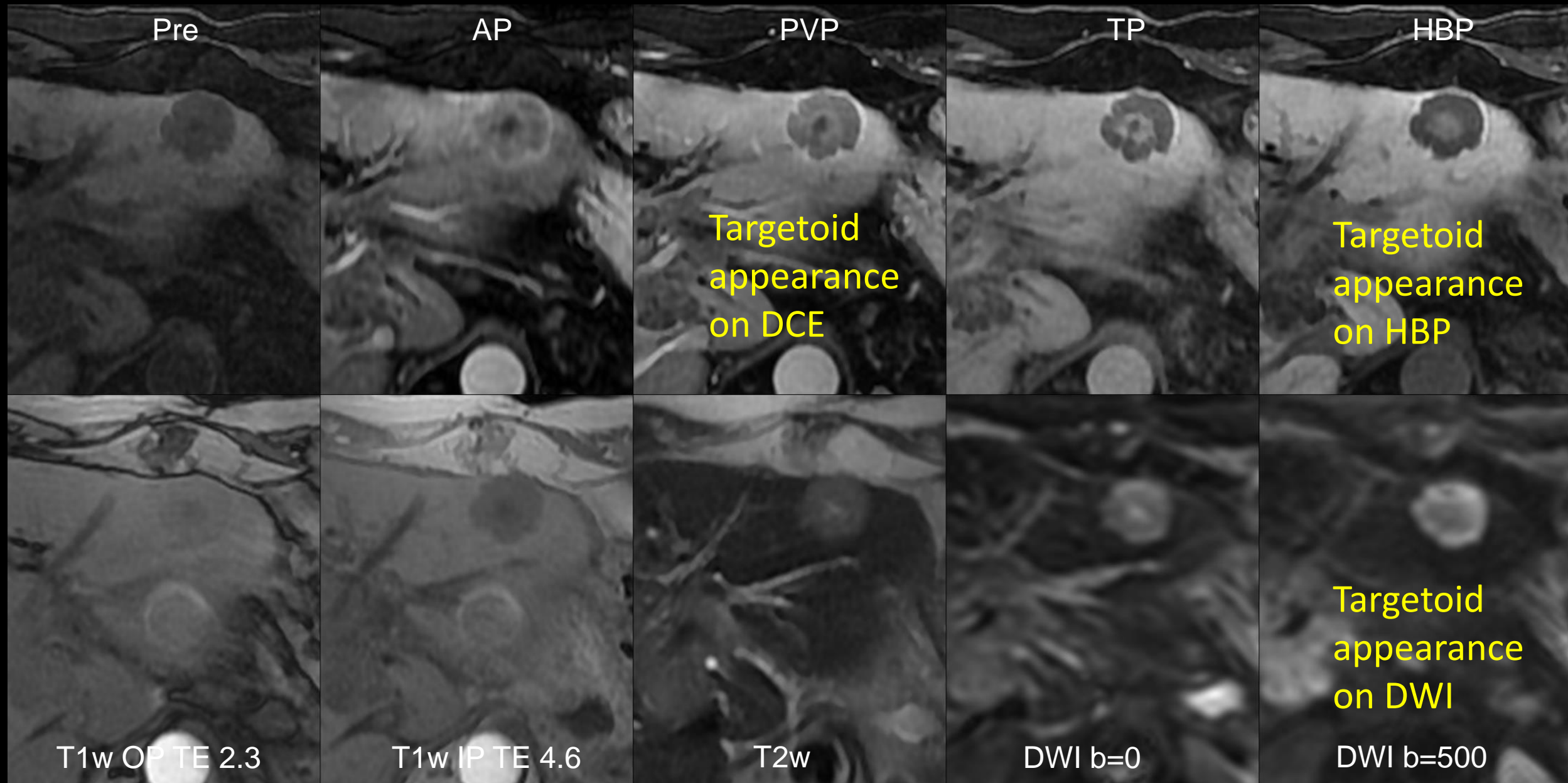
What is the most likely diagnosis?

- a. HCC
- b. Cholangiocarcinoma
- c. Perfusion alteration
- d. Focal nodular hyperplasia

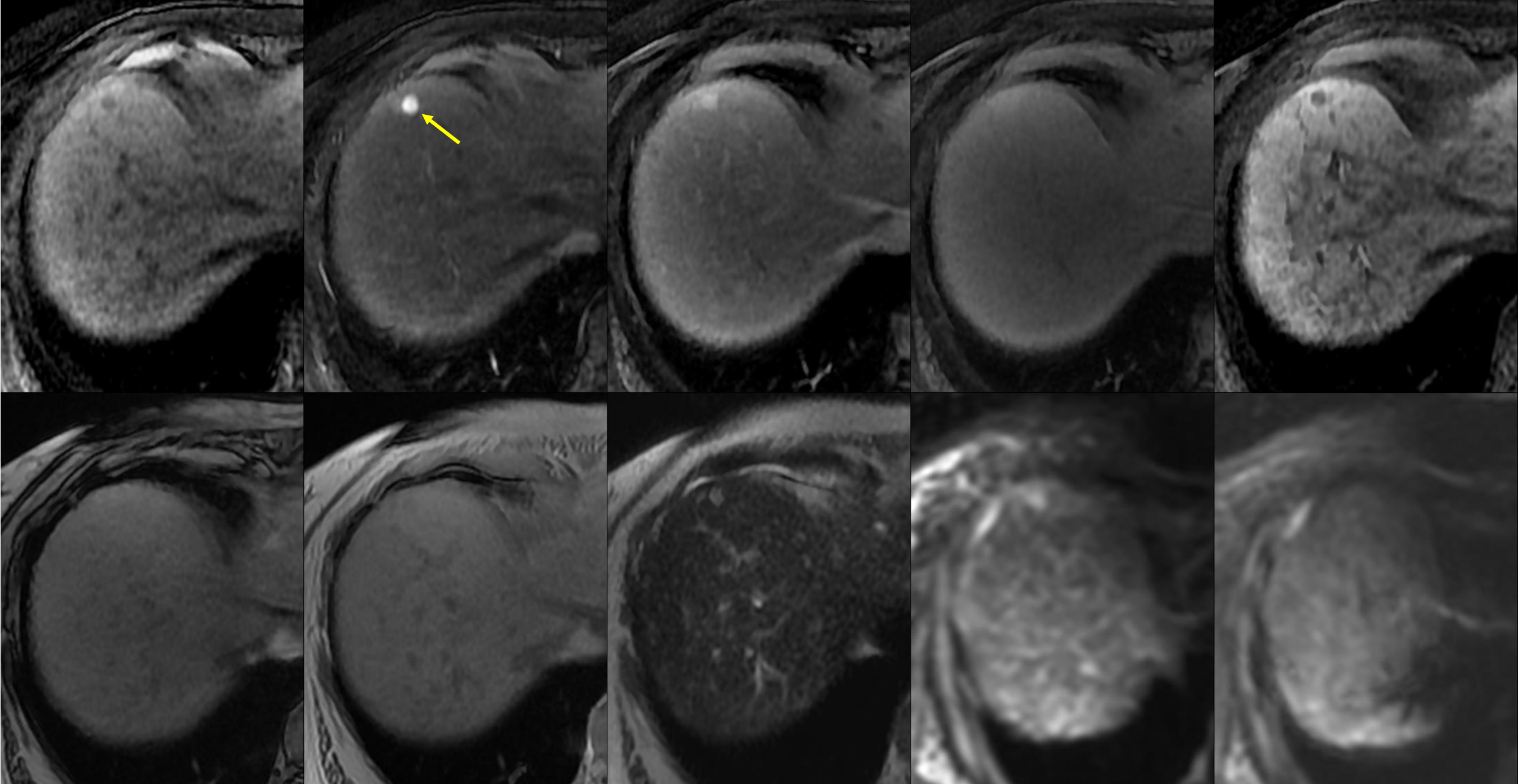
62 yo woman with alcoholic cirrhosis



Intrahepatic cholangiocarcinoma (LR-M)



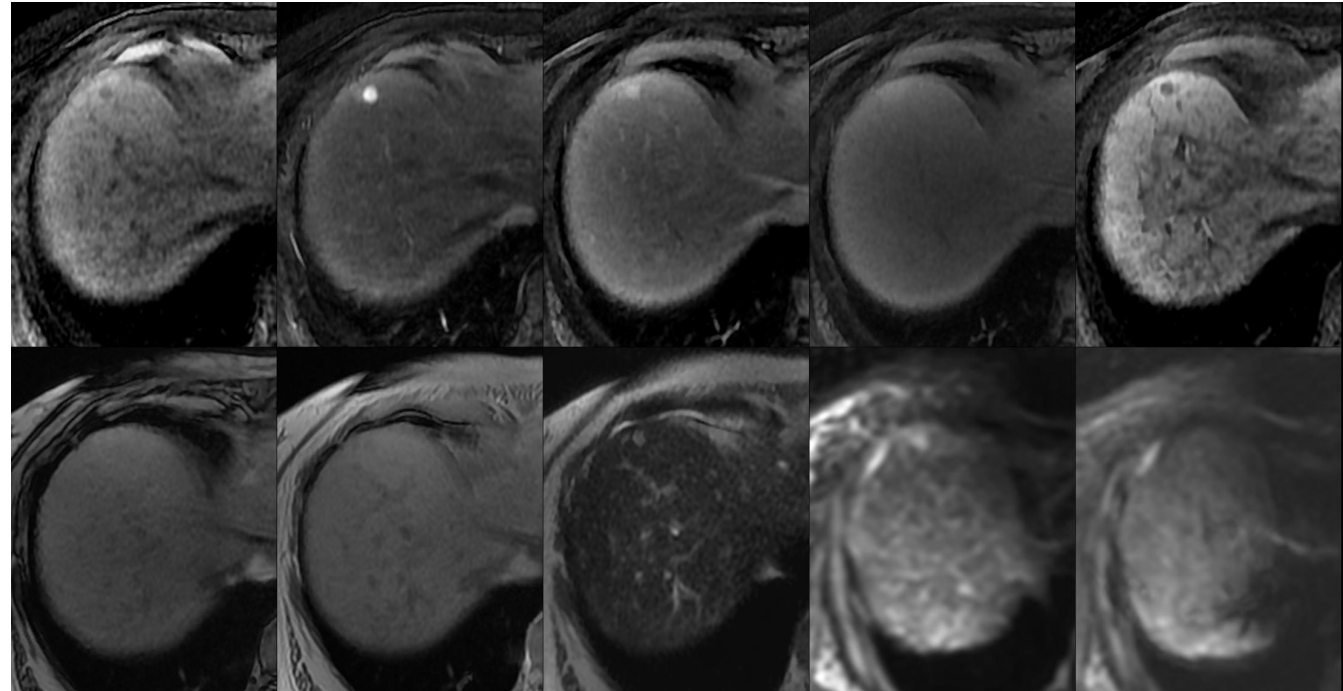
55 yo man with alcoholic cirrhosis



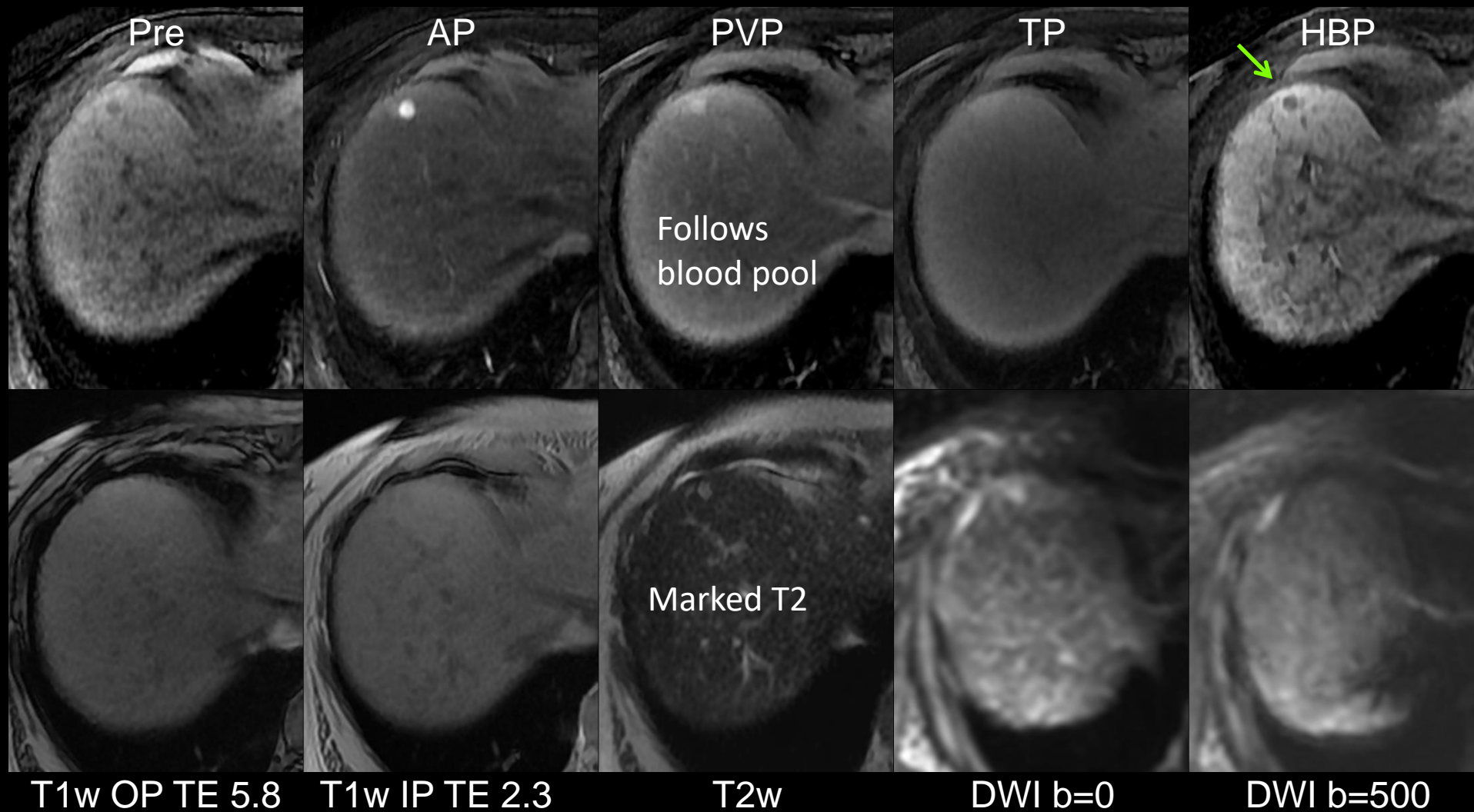
What is the most likely diagnosis?

- a. HCC
- b. Cholangiocarcinoma
- c. Hemangioma
- d. Focal nodular hyperplasia

55 yo man with alcoholic cirrhosis

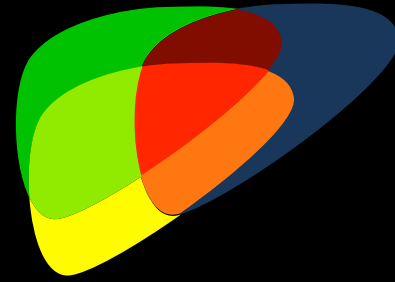


Small Hemangioma, not HCC



case courtesy of Eduardo Costa

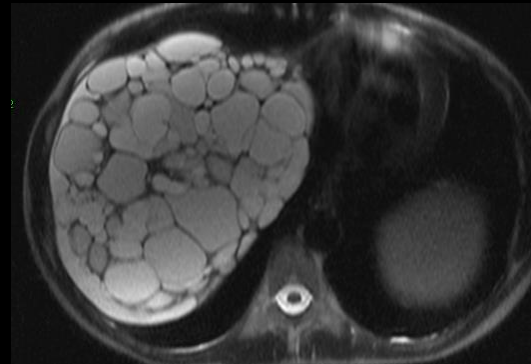
Rule out Benign disease



LR-1: Definitely Benign

LR-2: Probably Benign

- Cysts, hemangiomas, cirrhotic nodules, focal fat, perfusion abnormalities



CT/MRI LI-RADS® v2018

Untreated observation without pathologic proof in patient at high risk for HCC

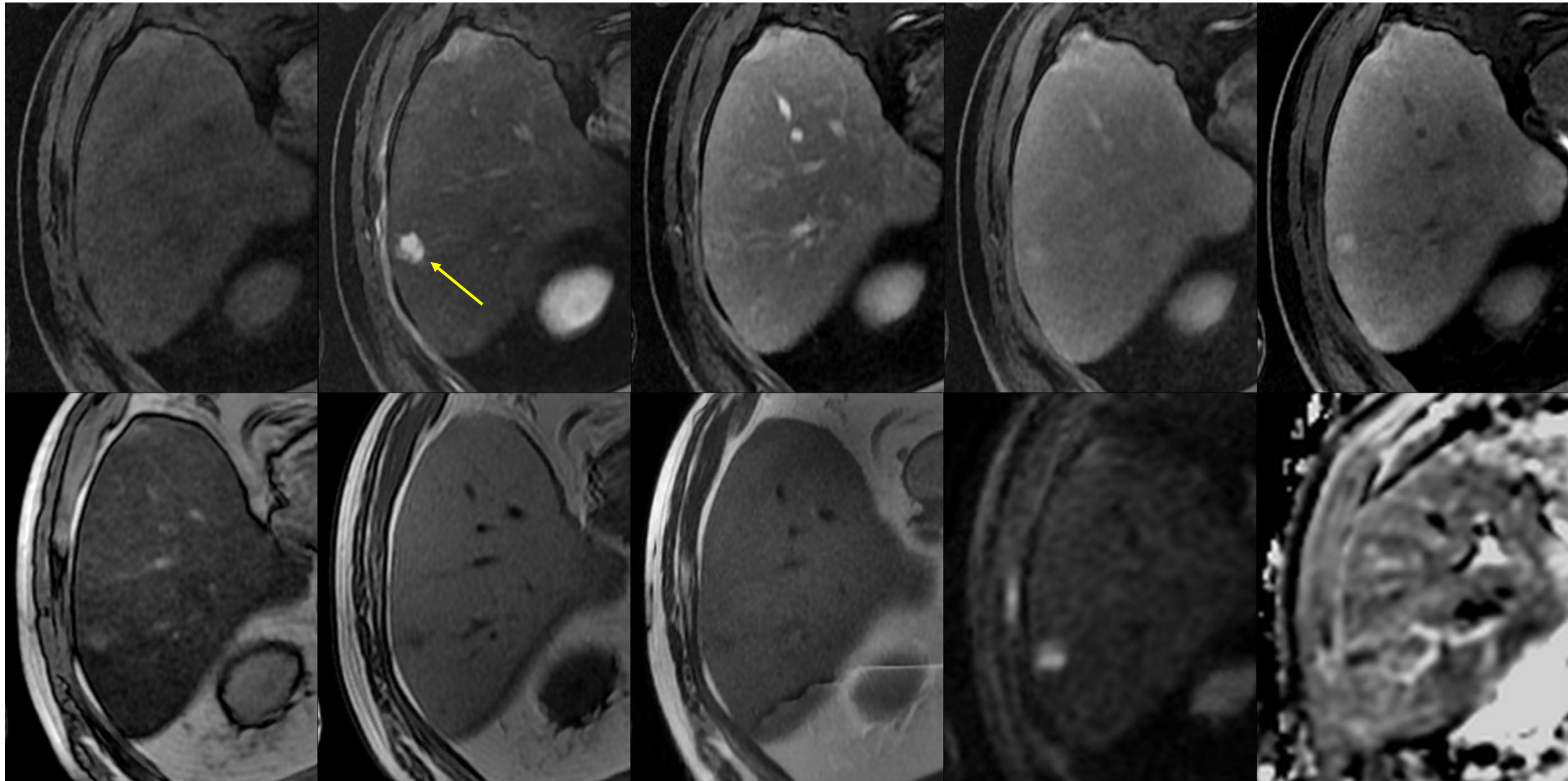
If cannot be categorized due to image degradation or omission	LR-NC
If definite tumor in vein (TIV)	LR-TIV
If definitely benign	LR-1
If probably benign	LR-2
If probably or definitely malignant but not HCC specific (e.g., if targetoid)	LR-M

