

Use of Contrast-enhanced Ultrasound in Liver Patients' Care

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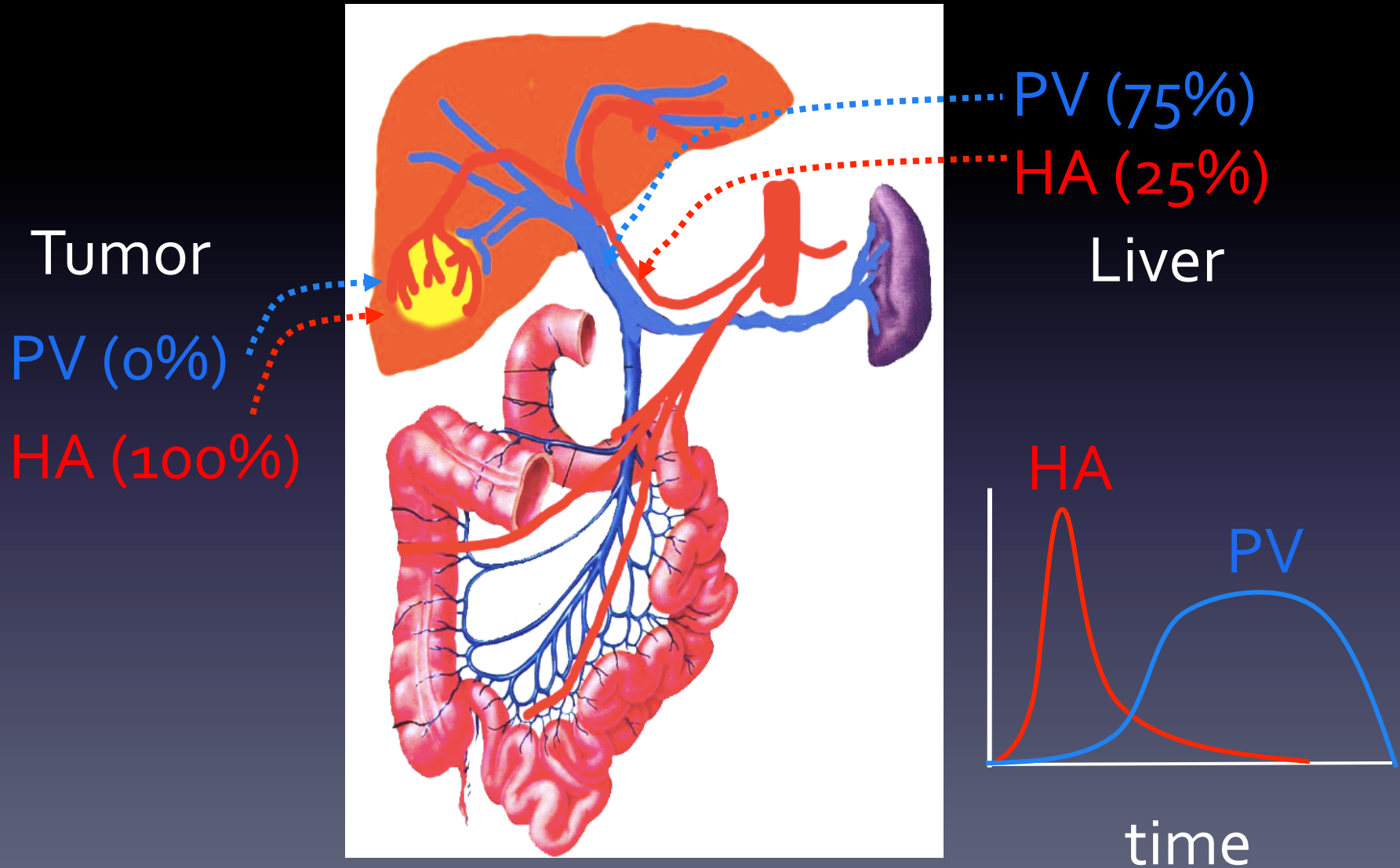
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Liver -blood supply-



Microbubbles in the Liver



Rat Liver, Imagent (perfluorohexane gas with lipid shell)

Kono Y et al. Radiology 2002;224(1):253-257

CEUS in the USA: Radiology

- No FDA approved US contrast agent for radiological applications
- UCSD: 1998~ off label use
 - It is legal to bill for contrast use for widely accepted application
- More institutions using in the USA
 - Liver applications
 - Pediatrics

