

AMSER Case of the Month: December 2025

81-year-old male with an incidentally discovered hepatic mass

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Patient Presentation

HPI: 81-year-old male with a significant past medical history of prostate cancer (EOT 2021), history of SCC (mohs 2017), and multiple comorbidities, as well as a history of smoking, who underwent chest CT for surveillance of a known pulmonary nodule.

PMH: HTN, HLD, DM II, OSA, spinal stenosis, vertebrobasilar insufficiency, recurrent TIA, history of prostate cancer, history of SCC (mohs 7/2017)

SHx: Prior heavy alcohol use (sober 38 years), smoking history (quit 1967)

Findings: CT Chest 7/2025 incidentally demonstrated an incompletely imaged 8.5 x 7.2 cm well-circumscribed hepatic mass. Growth: 4.7 x 4.3 cm (12/2023) → 6.8 x 5.4 cm (7/2024) → 8.5 cm (7/2025)

Findings (unlabeled)



CT Chest, Coronal Non-Contrast

Findings (labeled)



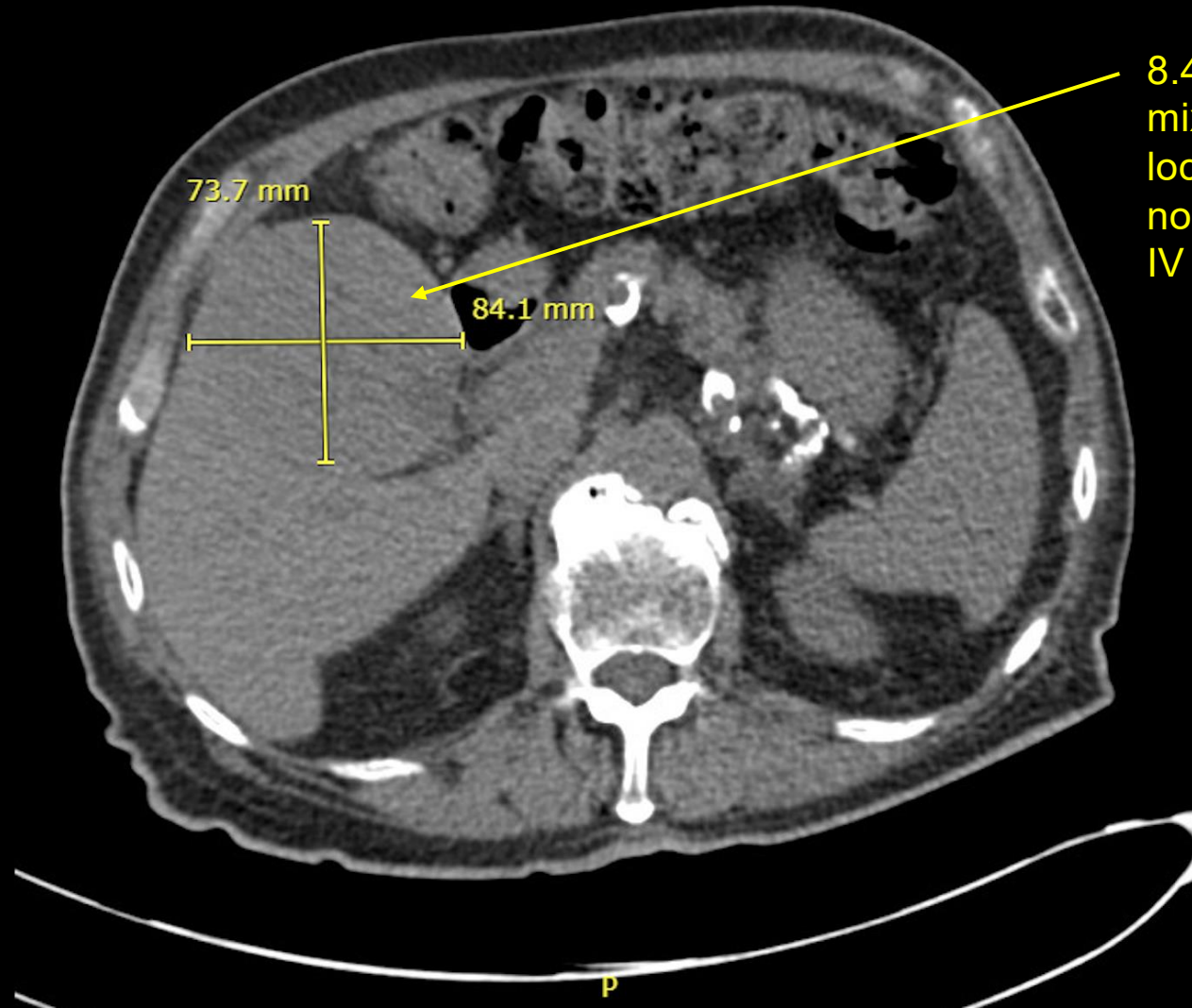
CT Chest, Coronal Non-Contrast

Incompletely imaged 8.5 x 7.2 cm well-circumscribed hepatic mass

Findings: (unlabeled)



Findings: (labeled)



CT Chest, Axial Non-contrast

8.4 x 7.2 cm well-circumscribed mixed-density hepatic mass located superior to the gallbladder, not optimally characterized without IV contrast.