Otherwise, use CT/MRI diagnostic table below

If intermediate probability of malignancy	LR-3
If probably HCC	LR-4
If definitely HCC	LR-5



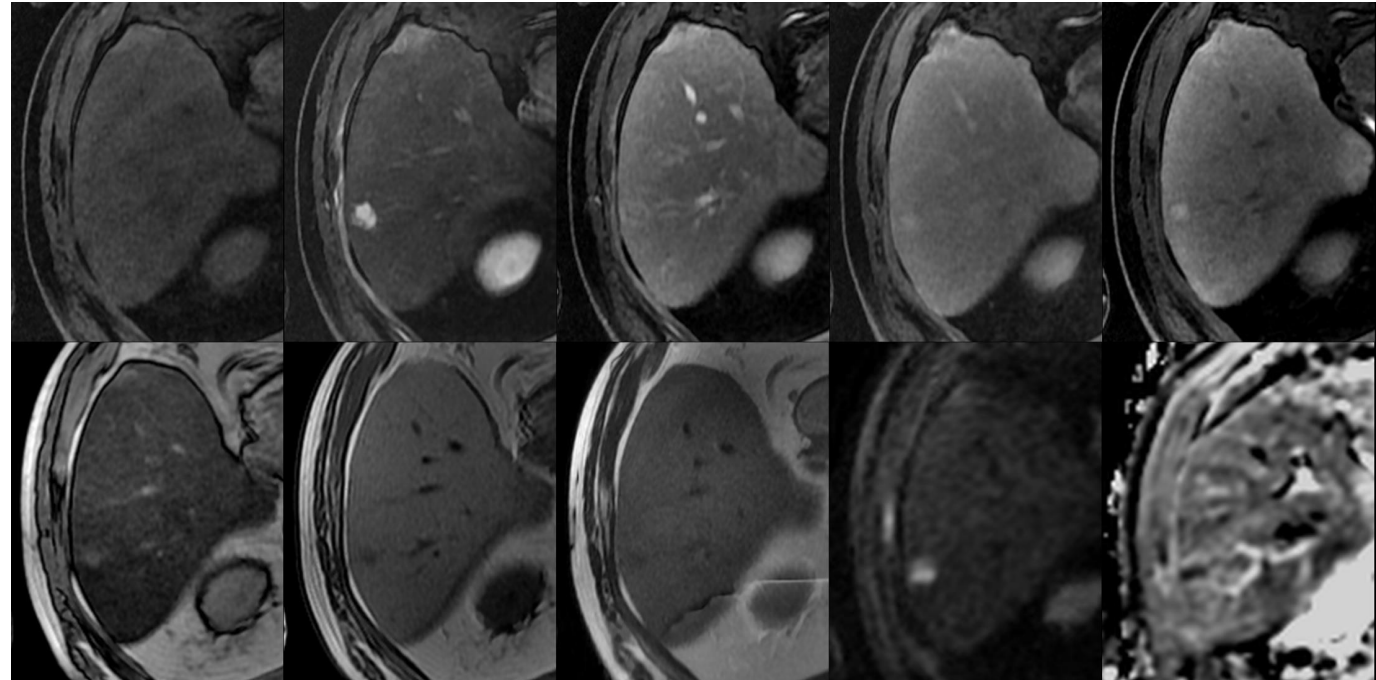
77 yo man with alcoholic cirrhosis



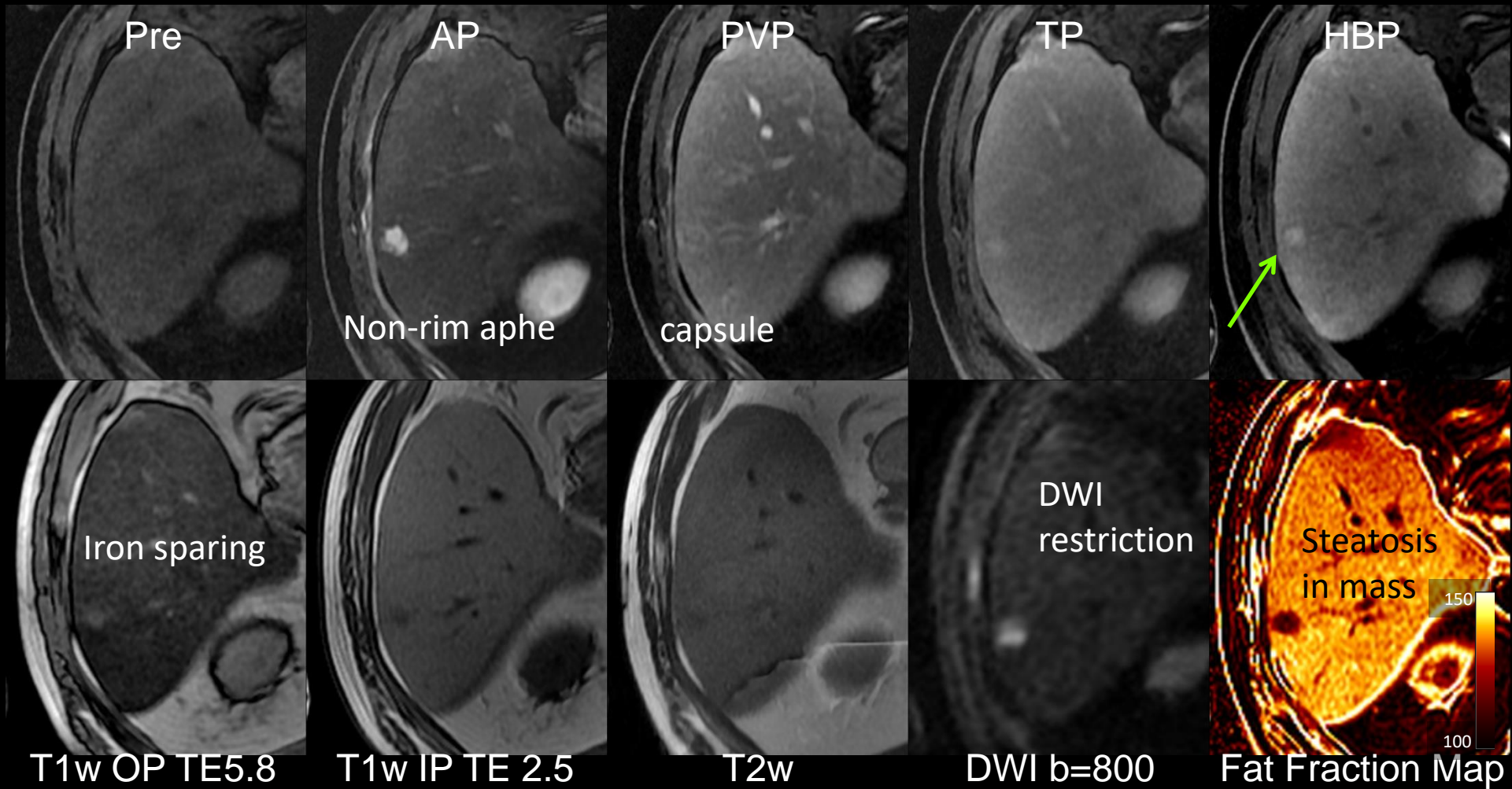
What is the most likely diagnosis?

- a. HCC
- b. Cholangiocarcinoma
- c. Hemangioma
- d. Focal nodular hyperplasia

77 yo man with alcoholic cirrhosis

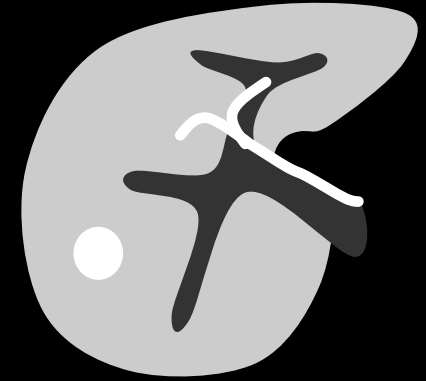


HCC with HBP hyper intensity (LR-5)



case courtesy of Eduardo Costa

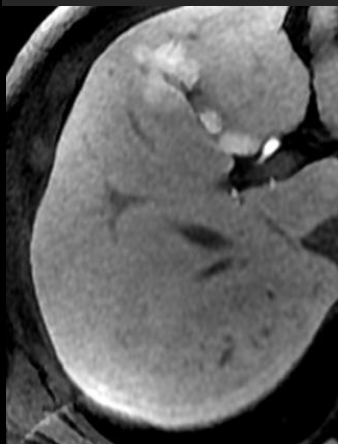
Not ancillary feature: Hepatobiliary phase hyper-intensity



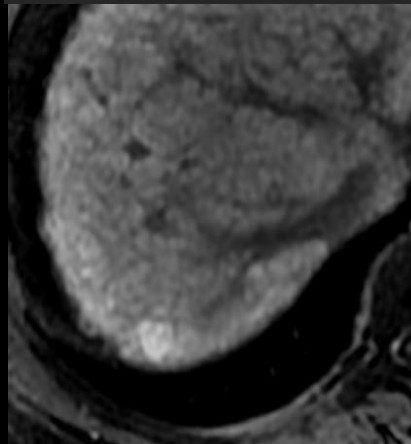
- Intensity in HBP that is unequivocally greater than that of surrounding liver
- Not included as ancillary feature
 - Can be seen with benign or malignant nodules (5-12% HCC)

FNH like nodule

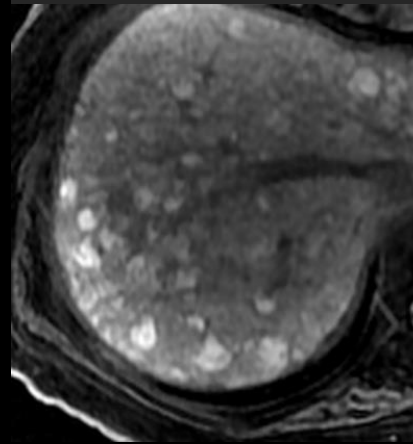
Fatty sparing



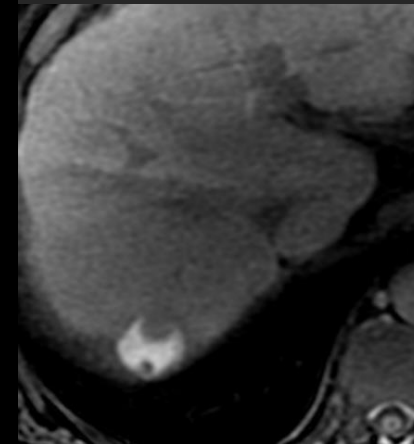
Cirrhotic nodule



Cirrhotic nodules



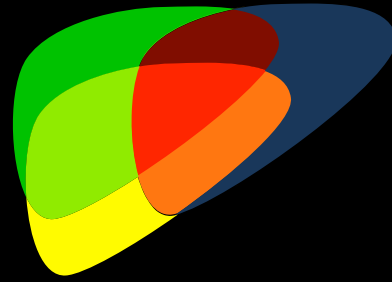
HCC



HCC



Major Features



CT/MRI Diagnostic Table

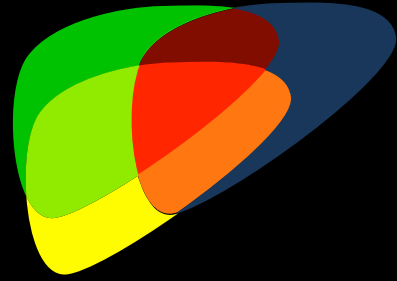
Arterial phase hyperenhancement (APHE)		No APHE		Nonrim APHE		
Observation size (mm)		< 20	≥ 20	< 10	10-19	≥ 20
Count additional major features: • Enhancing "capsule" • "Nonperipheral "washout" • Threshold growth	None	LR-3	LR-3	LR-3	LR-3	LR-4
	One	LR-3	LR-4	LR-4	LR-4 / LR-5	LR-5
	≥ Two	LR-4	LR-4	LR-4	LR-5	LR-5



Observations in this cell are categorized based on one additional major feature:

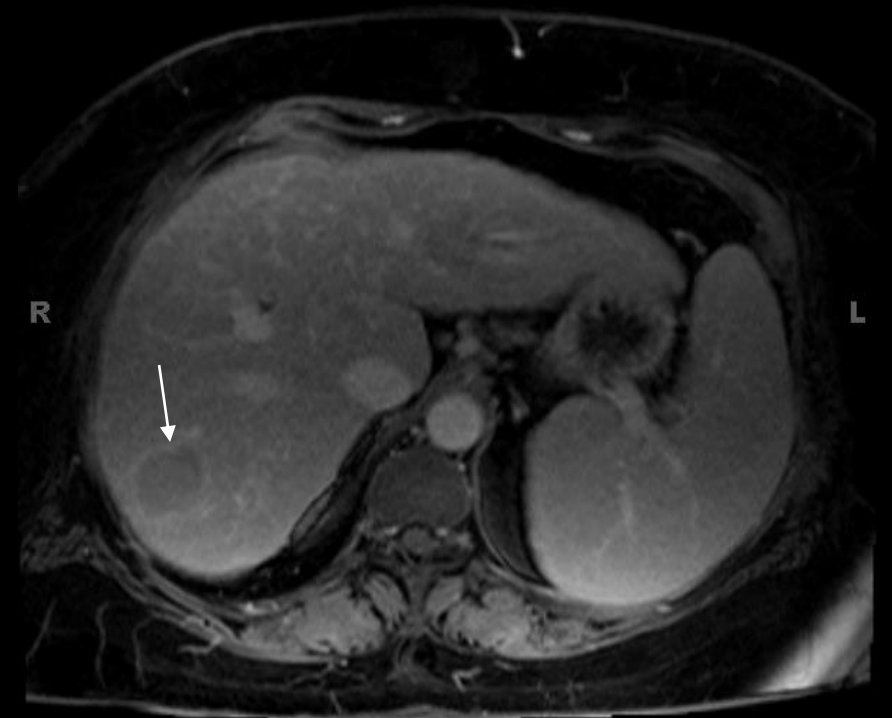
- LR-4 – if enhancing "capsule"
- LR-5 – if nonperipheral "washout" **OR** threshold growth

LR-4: Criteria

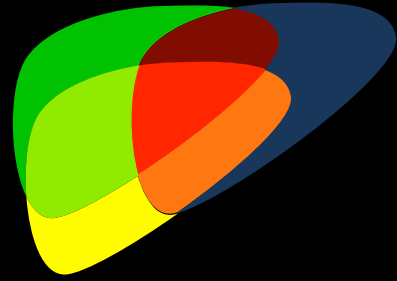


LR-4: Probably HCC

- High probability of HCC
- Unequivocal features
 - 10-19 mm: non-rim APHE + Capsule
 - ≥ 20 mm: non-rim APHE
 - No APHE, but Capsule, WO, or TG
- Tie breaking rules LR-5 goes to LR-4

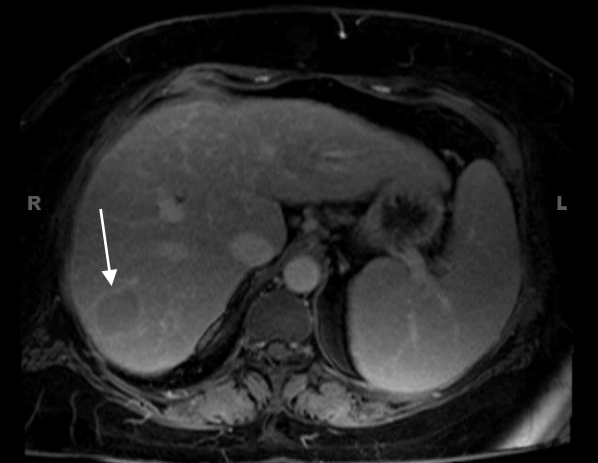
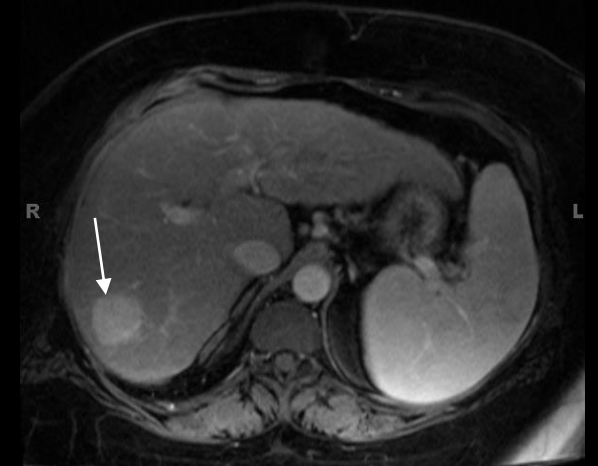


LR-5: Criteria

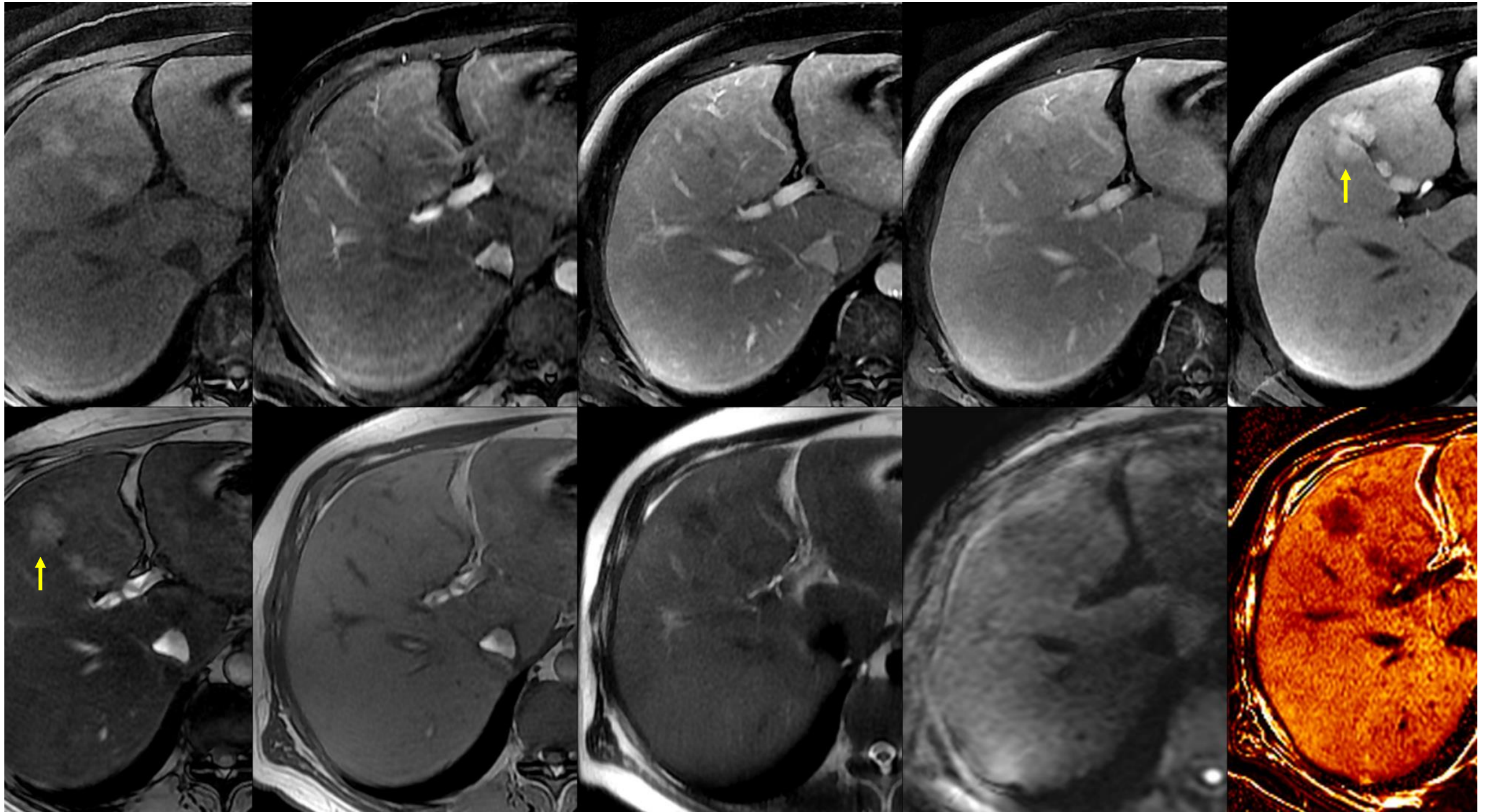


LR-5: Definitely HCC

- 100% certainty
- Unequivocal features
 - 10-19 mm: non-rim APHE + WO or APHE + TG
 - ≥ 20 mm: non-rim APHE + WO, or APHE + Capsule, or APHE + TG



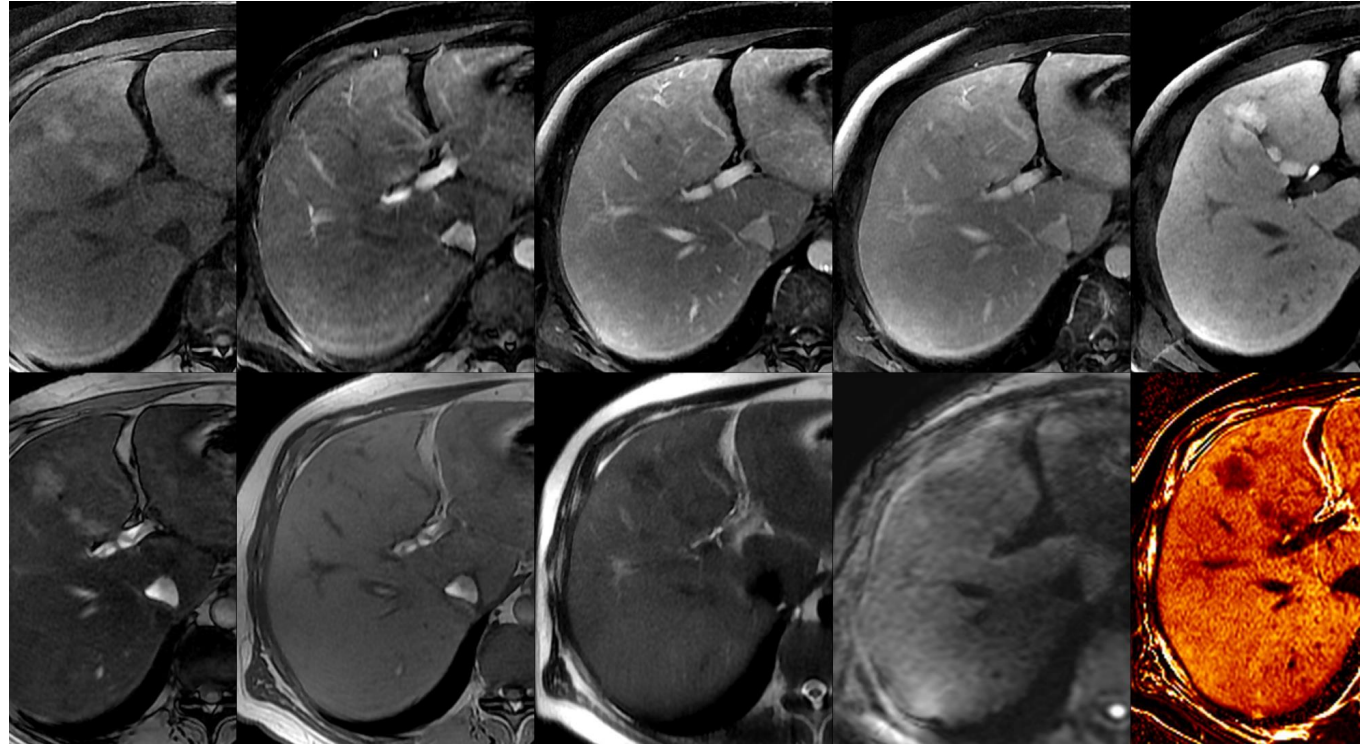
48 yo man with chronic HBV



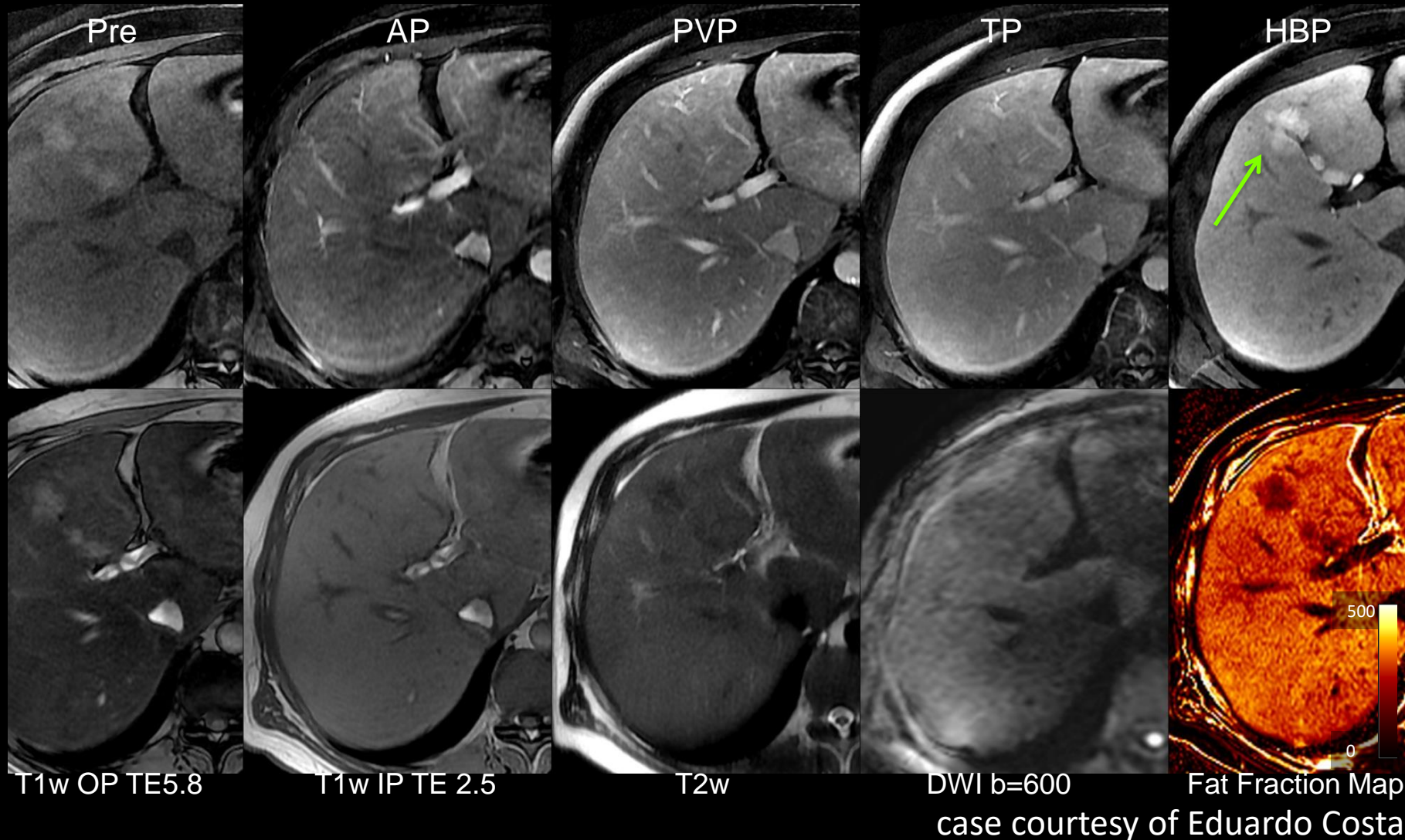
What is the most likely diagnosis?

- a. HCC
- b. Cholangiocarcinoma
- c. Fatty sparing
- d. Focal nodular hyperplasia

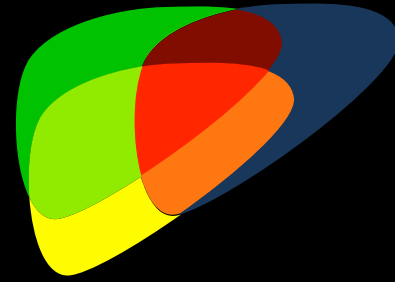
48 yo man with chronic HBV



Fatty sparing with HBP hyper intensity:
Notice that the hyperintensity of the focal area easily characterized in dual-echo images and fat fraction maps.