Patient Presentation

Symptoms: Asymptomatic. Denies abdominal pain, jaundice, N/V, or weight loss. Reports mild constipation and easy bruising

Liver Function: No history of cirrhosis. Hepatitis B and C negative

Tumor Markers: AFP 1.43-1.79 ng/ml (normal <9) and CA 19-9: 17 U/mL (normal <36)

ROS: Negative

Physical Exam: Unremarkable

Skin: Skin color, texture, turgor normal. No rashes or lesions.

Eyes: Anicteric sclera. Pupils are equally round and reactive to light. Extraocular movements are intact.

Lymph Nodes: No cervical, supraclavicular, axillary or inguinal adenopathy.

Oropharynx: Lips, mucosa, and tongue normal.

Back: No pain to percussion. Negative SLR test

Lungs: clear to auscultation, No wheezing or rhonchi

Heart: RRR without murmur, gallop, or rubs.

Abdomen soft, non-tender. No masses, organomegaly

Extremities: No deformities. No edema

Neuro: Gait and speech normal. Reflexes normal and symmetric. Muscular strength intact. Sensation grossly intact.

What Imaging Should We Order?

Select the applicable ACR Appropriateness Criteria

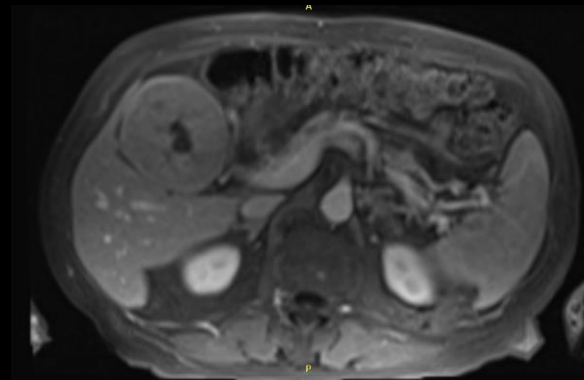
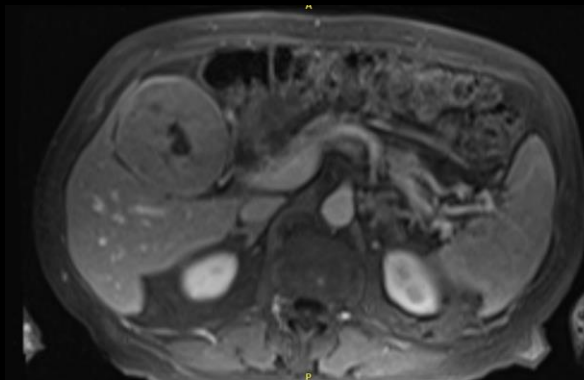
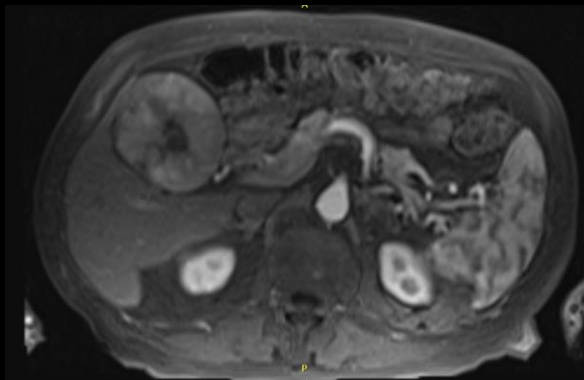
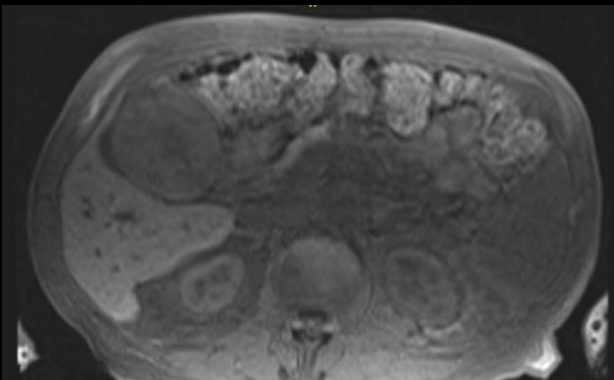
Variant 2:

Indeterminate, greater than 1 cm liver lesion on initial imaging with CT (noncontrast or single-phase) or noncontrast MRI. Normal liver. No suspicion or evidence of extrahepatic malignancy or underlying liver disease.

Procedure	Appropriateness Category	Relative Radiation Level
MRI abdomen without and with IV contrast	Usually Appropriate	○
CT abdomen with IV contrast multiphase	Usually Appropriate	☼☼☼
US abdomen	May Be Appropriate (Disagreement)	○
US abdomen with IV contrast	May Be Appropriate	○
Image-guided biopsy liver	Usually Not Appropriate	Varies
Liver spleen scan	Usually Not Appropriate	☼☼☼
RBC scan abdomen and pelvis	Usually Not Appropriate	☼☼☼
CT abdomen without and with IV contrast	Usually Not Appropriate	☼☼☼☼
DOTATATE PET/CT skull base to mid-thigh	Usually Not Appropriate	☼☼☼
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	☼☼☼☼
Ocotreotide scan with SPECT or SPECT/CT chest and abdomen	Usually Not Appropriate	☼☼☼☼

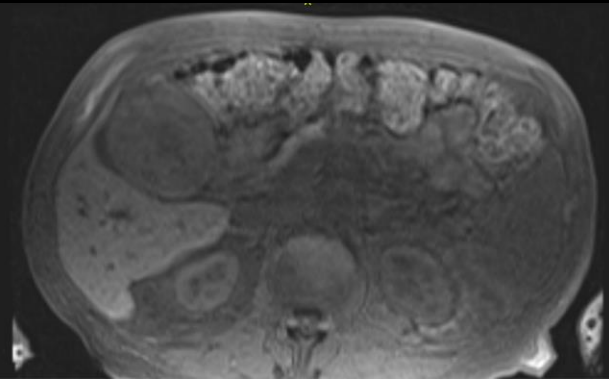
Based on the CT findings, an MRI abdomen without and with IV contrast was recommended by the radiologist for further evaluation.

Findings: (unlabeled)

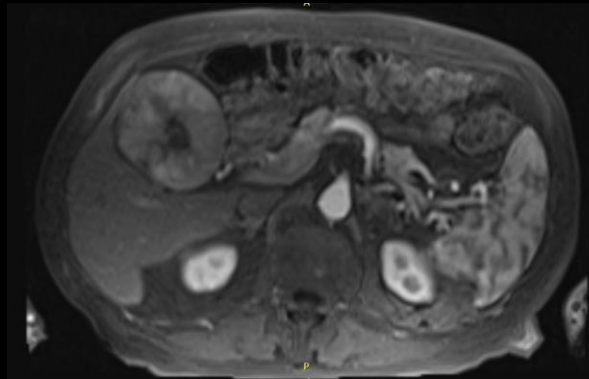


Findings: (labeled)