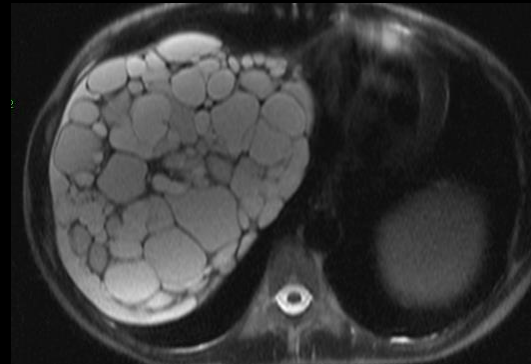
Rule out Benign disease



LR-1: Definitely Benign

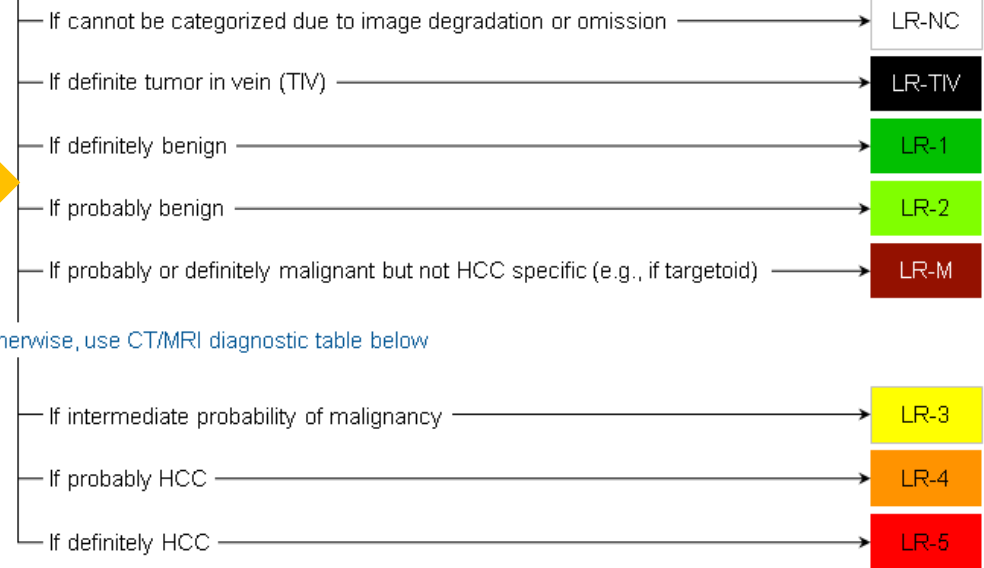
LR-2: Probably Benign

- Cysts, hemangiomas, cirrhotic nodules, focal fat, perfusion abnormalities

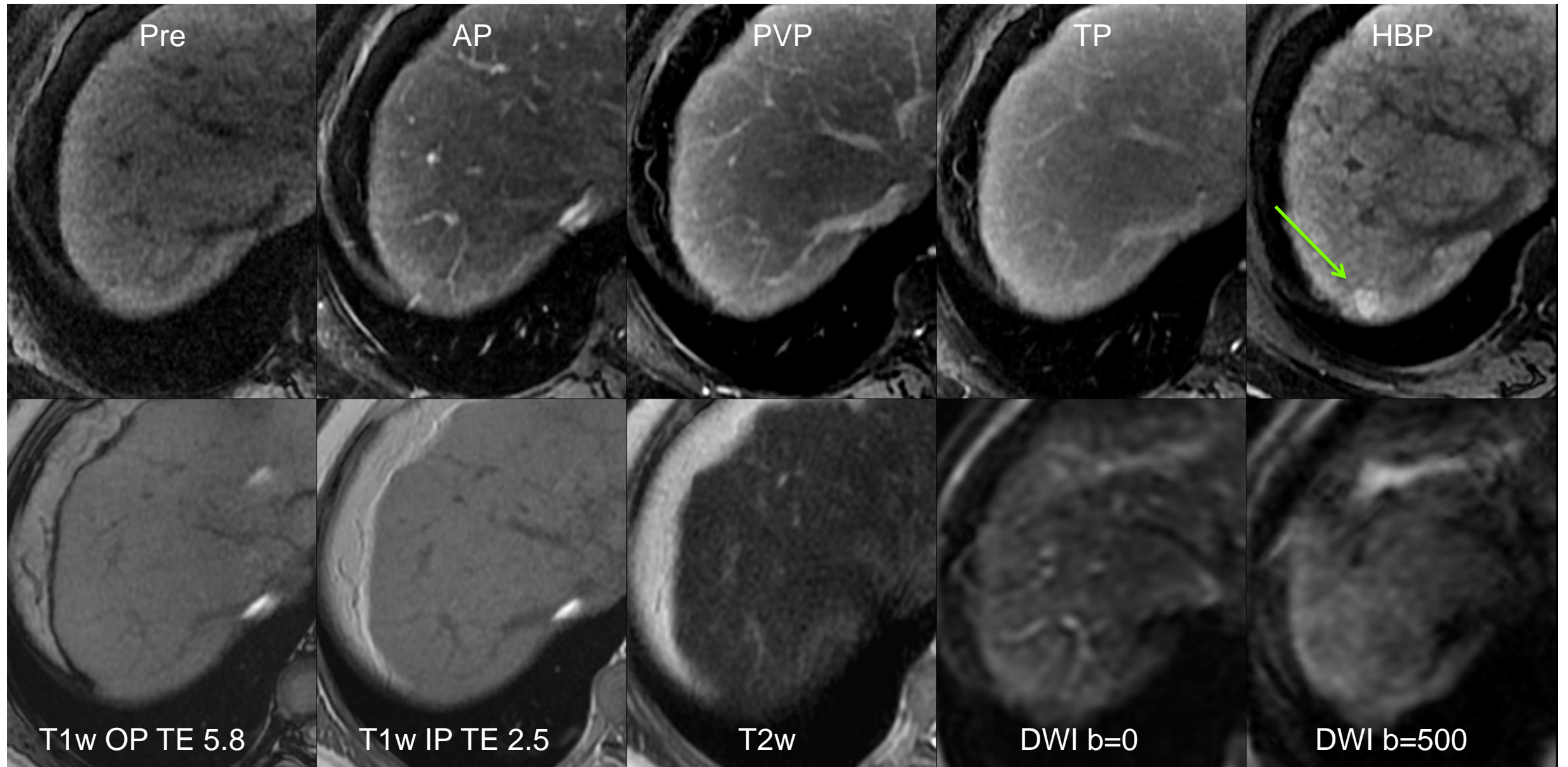


CT/MRI LI-RADS® v2018

Untreated observation without pathologic proof in patient at high risk for HCC



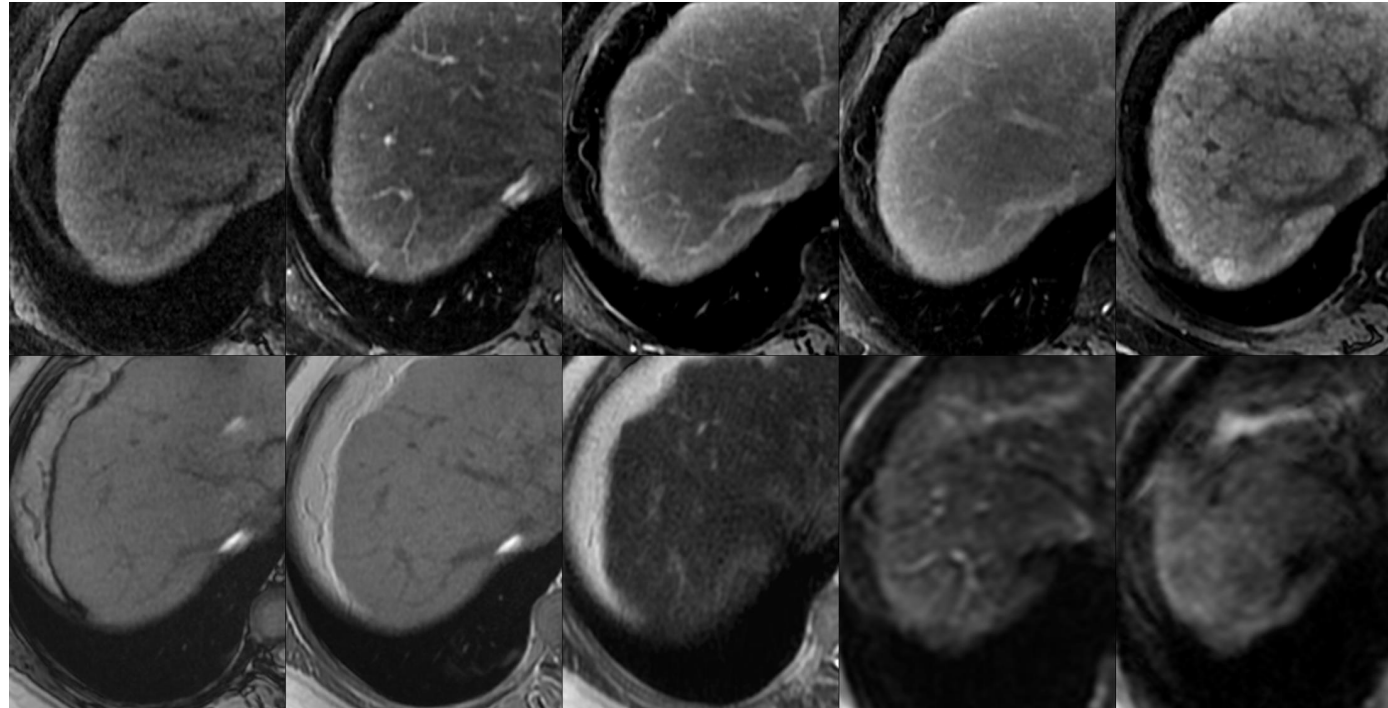
54 yo man with cirrhosis



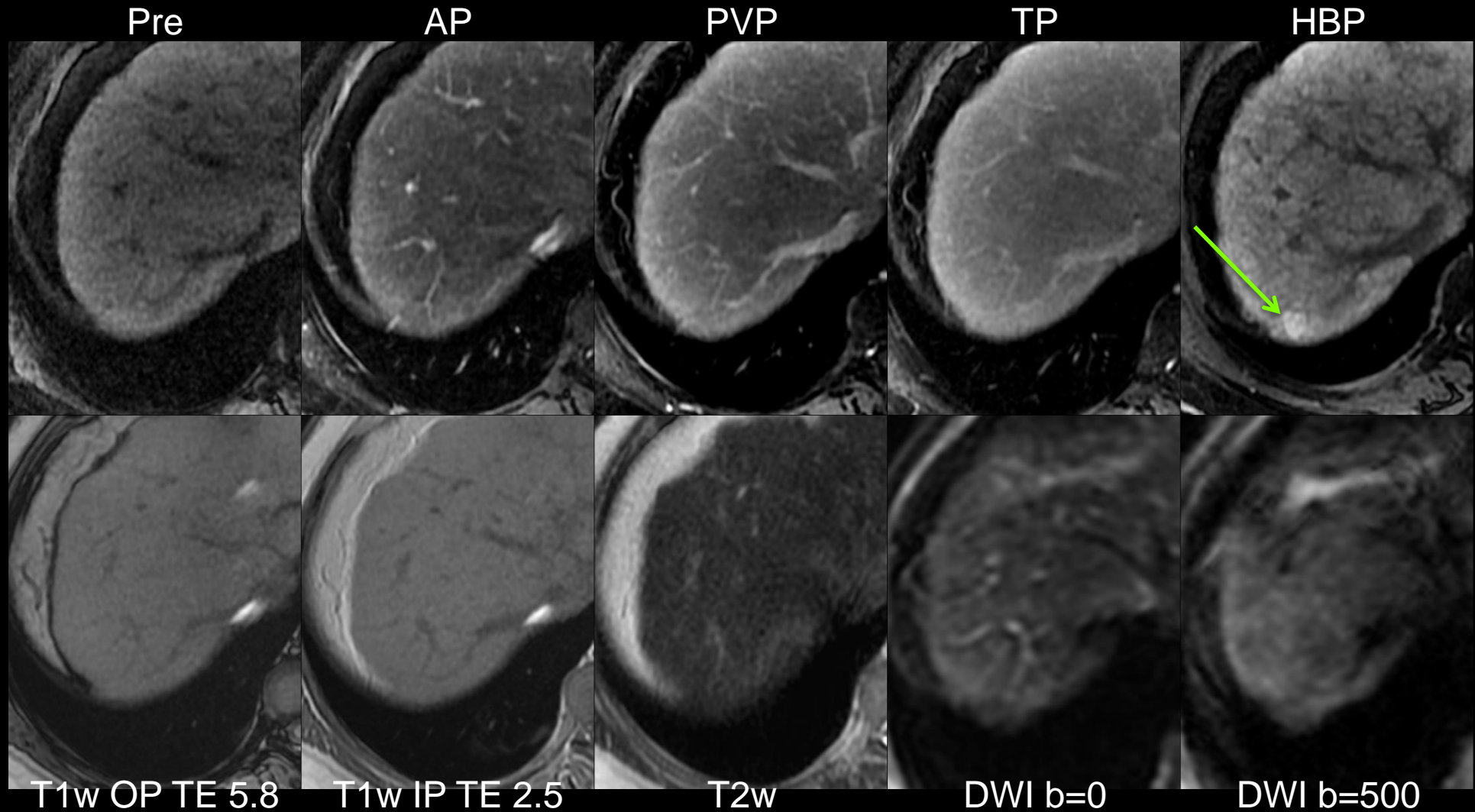
What is the most likely diagnosis?

- a. HCC
- b. Regenerative nodule
- c. Fatty sparing
- d. HCA

54 yo man with cirrhosis

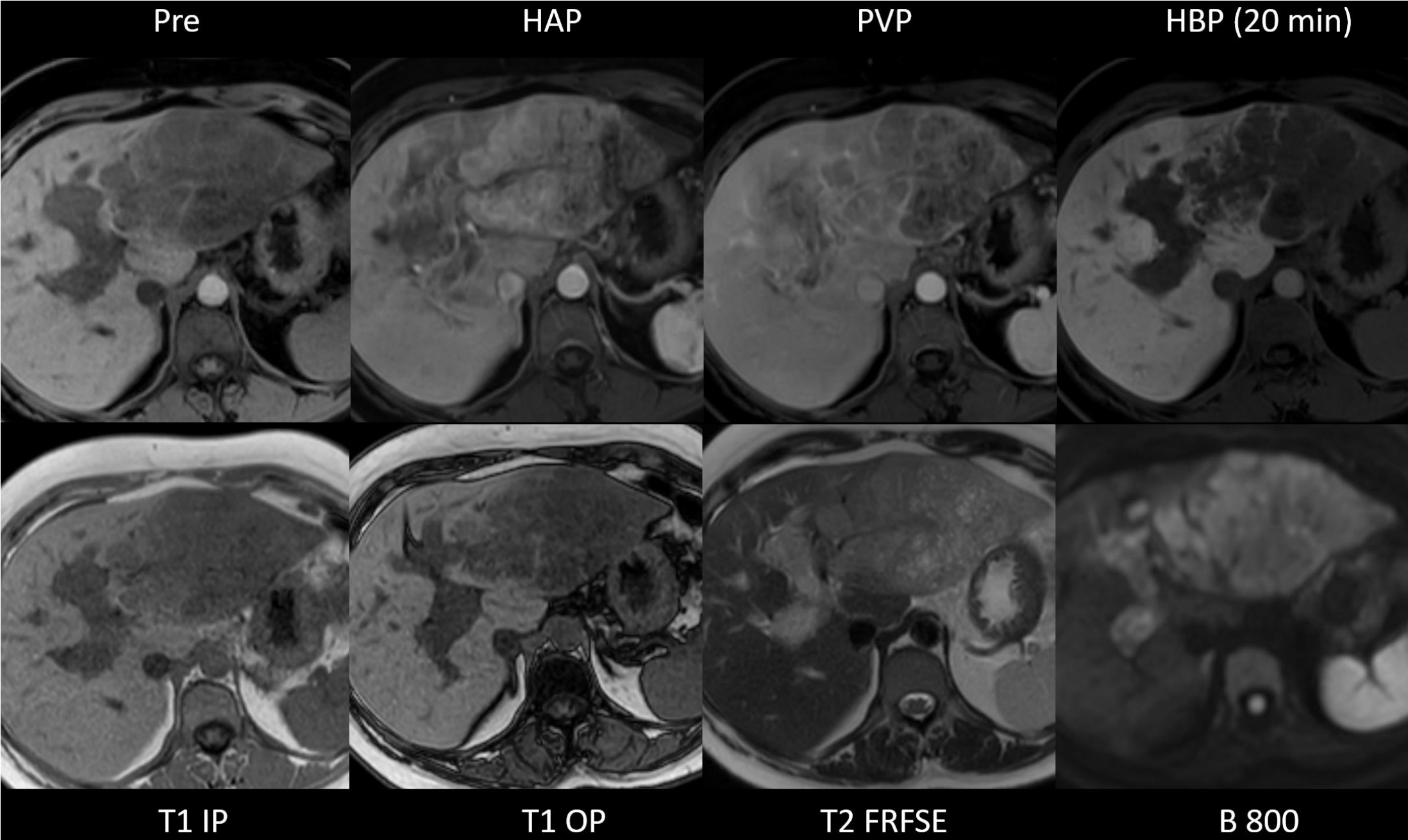


AP non-hyperenhancing observation with HBP hyperintensity. Occult on all other sequences. LR-2



case courtesy of Eduardo Costa

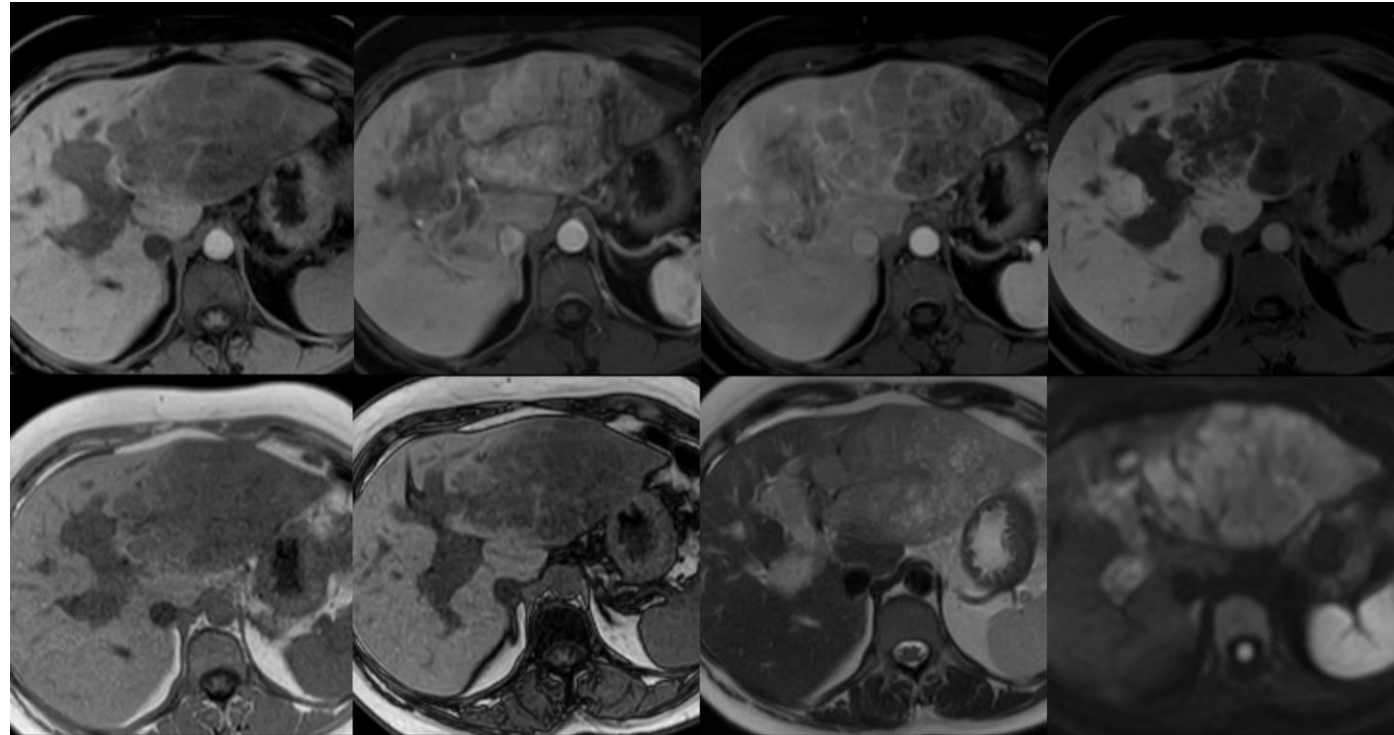
58 yo man with cirrhosis



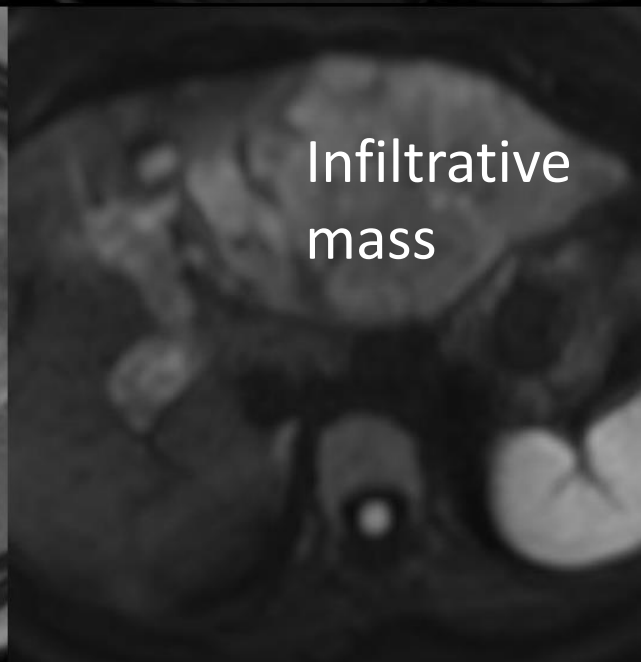
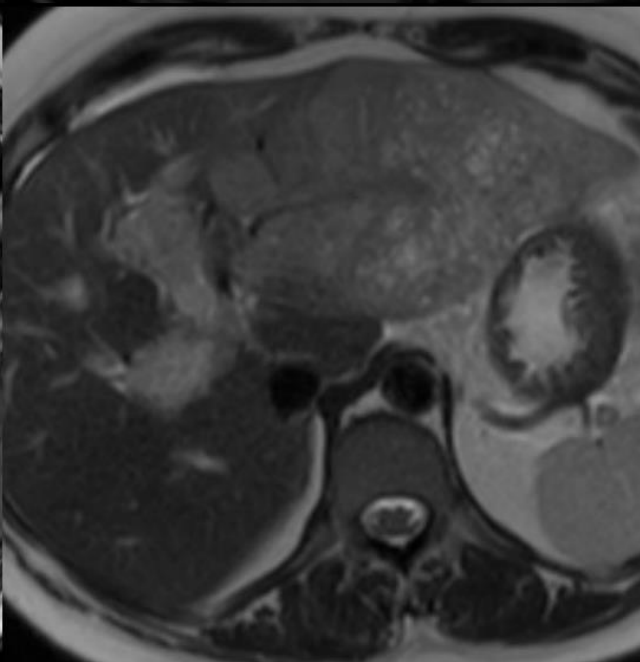
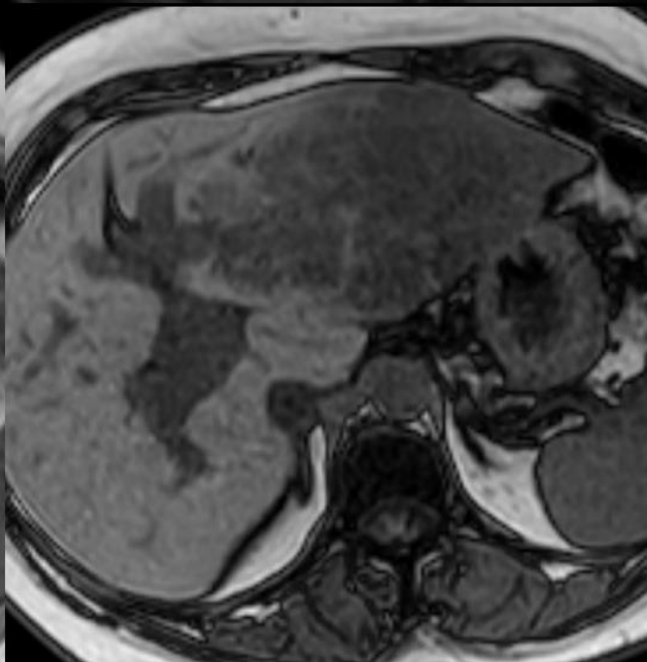
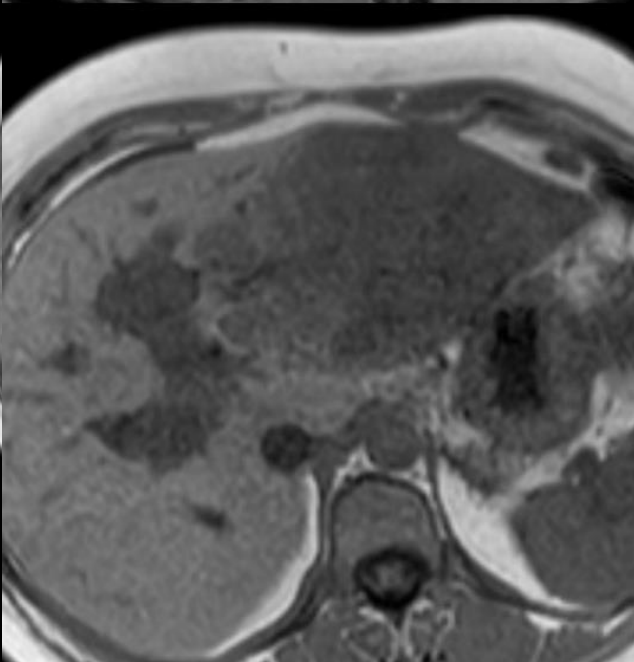
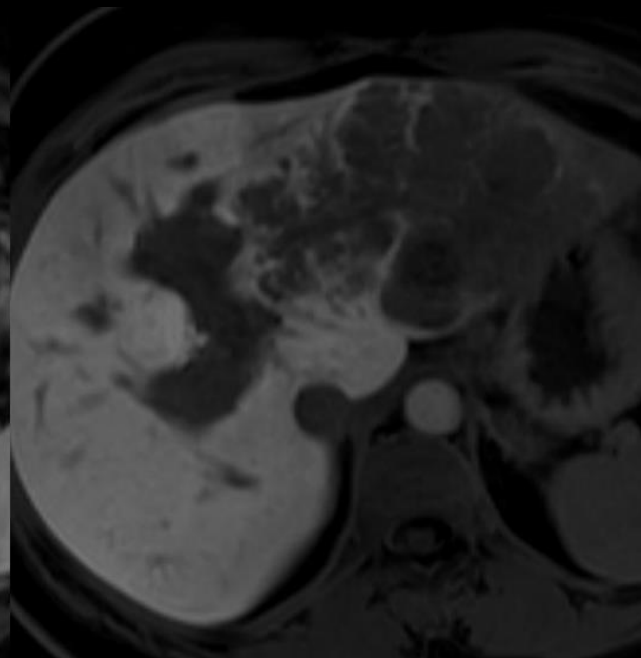
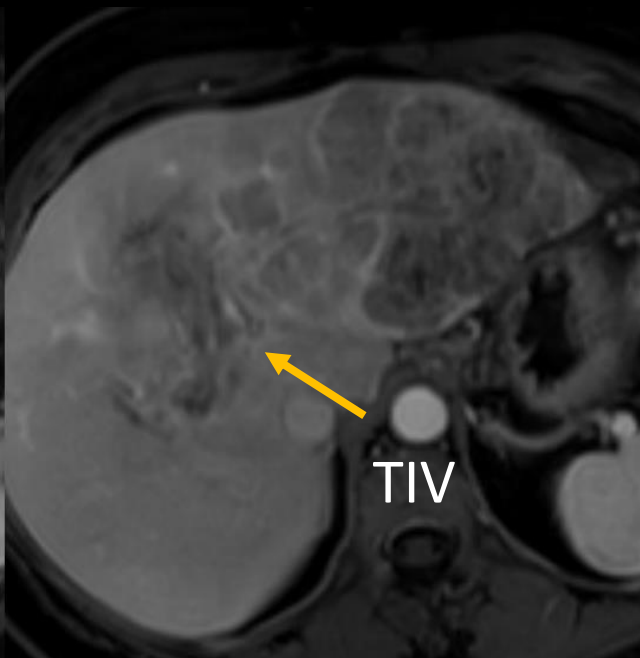
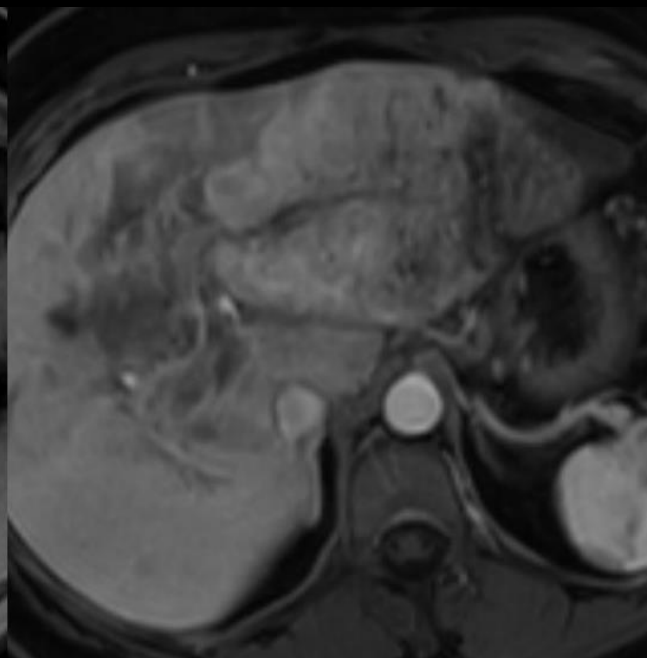
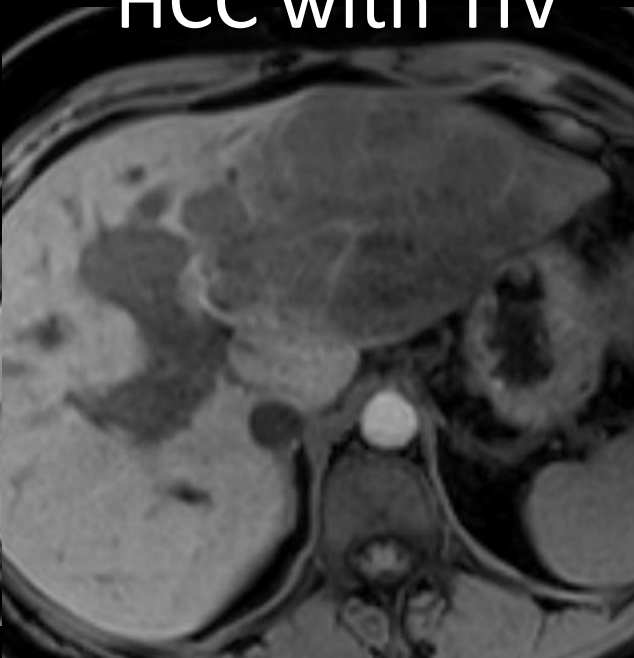
What is the most likely diagnosis?

- a. HCC with TIV
- b. Angiosarcoma
- c. Acute hepatitis
- d. Abscess

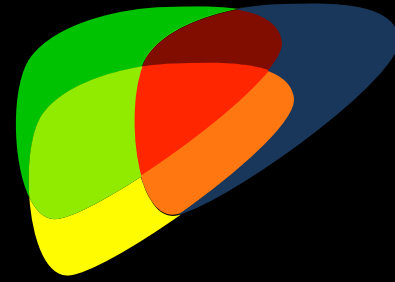
58 yo man with cirrhosis



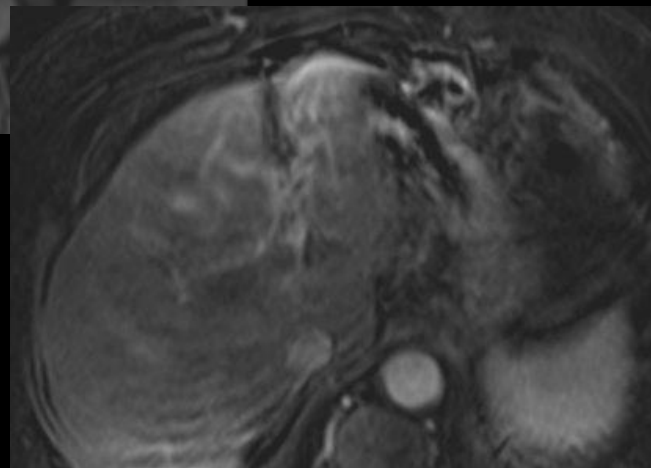
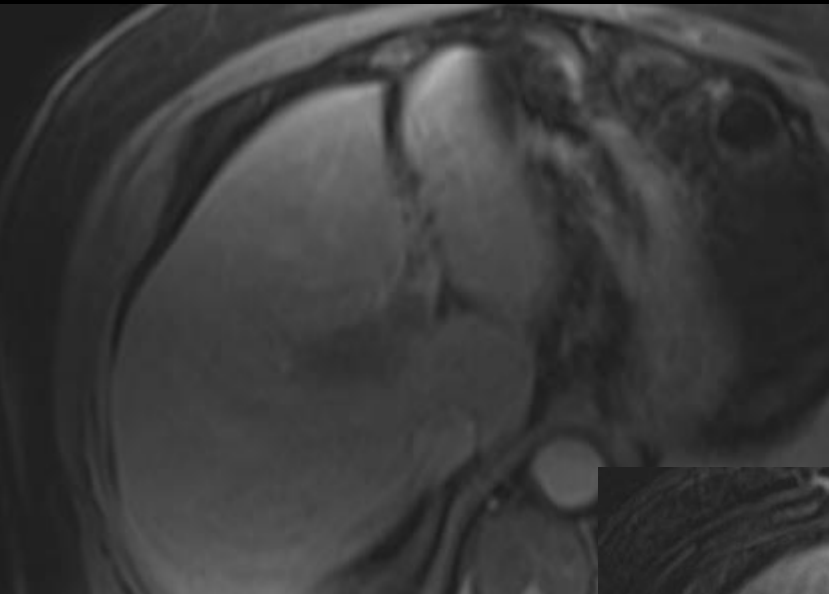
HCC with TIV



Exclude Advanced Disease



LR-TIV: Tumor in Vein



CT/MRI LI-RADS® v2018

Untreated observation without pathologic proof in patient at high risk for HCC

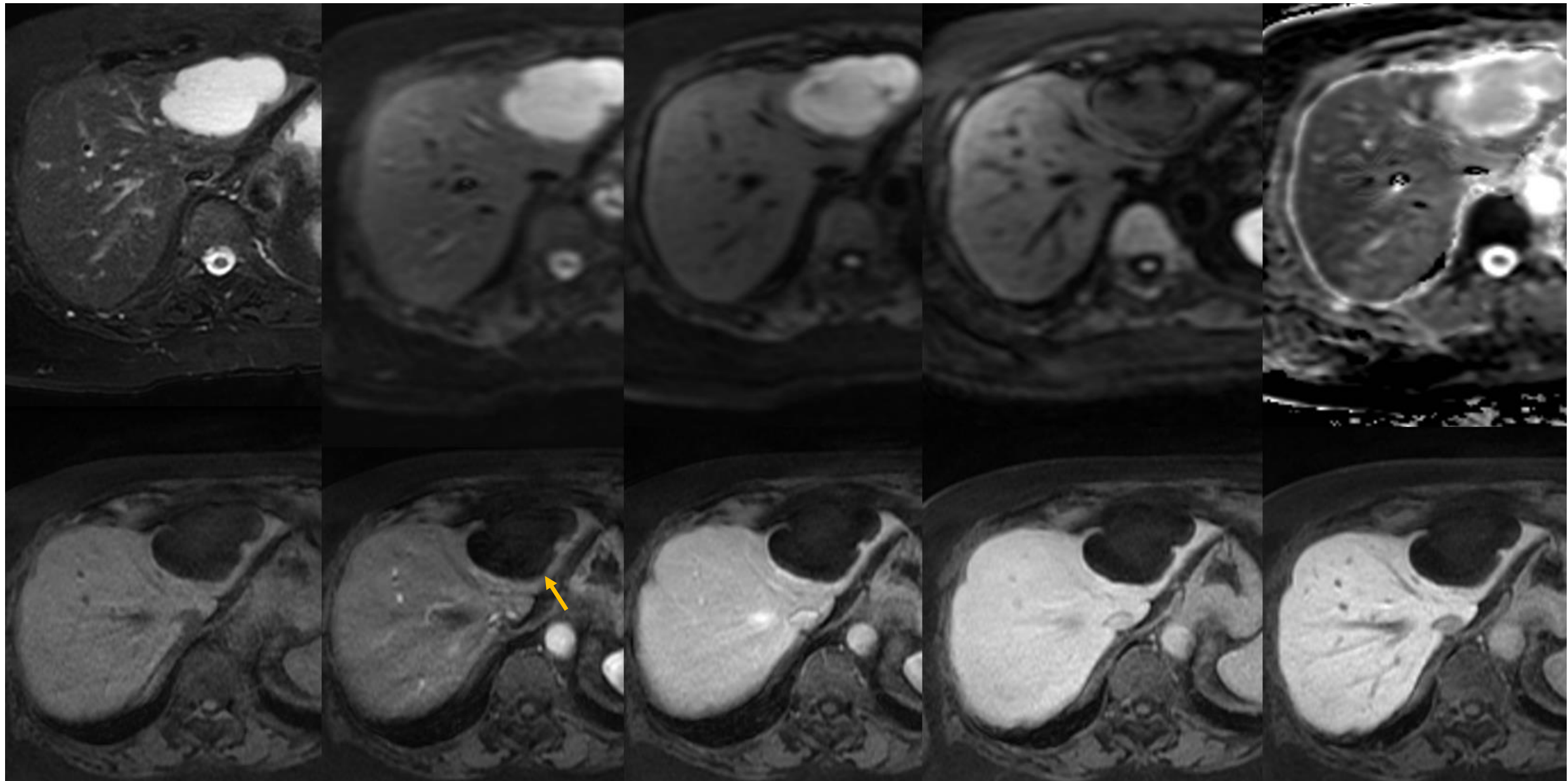
- If cannot be categorized due to image degradation or omission → LR-NC
- If definite tumor in vein (TIV) → **LR-TIV**
- If definitely benign → LR-1
- If probably benign → LR-2
- If probably or definitely malignant but not HCC specific (e.g., if targetoid) → LR-M

Otherwise, use CT/MRI diagnostic table below

- If intermediate probability of malignancy → LR-3
- If probably HCC → LR-4
- If definitely HCC → LR-5

Unequivocal enhancing tissue in vessel

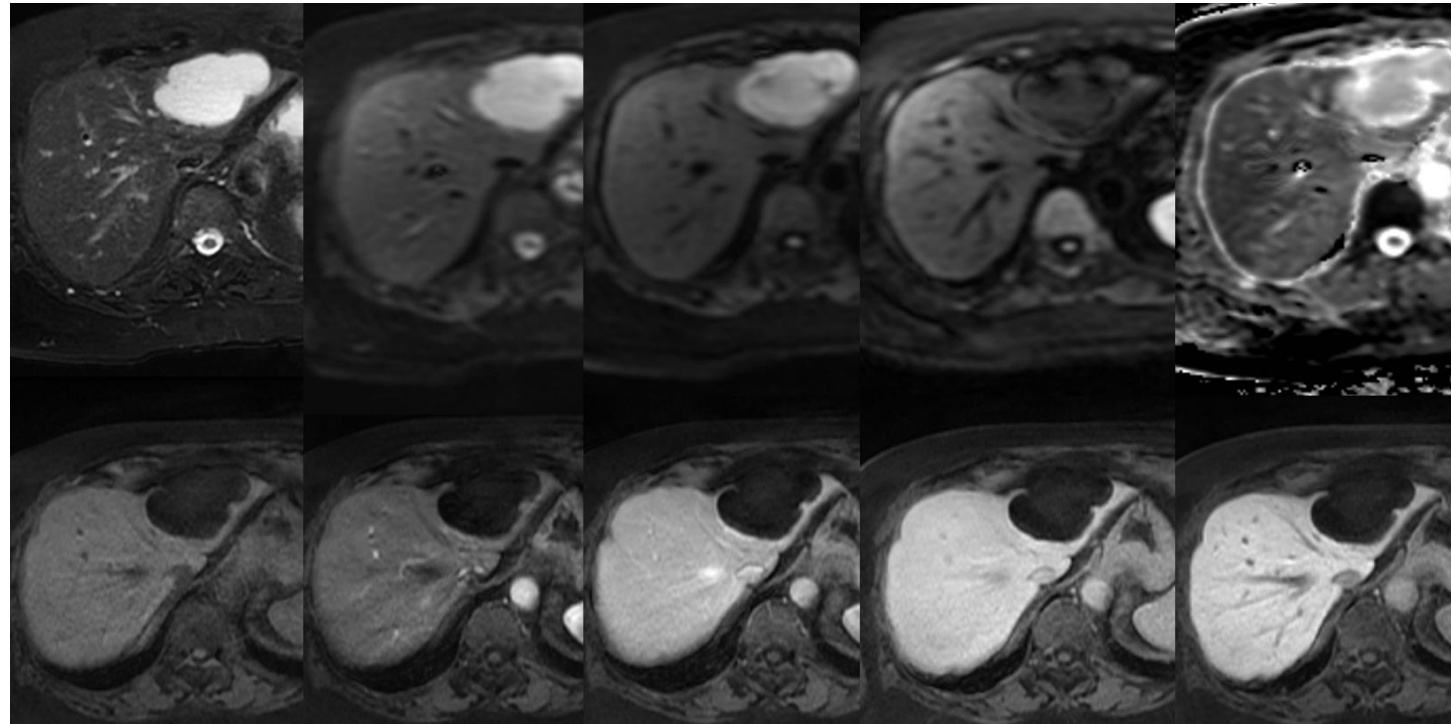
66 yo man with chronic HBV



What is the most likely diagnosis?

- a. HCC
- b. Angiosarcoma
- c. Hemangioma
- d. Cyst

66 yo man with chronic HBV

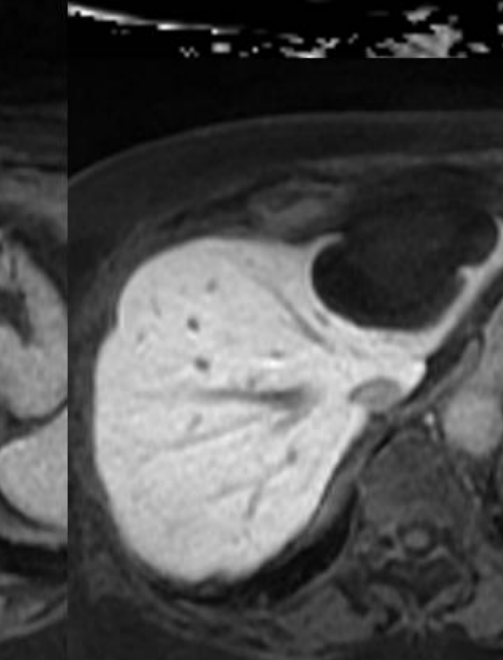
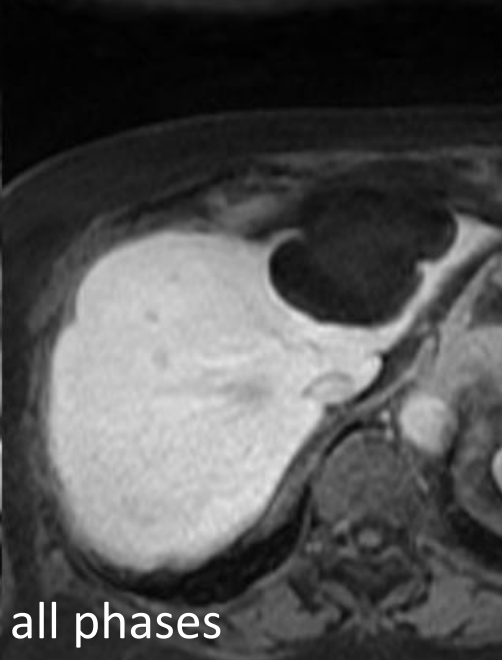
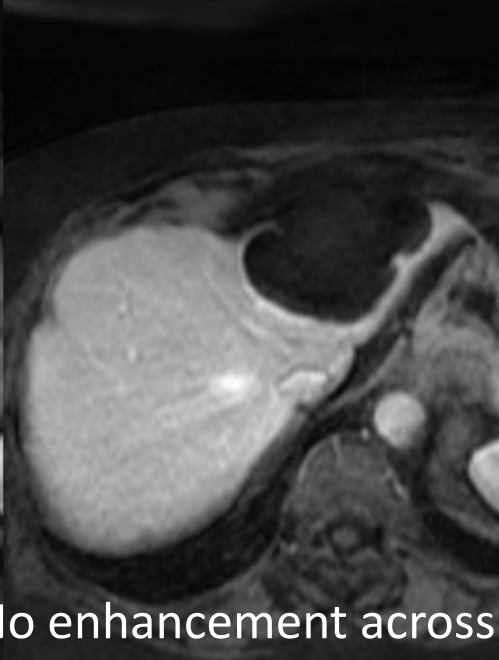
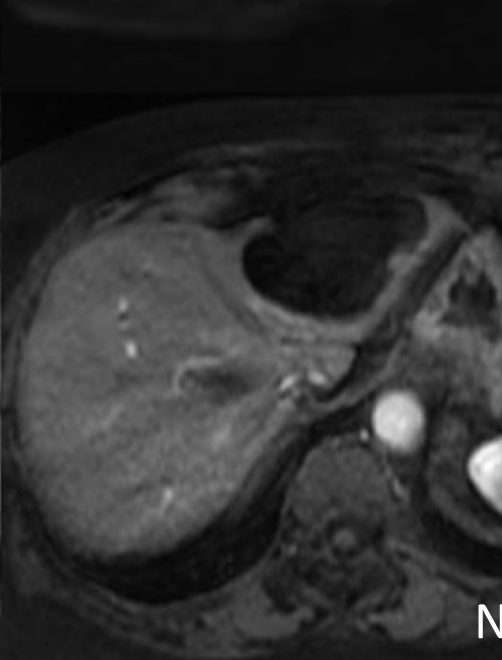
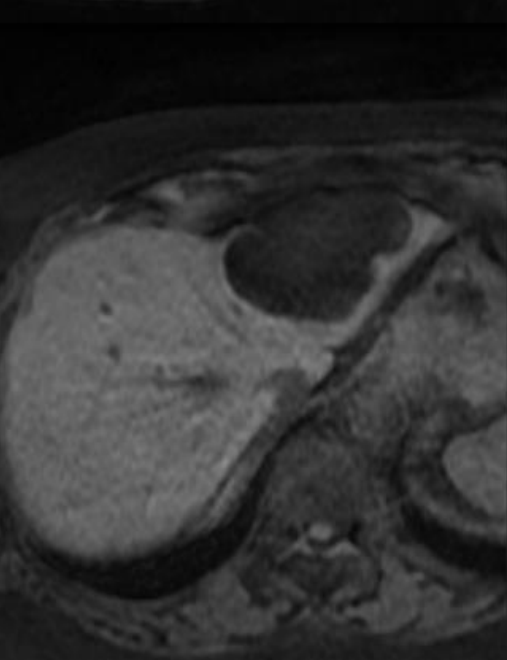
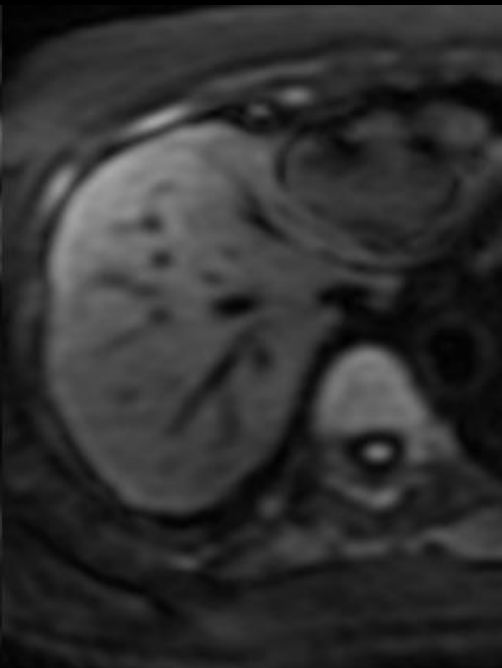
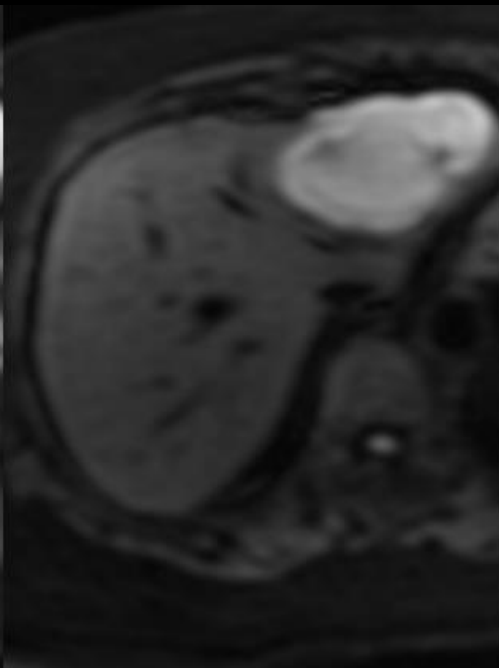
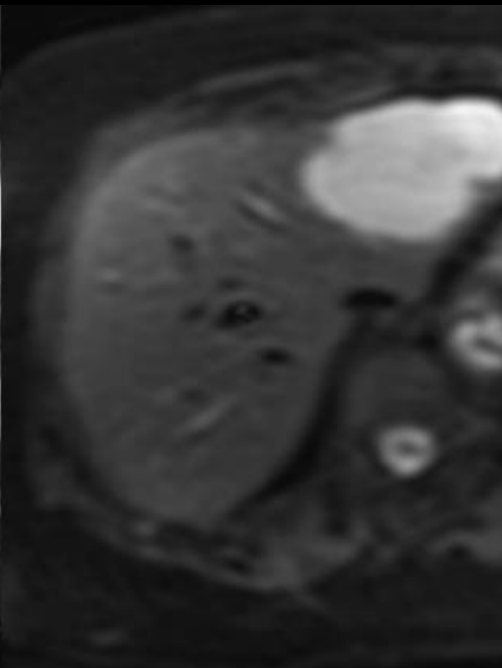
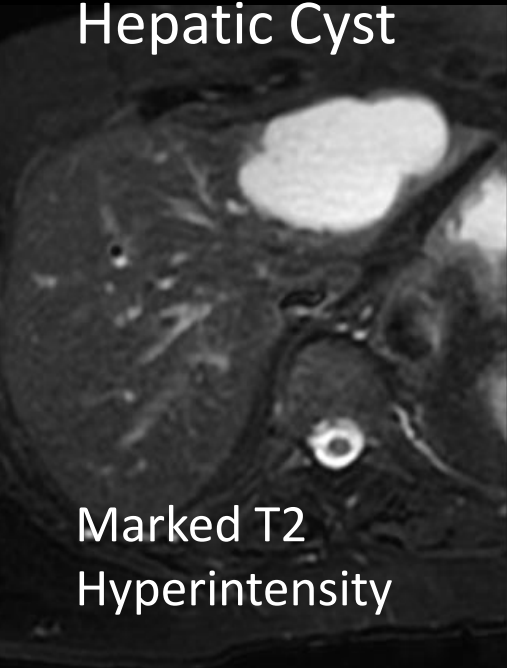