MRI Liver T1-weighted, Axial

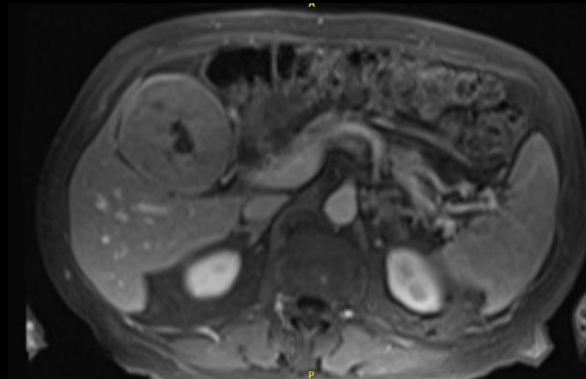


Pre-contrast



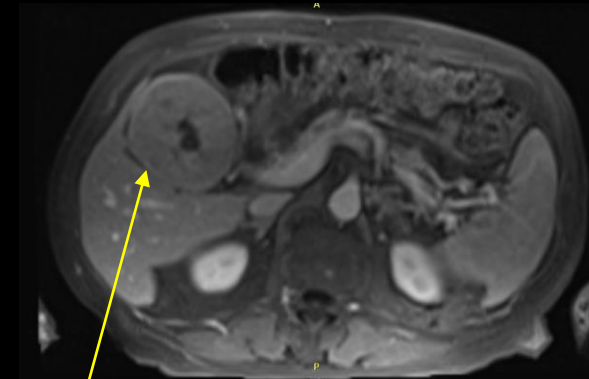
Arterial Phase

Marked hyperenhancement of the lesion relative to background liver due to the tumor's arterial vascularization



Portal Venous Phase

Relative hypointensity due to washout



Delayed Phase

Peripheral capsule Appearance

Imaging Suggests HCC, but Can We Diagnose It on Imaging Alone?

Select the applicable ACR Appropriateness Criteria

Variant 2:

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Image-guided biopsy liver	Usually Not Appropriate	Varies
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RBC scan abdomen and pelvis	Usually Not Appropriate	⊕⊕⊕
CT abdomen without and with IV contrast	Usually Not Appropriate	⊕⊕⊕⊕
DOTATATE PET/CT skull base to mid-thigh	Usually Not Appropriate	⊕⊕⊕
FDG-PET/CT skull base to mid-thigh	Usually Not Appropriate	⊕⊕⊕⊕
Octreotide scan with SPECT or SPECT/CT chest and abdomen	Usually Not Appropriate	⊕⊕⊕⊕

Image-guided biopsy may be necessary to establish the diagnosis, particularly when the imaging features on MRI indicate the possibility of malignancy.

For patients without cirrhosis, a liver biopsy is required for diagnosis. [3]