Hepatic Cyst

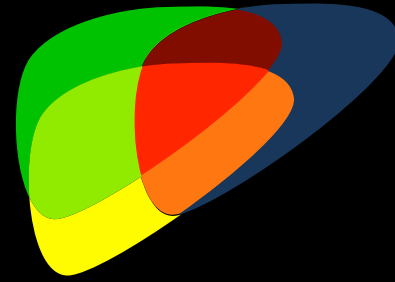
Marked T2
Hyperintensity

T2 shine through

No enhancement across all phases



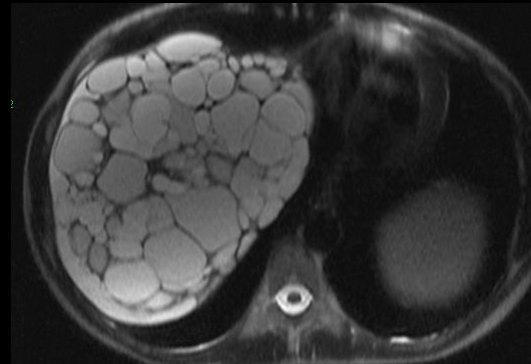
Rule out Benign disease



LR-1: Definitely Benign

LR-2: Probably Benign

- Cysts, hemangiomas, cirrhotic nodules, focal fat, perfusion abnormalities



CT/MRI LI-RADS® v2018

Untreated observation without pathologic proof in patient at high risk for HCC

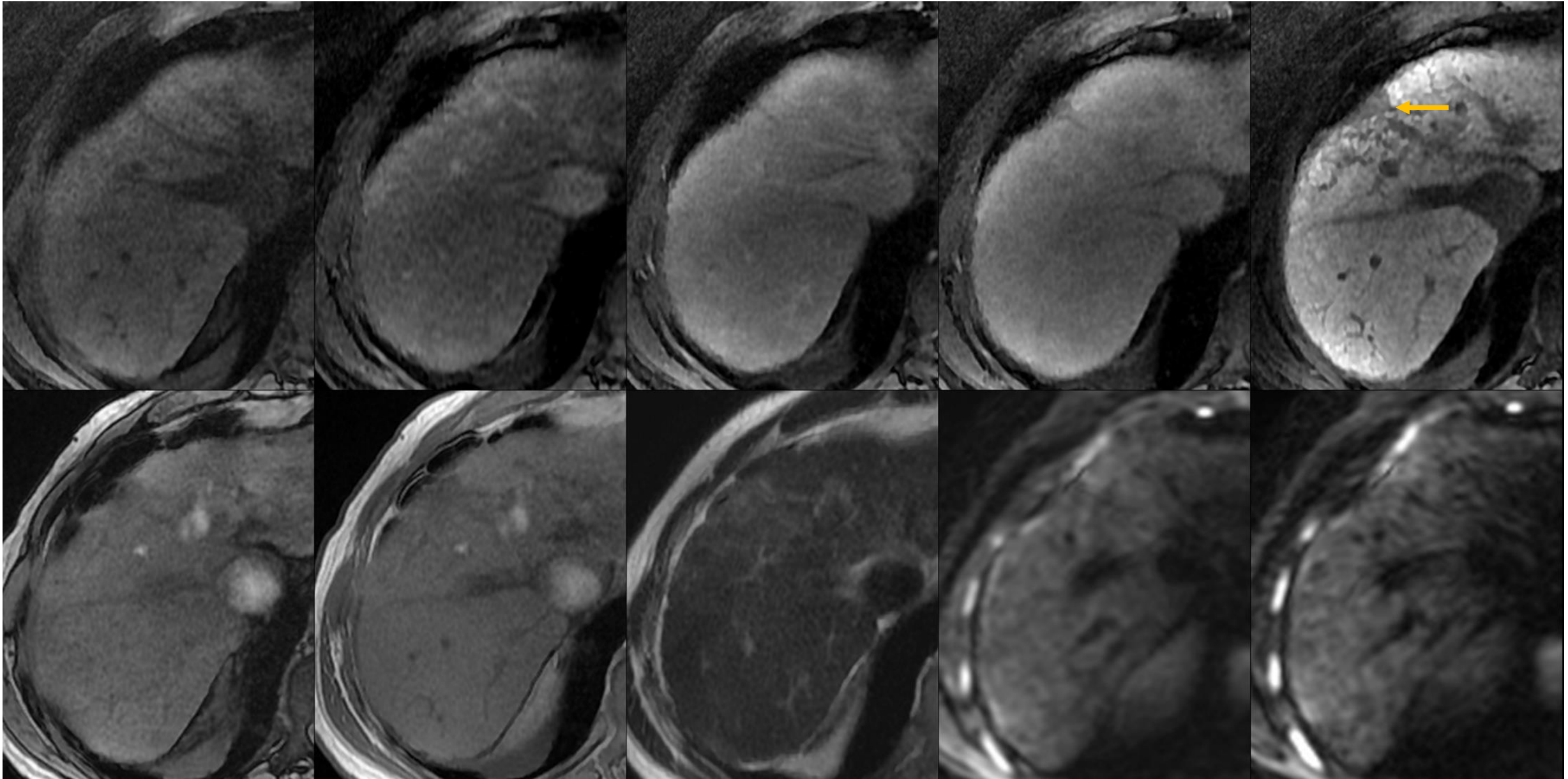
If cannot be categorized due to image degradation or omission	LR-NC
If definite tumor in vein (TIV)	LR-TIV
If definitely benign	LR-1
If probably benign	LR-2
If probably or definitely malignant but not HCC specific (e.g., if targetoid)	LR-M

Otherwise, use CT/MRI diagnostic table below

If intermediate probability of malignancy	LR-3
If probably HCC	LR-4
If definitely HCC	LR-5



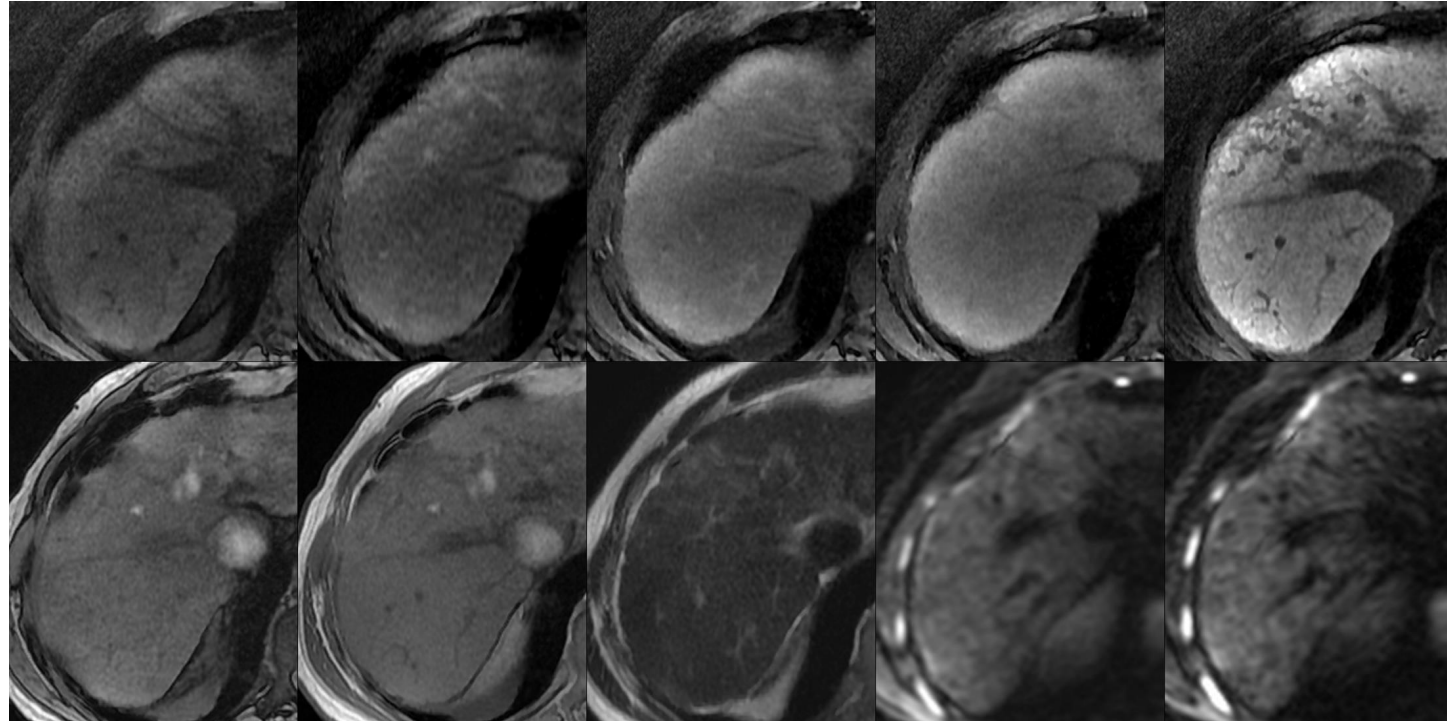
74 yo woman with cryptogenic cirrhosis



What is the most likely diagnosis?

- a. HCC
- b. ICC
- c. Confluent fibrosis
- d. Focal fatty infiltration

74 yo woman with cryptogenic cirrhosis



Confluent fibrosis

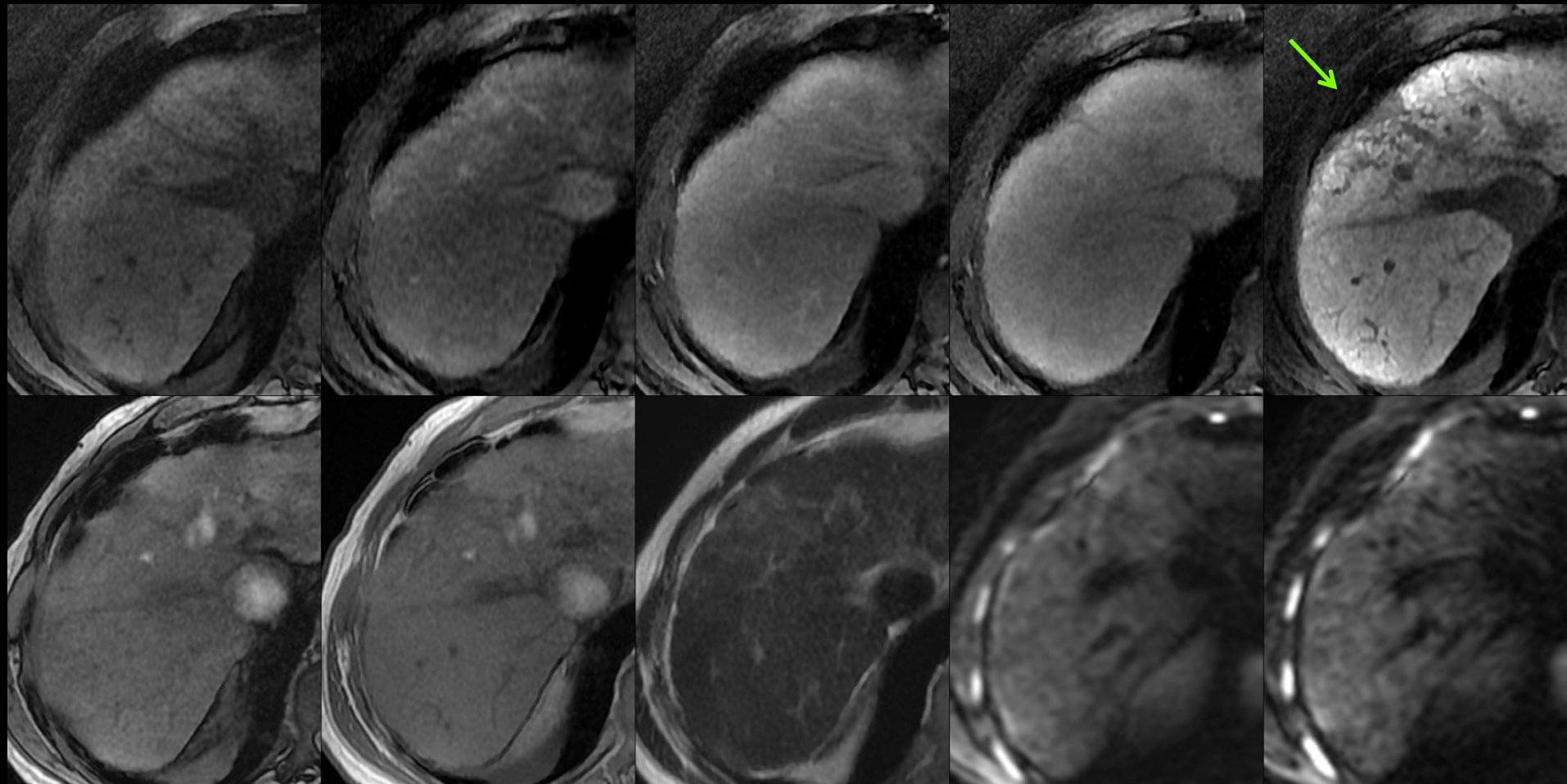
Pre

AP

PVP

TP

HBP



T1w OP TE 5.8

T1w IP TE 2.2

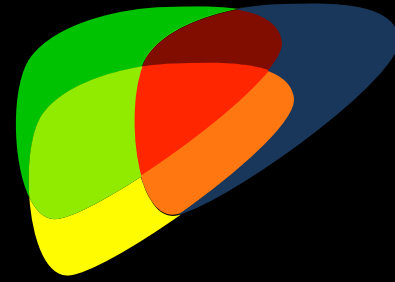
T2w

DWI b=500

DWI b=1000

case courtesy of Eduardo Costa

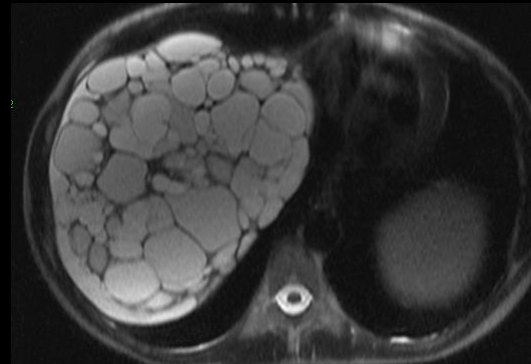
Rule out Benign disease



LR-1: Definitely Benign

LR-2: Probably Benign

- Cysts, hemangiomas, cirrhotic nodules, focal fat, perfusion abnormalities



CT/MRI LI-RADS® v2018

Untreated observation without pathologic proof in patient at high risk for HCC

If cannot be categorized due to image degradation or omission	LR-NC
If definite tumor in vein (TIV)	LR-TIV
If definitely benign	LR-1
If probably benign	LR-2
If probably or definitely malignant but not HCC specific (e.g., if targetoid)	LR-M

Otherwise, use CT/MRI diagnostic table below

If intermediate probability of malignancy	LR-3
If probably HCC	LR-4
If definitely HCC	LR-5



Confluent fibrosis

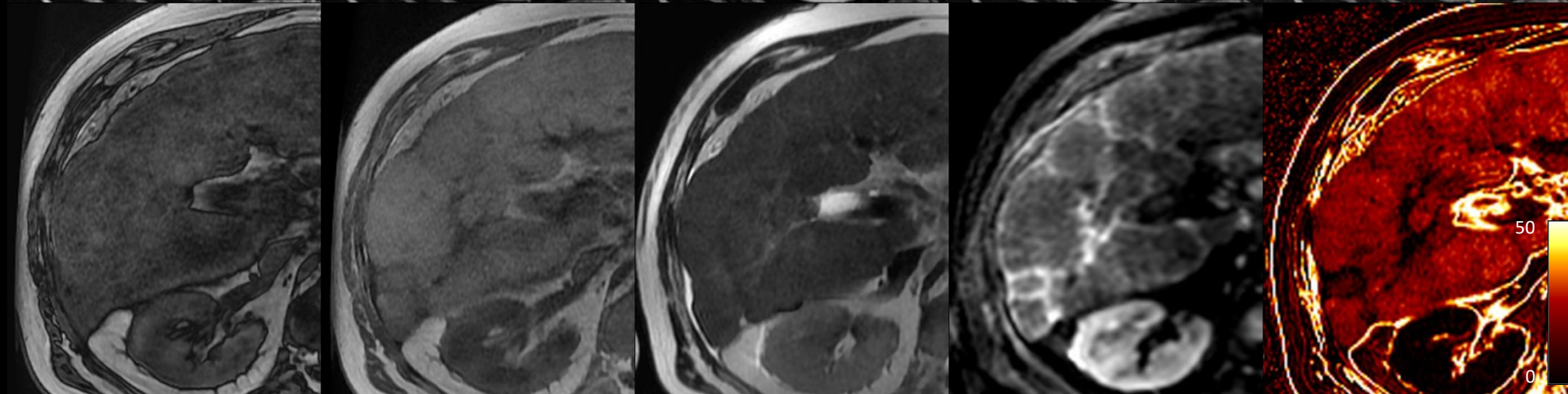
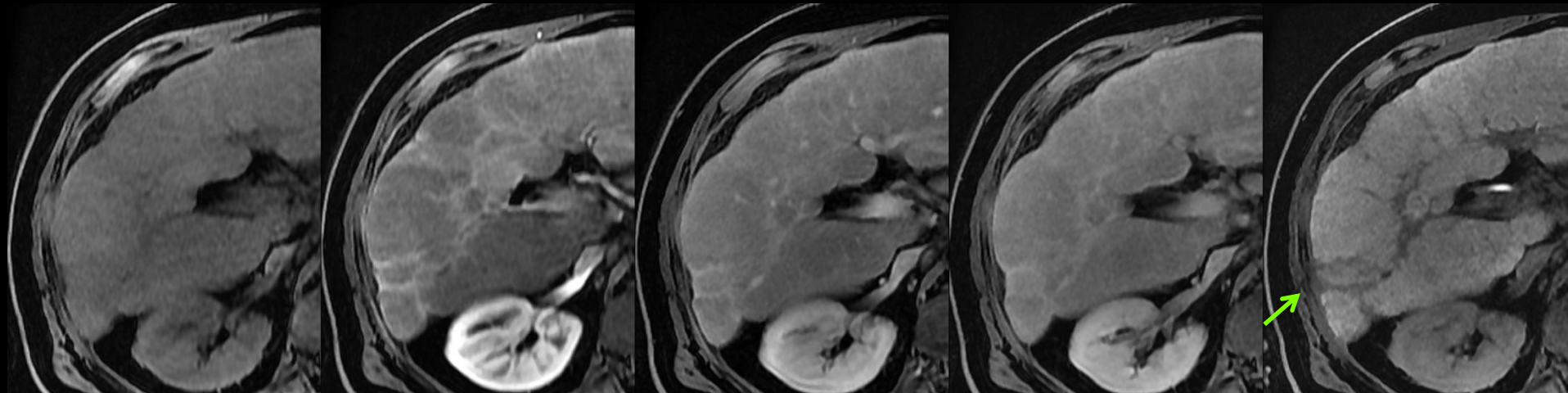
Pre