Pathology Findings

Percutaneous ultrasound-guided core needle biopsy of central liver mass 8/2025

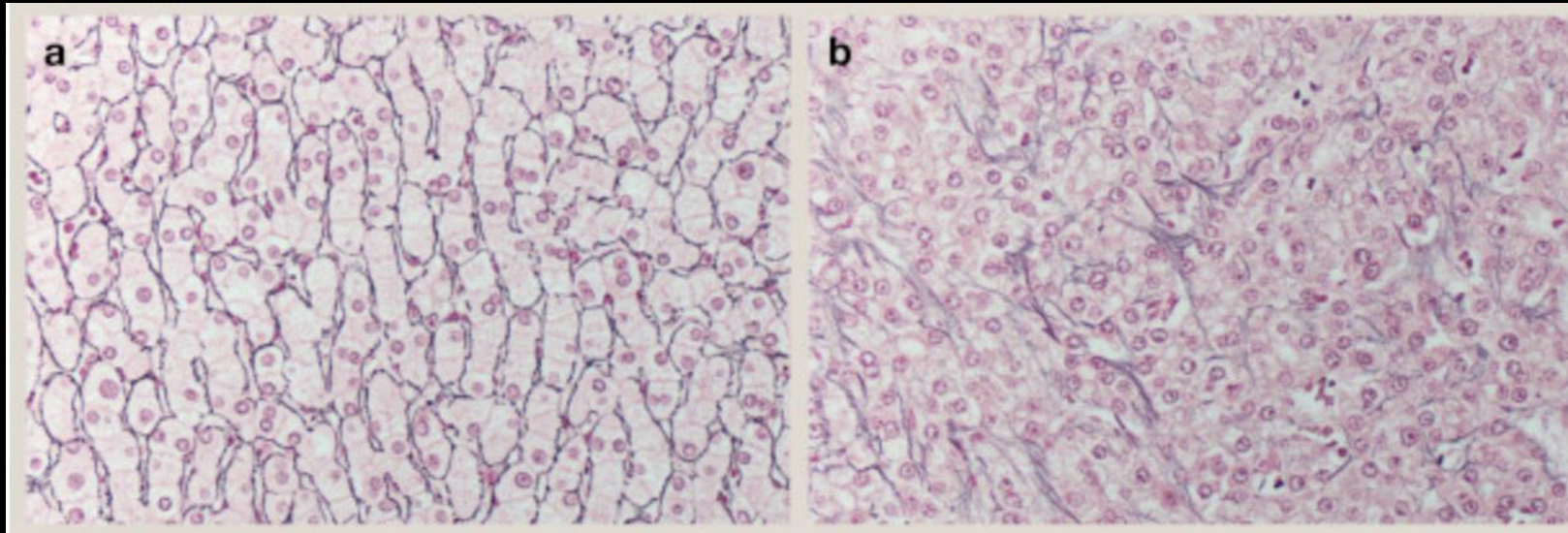


Image source: Reticulin stain. ScienceDirect Topics in Medicine and Dentistry, Elsevier.

a) Normal Liver- Reticulin stain shows the underlying collagen network that supports the hepatic cords, which are 1-2 cells thick

b) Liver lesion lacks an intact reticulin framework

Pathology Findings

Final Diagnosis: Liver, mass, biopsy: well-differentiated hepatocellular carcinoma

Comment: Reticulin stain shows loss of normal trabecular mesh network, consistent with diagnosis

Final Dx:

Hepatocellular carcinoma in non-cirrhotic liver

Management

Select the applicable ACR Appropriateness Criteria

Variant 3:

Hepatocellular cancer: Multifocal, bilobar disease, at least 1 tumor greater than 5 cm, cirrhotic.

Procedure	Appropriateness Category
Transarterial chemoembolization	Usually Appropriate
Transarterial radioembolization	Usually Appropriate
Bland transarterial embolization	Usually Appropriate
Systemic therapies	Usually Appropriate
Combination locoregional therapy	May Be Appropriate
External beam radiation therapy	May Be Appropriate
Percutaneous ablation liver	Usually Not Appropriate
Surgical liver resection	Usually Not Appropriate
Liver transplantation	Usually Not Appropriate

The multidisciplinary GI Tumor Board recommended non-surgical management given the patient's age and functional status.

Interventional Radiology Recommendation: Y-90 radioembolization

What Imaging Should We Order for Pre-Y-90
Mapping?

Select the applicable ACR Appropriateness Criteria

Pre-Mapping Work-Up for Y-90 Radioembolization [1] <i>Adapted from ACR–ABS–ACNM–ARS–SIR–SNMMI Practice Parameter for Radioembolization of Liver Malignancies (2022)</i>	
Step	Guideline Recommendation
1. Baseline Imaging	Obtain multiphase contrast-enhanced CT or MRI of the liver to determine tumor size, distribution, and vascular involvement; include chest CT to assess for extrahepatic disease.
2. Angiographic Imaging	Perform hepatic angiography to delineate arterial anatomy and coil-embolize non-target vessels to prevent extrahepatic Y-90 delivery.
3. Simulation with Tc-99m MAA	Inject Tc-99m MAA at the intended treatment catheter position to simulate microsphere distribution.
4. Nuclear Medicine Imaging	Perform SPECT/CT to: <ul style="list-style-type: none">• Map MAA distribution• Calculate lung-shunt fraction (LSF) using geometric-mean counts• Detect extrahepatic tracer uptake
5. Treatment-Planning Imaging	Use a recent CT or MRI (within 30–60 days) to define liver and tumor volumes for dose calculation

Pre-Y-90 Mapping

- Pre-Y-90 planning angiogram and Tc-99m MAA SPECT/CT (9/2025)
 - Pre-Y-90 mapping angiogram
 - **Tc-99m MAA SPECT/CT**
 - **Findings:**
 - Liver-to-lung shunt fraction: **3.9%**
 - Heterogeneous tracer uptake in **segment IVb**
 - **Prominent gastric and gallbladder activity** - potential extrahepatic shunting
 - **No tracer activity in the lungs**

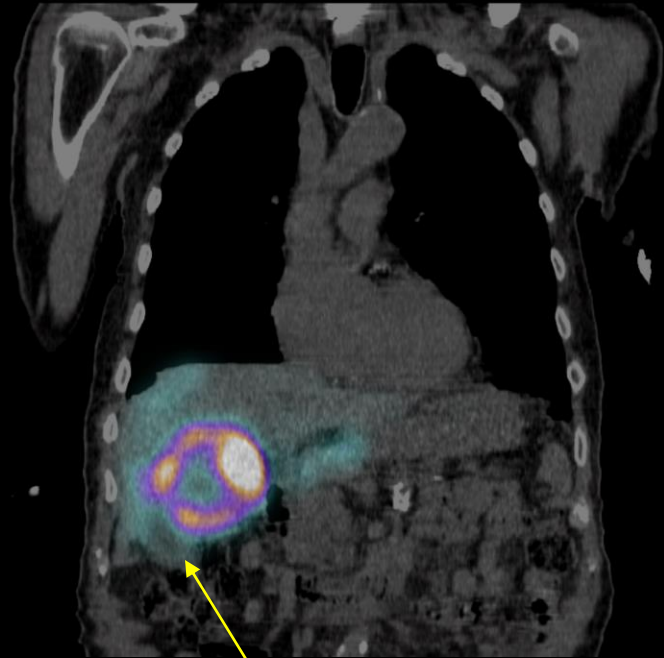
Findings

Localization CT

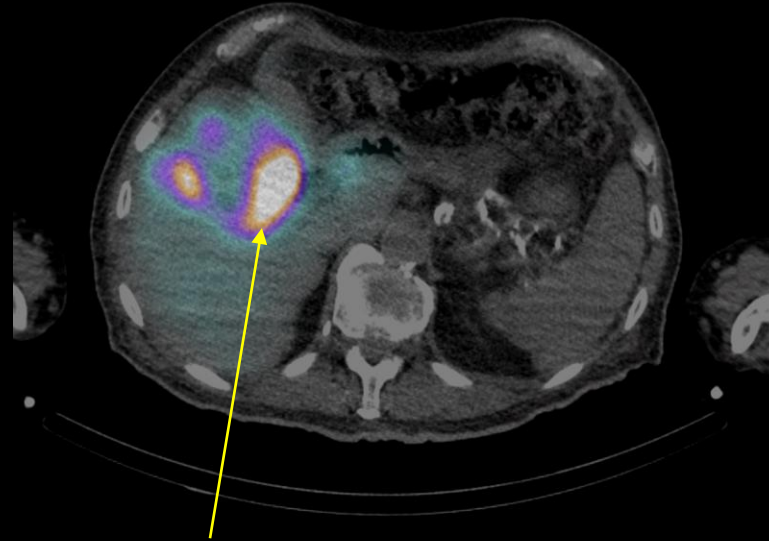


Findings

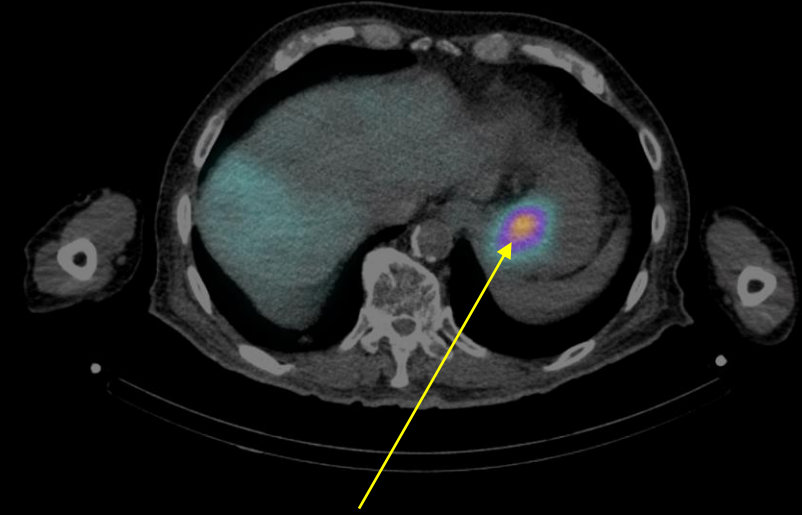
Tc-99m MAA SPECT/CT



Uptake around the gallbladder



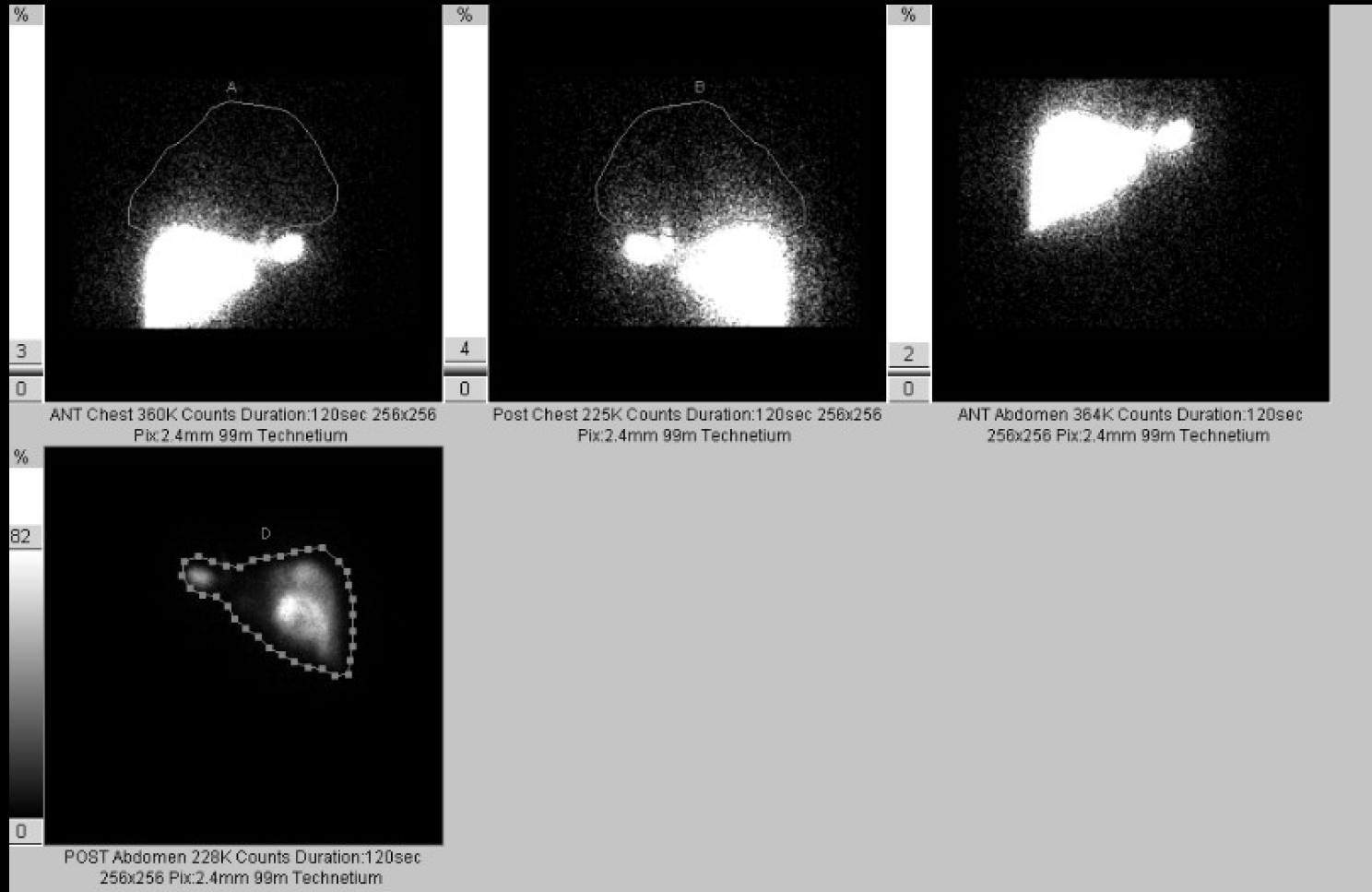
Heterogeneous tracer uptake in the liver, with the majority of tracer accumulation in the segment of neoplasm



Prominent tracer accumulation in the gastric fundus and antrum

Findings

Lung Shunt Fraction Calculation



Lung counts:

Anterior	10535
Posterior	10756
Lungs Geo Mean	10645

Liver counts:

Anterior	342649
Posterior	204465
Liver Geo Mean	264688

$$\text{LSF} = (10,645) / (10,645 + 264,688) \times 100$$

$$\text{LSF} = (10,645 / 275,333) \times 100 = 3.9\%$$

Result: Lung Shunt Fraction = 3.9%

No tracer accumulation in the lungs

Conclusion and Clinical Significance

Conclusion:

- Due to complex multivessel hepatic arterial anatomy and mild tracer uptake near the stomach, increasing the risk of non-target Y-90 delivery, the team proceeded with Transarterial Chemoembolization (TACE) as a safer initial therapy on with plans to further evaluate and, if needed, coil the left hepatic branch supplying the stomach to enable potential Y-90 treatment in the future.