AP

PVP

TP

HBP



T1w OP TE 1.3

T1w IP TE 2.7

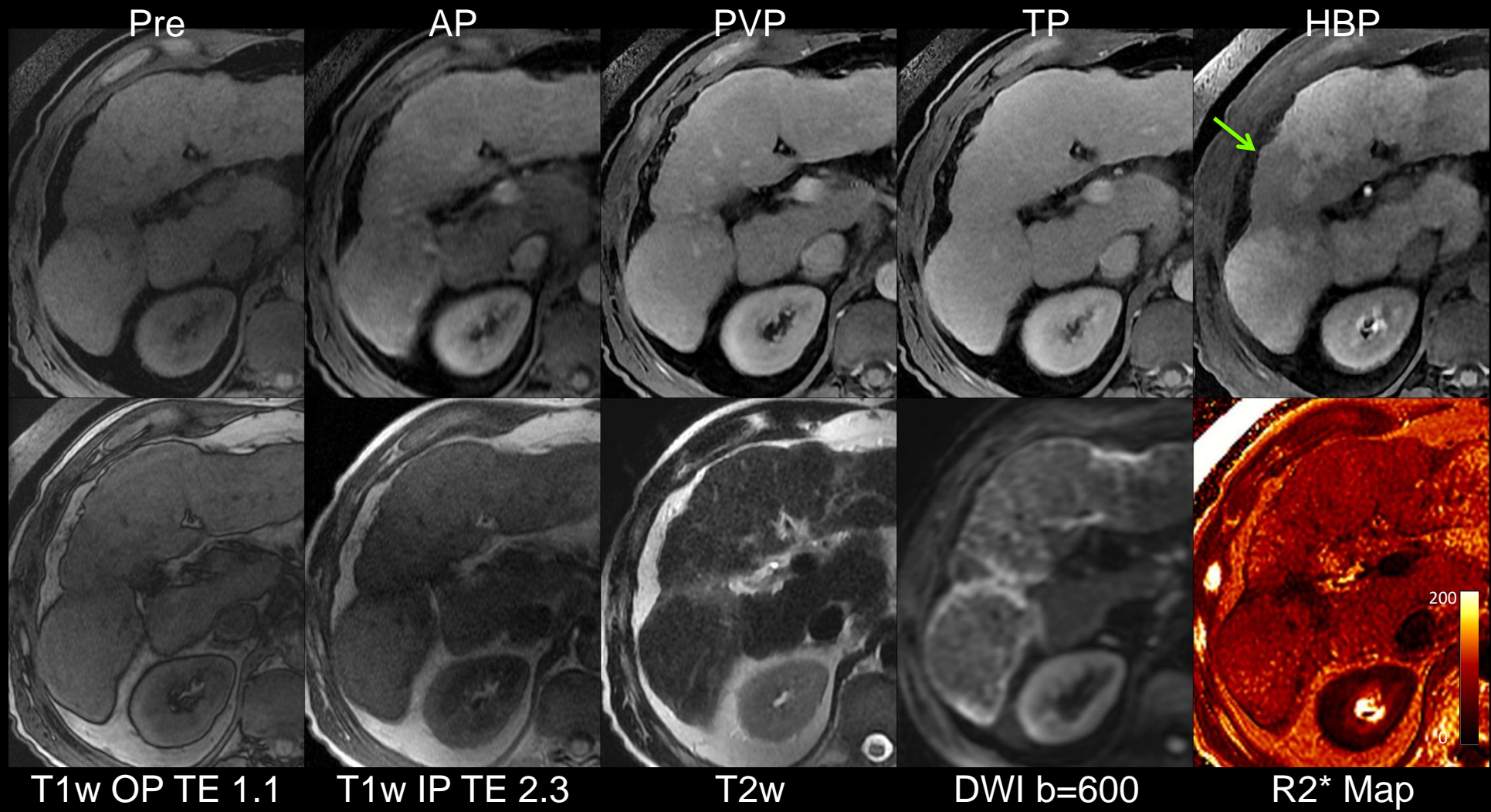
T2w

DWI b=500

Fat Fraction Map

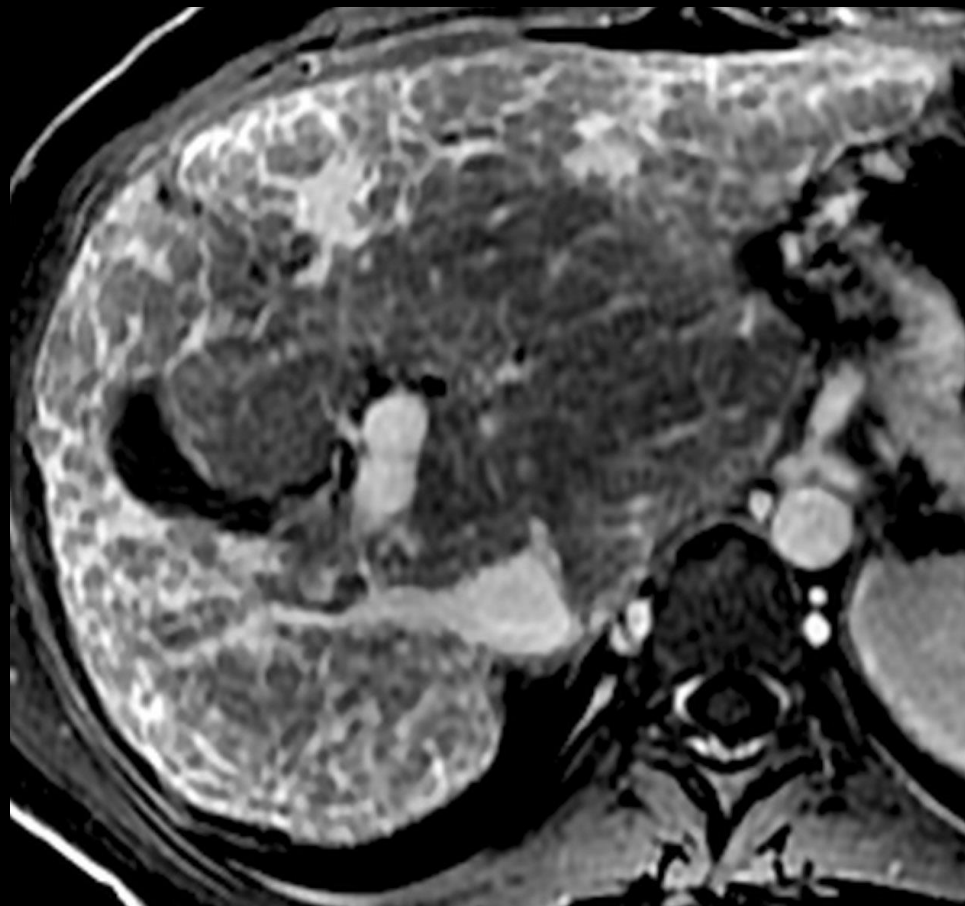
case courtesy of Eduardo Costa

Confluent fibrosis

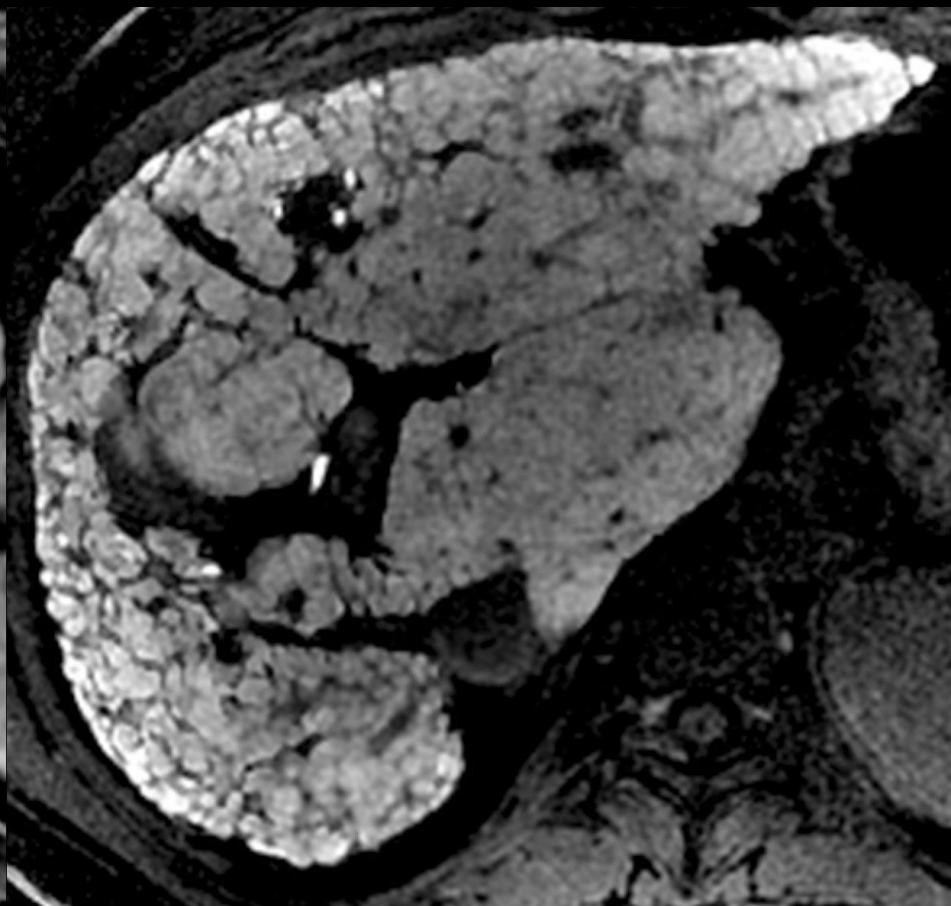


case courtesy of Eduardo Costa

5 minutes after ECA

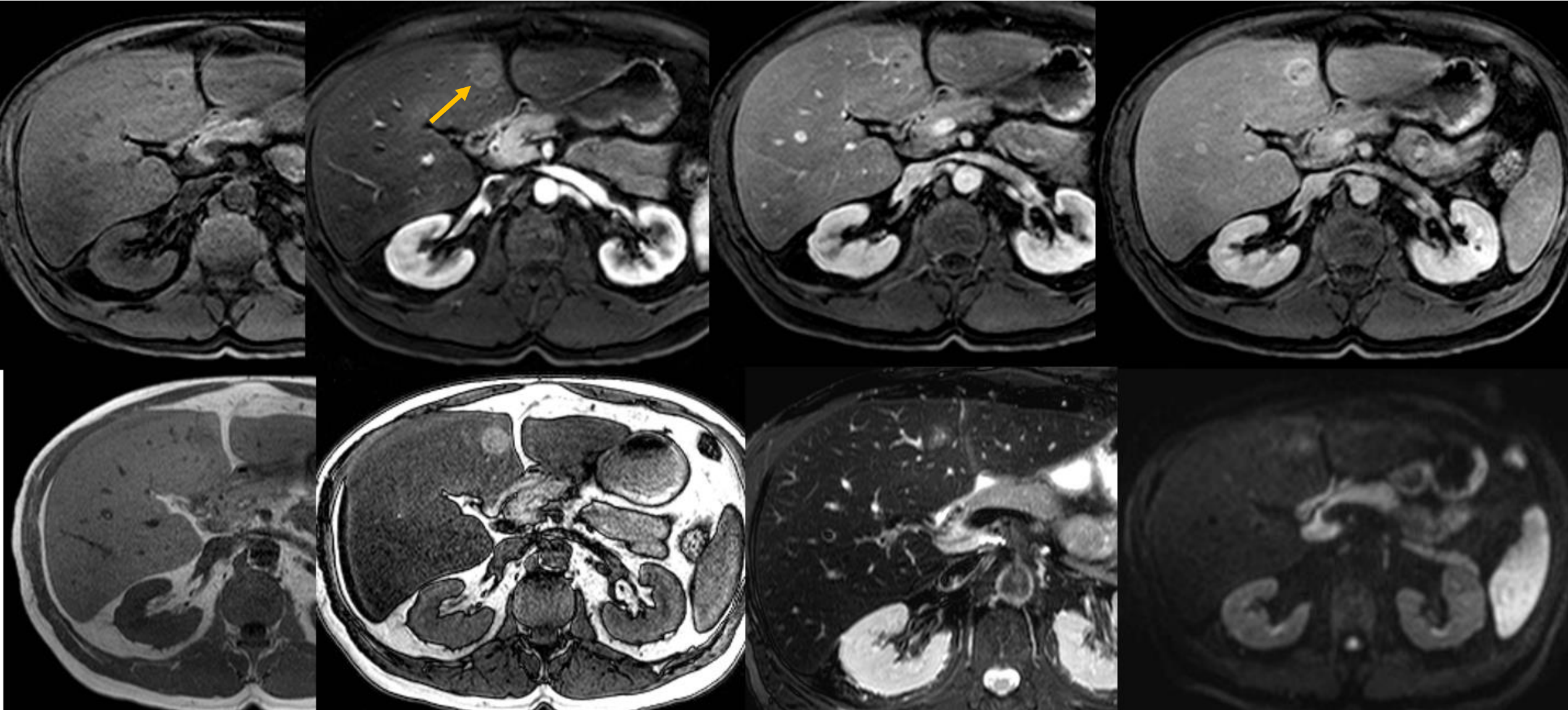


20 minutes after gadoxetic acid



case courtesy of Claude Sirlin

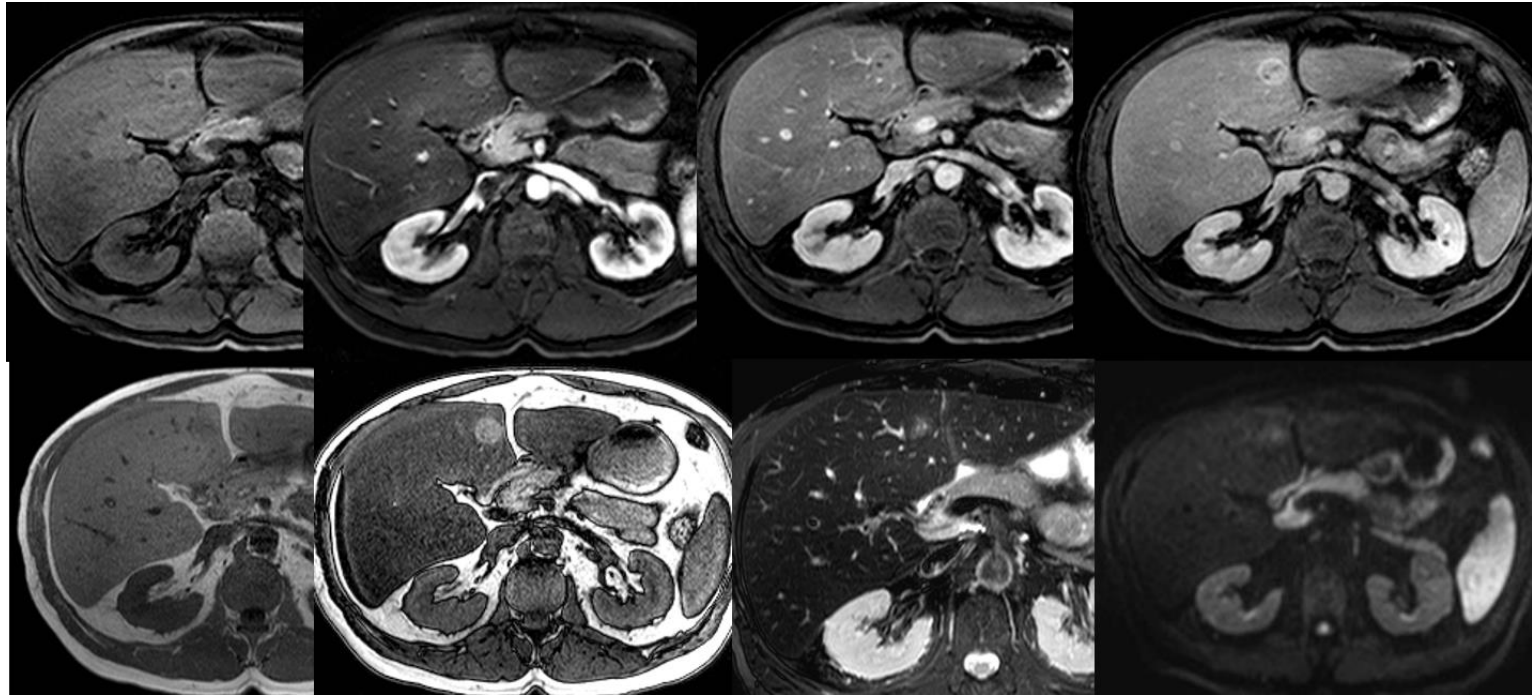
35 yo woman with NAFLD



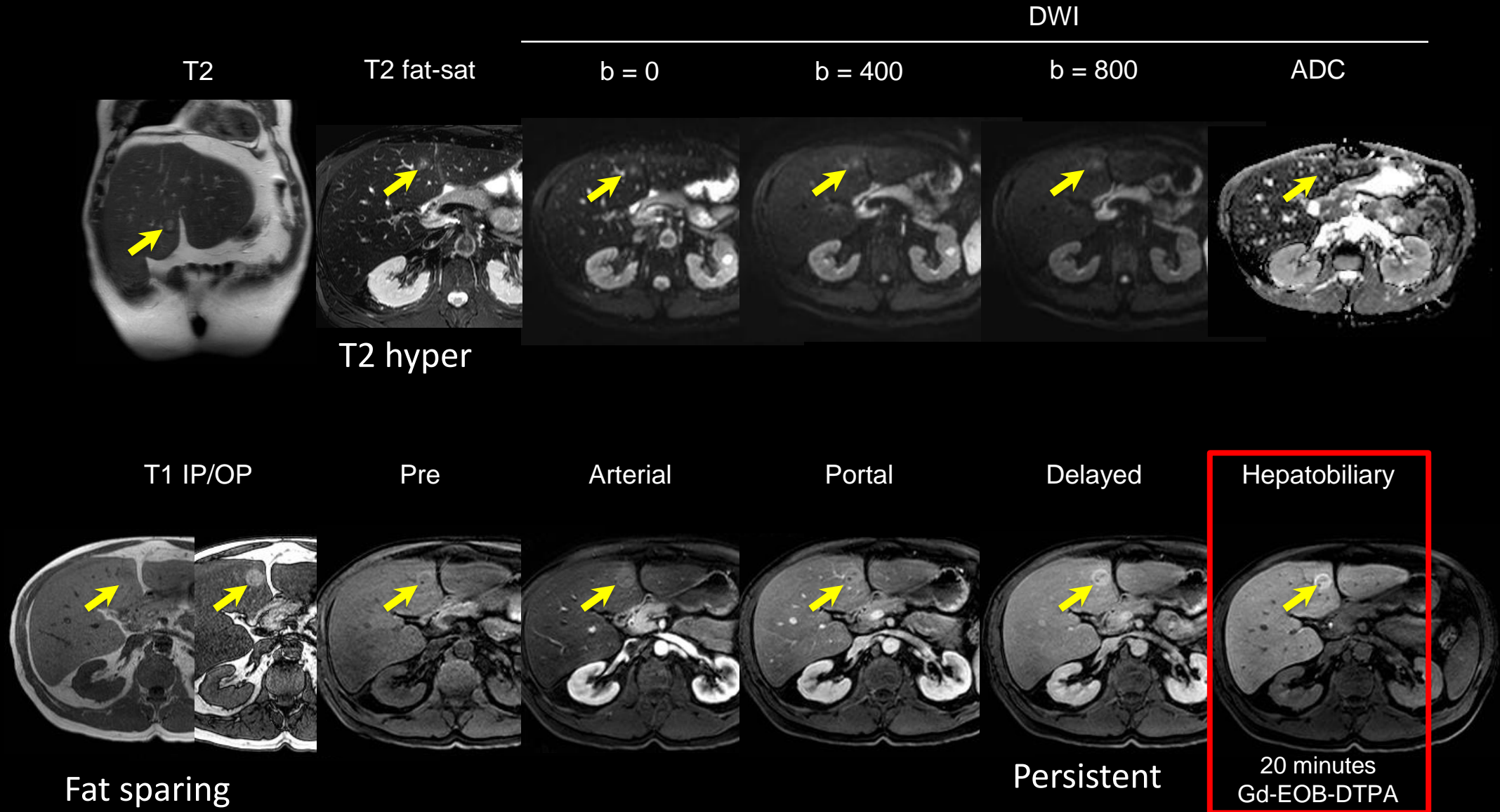
What is the most likely diagnosis?

- a. HCC
- b. ICC
- c. HCA
- d. FNH

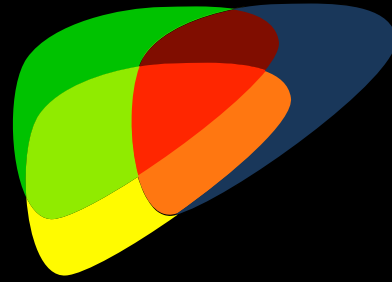
35 yo woman with NAFLD



β -catenin adenoma and glycogenosis (not a LI-RADS case)



Specific Diagnosis only in certain patients



Population with high pre-test probability of HCC

“High risk” population



APPLY LI-RADS

Cirrhosis
Hepatitis B viral infection
Current or prior HCC



DO NOT APPLY

Children < 18
Cirrhosis due to vascular etiology, cardiac disease, or
congenital hepatic fibrosis

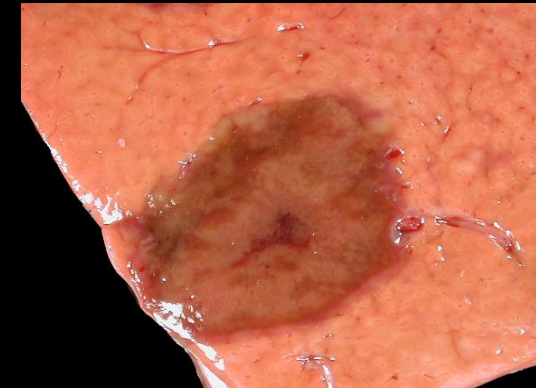
Several subtypes but 3 imaging aspects

Inflammation
45%

HNF1A
40%

β -catenin
8%

Unclassified
7%



Arterial enhancement

T2 hyperintensity

Signal drop out on OP

Washout

Delayed contrast retention

Lower signal on Fat sat images

Capsule

Heterogeneity

Bleeding

Fat content

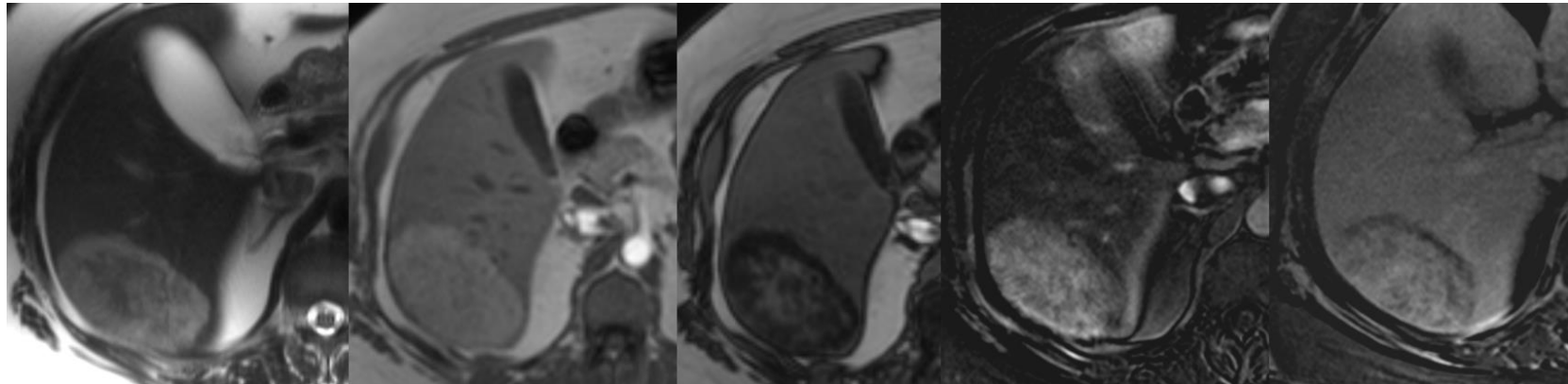
32 yo woman with NAFLD



What is the most likely diagnosis?

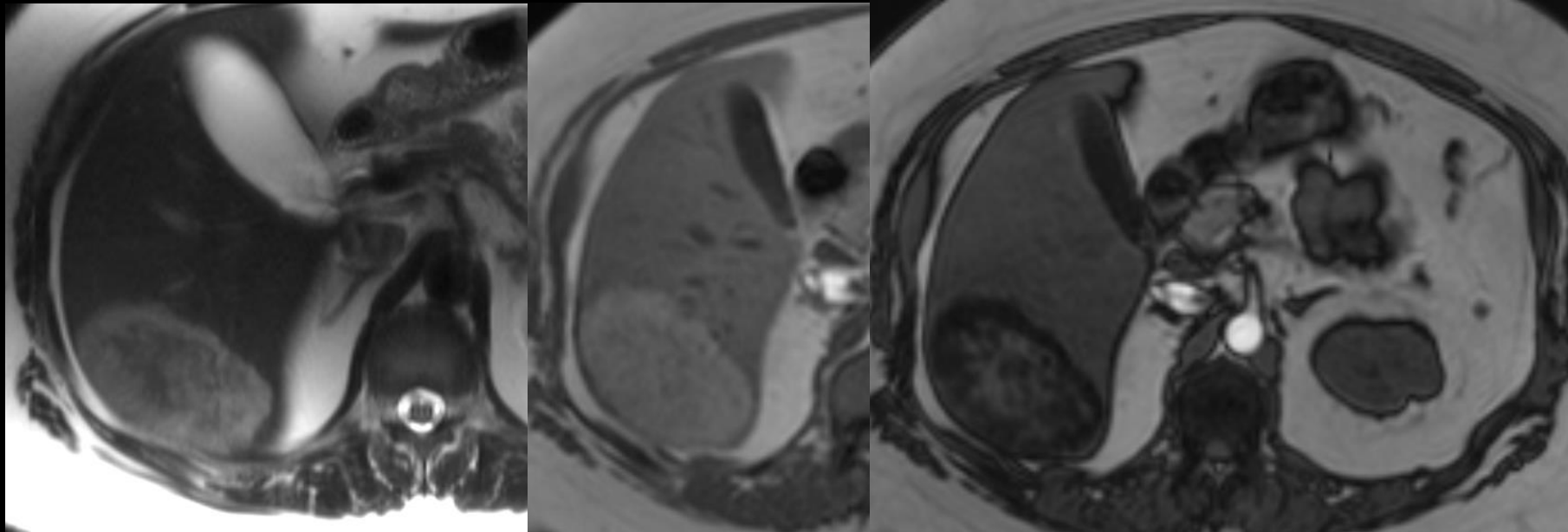
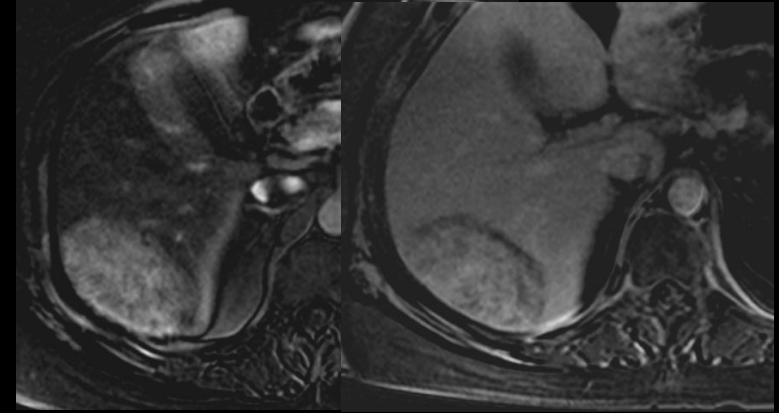
32 yo woman with NAFLD

- a. HCC
- b. ICC
- c. HCA
- d. FNH

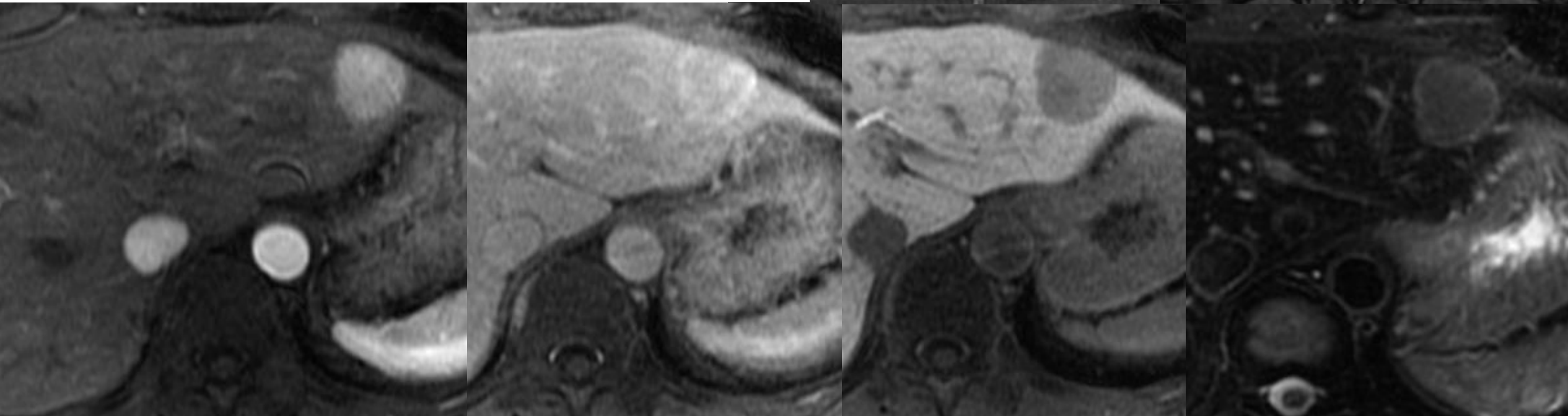
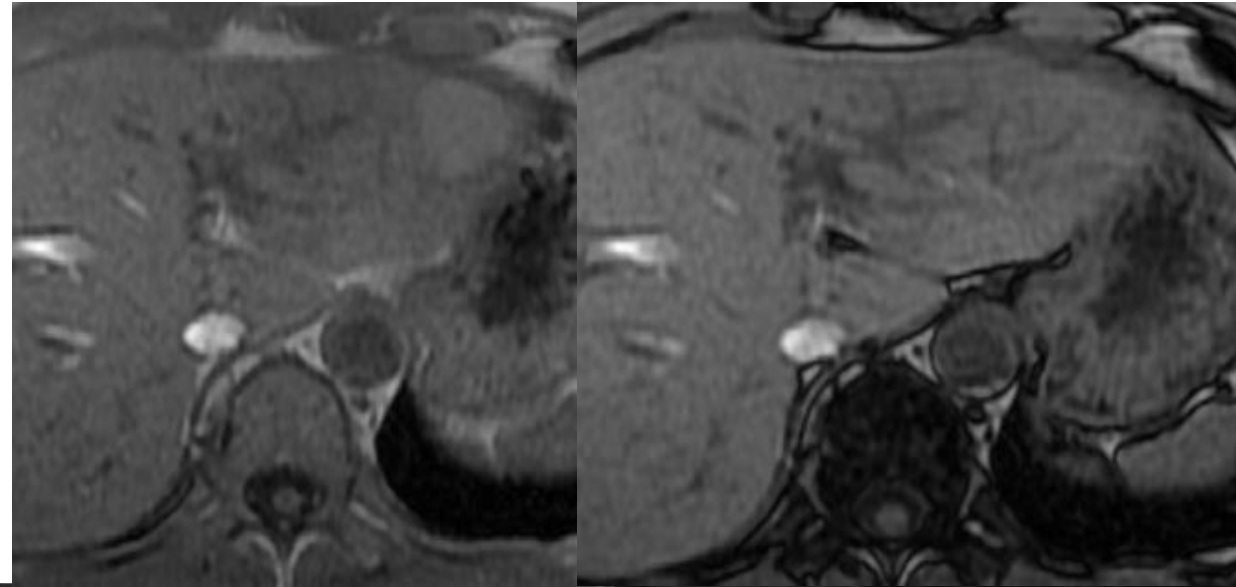


HNF-1 α mutated (HHCA)

- Diffuse intravoxel fat content.
- *Beta catenin activation excluded.*



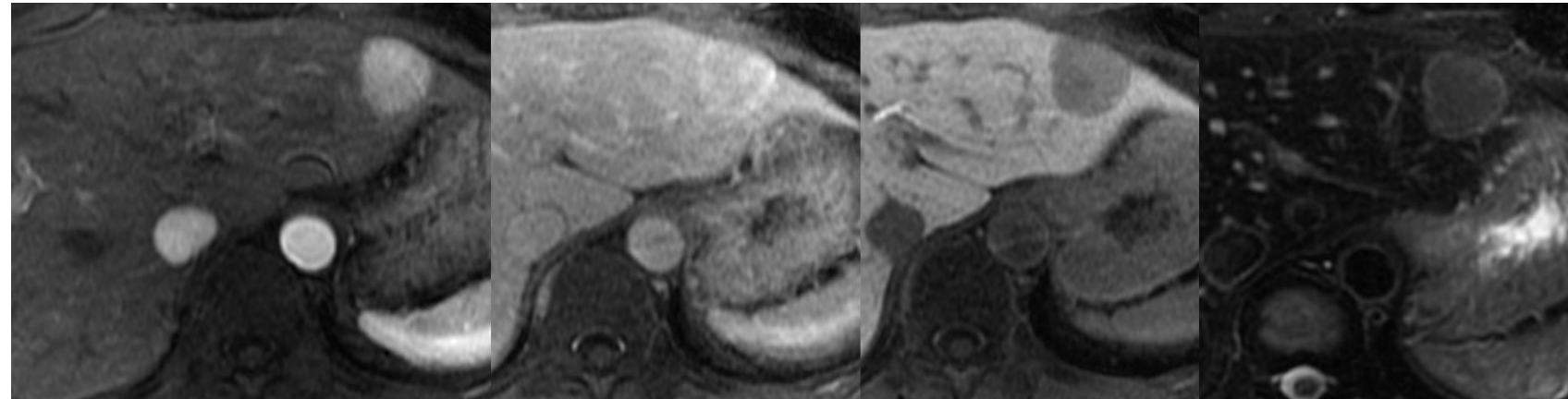
28 yo woman with NAFLD



What is the most likely diagnosis?

28 yo woman with NAFLD

- a. HCC
- b. HCA
- c. FNH
- d. Hemangioma



Inflammatory Adenoma (IHCA)

T2 hyperintense-Atoll Sign

Sustained enhancement

+/- central retention on HBP