Clinical Significance:

- Critical role of pre-Y90 mapping in identifying variant arterial anatomy and preventing non-target radiation injury.
- The multidisciplinary decision to pursue chemoembolization prior to Y90 reflects personalized management.

Case Discussion

Hepatocellular carcinoma

- Hepatocellular carcinoma is the most common type of primary liver cancer, the sixth most common cancer worldwide. [3]
- About 20% of HCC develops in non-cirrhotic livers. [3]
- In the absence of cirrhosis, there is insufficient evidence to support that LI-RADS would provide a sufficiently high PPV for HCC in this sub-cirrhotic population. [2]

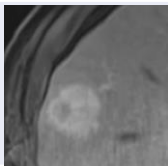
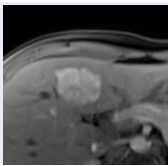
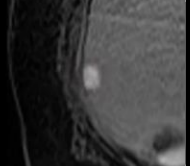
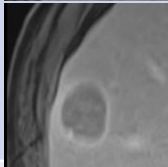
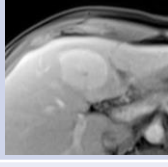
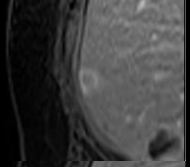
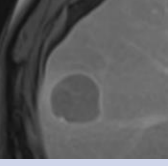
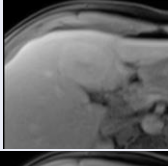
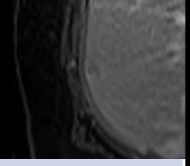
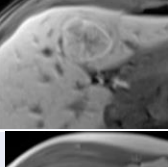
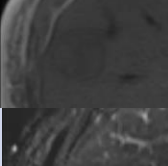
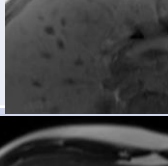
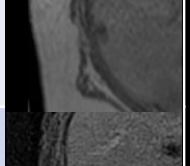
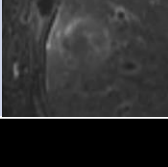
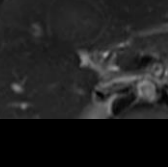
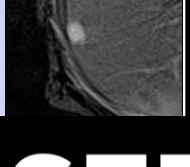
Why does HCC in a non-cirrhotic liver present late? [3]

- No routine surveillance in non-cirrhotic patients
- Few early symptoms due to preserved liver function

Who is at Risk? [8]

- Chronic HBV
- NAFLD/NASH & metabolic syndrome (T2DM, obesity, inflammation)
- Advanced fibrosis across NAFLD, HBV, and HCV
- Alcohol, Aflatoxin, iron overload, anabolic steroids/oral contraceptives
- Inherited disorders: A1AT deficiency, hemochromatosis, glycogen storage disease

Case Discussion

Differential Diagnosis - Hypervascular Lesions [12]						
	Hepatocellular Carcinoma (HCC)		Focal Nodular Hyperplasia (FNH)		Hypervascular Metastasis	
Enhancement Pattern (Late Arterial Phase)	Non-rim arterial phase hyperenhancement		Homogenous arterial hyperenhancement		Central arterial phase hyperenhancement	
Portal Venous Phase	Washout		Equilibration		Washout	
Delayed Phase	Washout + Capsule		Equilibration		Washout	
Hepatobiliary	Hypointense		Retains Eovist		Hypointense	
T1	Hypointense + Fat		Near isointense		Hypointense	
T2	Mildly hyperintense		Near isointense		Mixed	

Case Discussion

- Lung Shunt Fraction [5]
 - $(\text{total lung counts}) / (\text{total lung counts} + \text{total liver counts})$
 - LSF > 10% - reduce Y-90 dose to prevent radiation pneumonitis
 - LSF > 20% - contraindication to Y-90 therapy
- In this case:
 - LSF = 3.9%, indicating minimal shunting
 - SPECT/CT confirmed no significant lung uptake but revealed unexpected gastric tracer activity, suggesting variant supply from a gastrohepatic branch of the left hepatic artery
 - Findings prompted deferral of Y-90 and consideration of chemoembolization to avoid non-target radiation.

References:

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