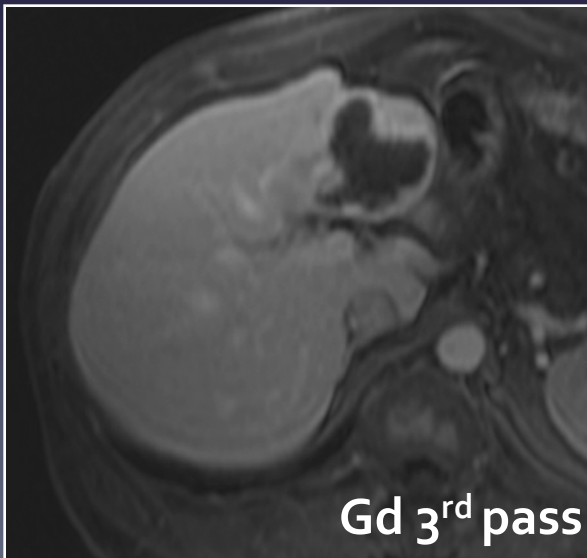
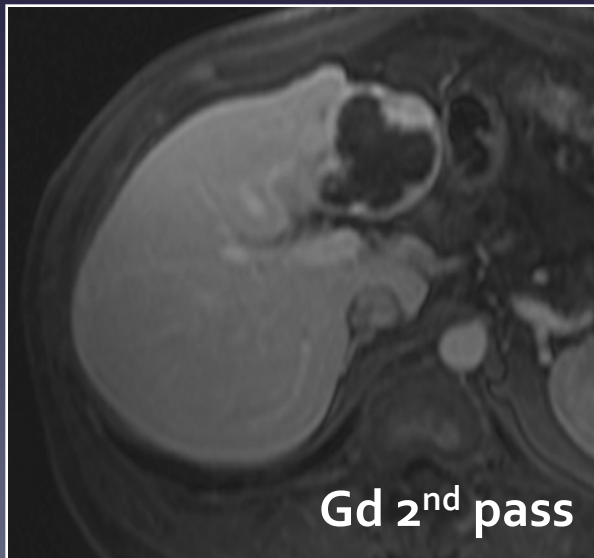
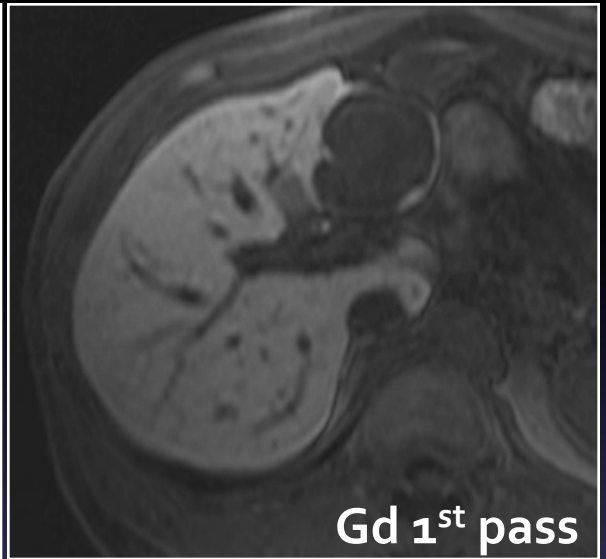
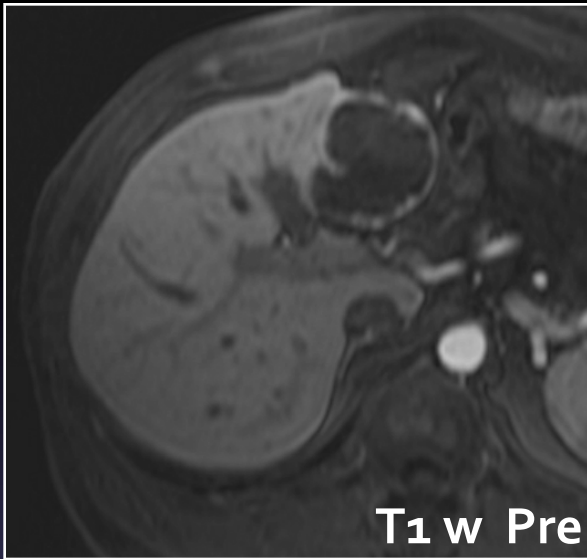
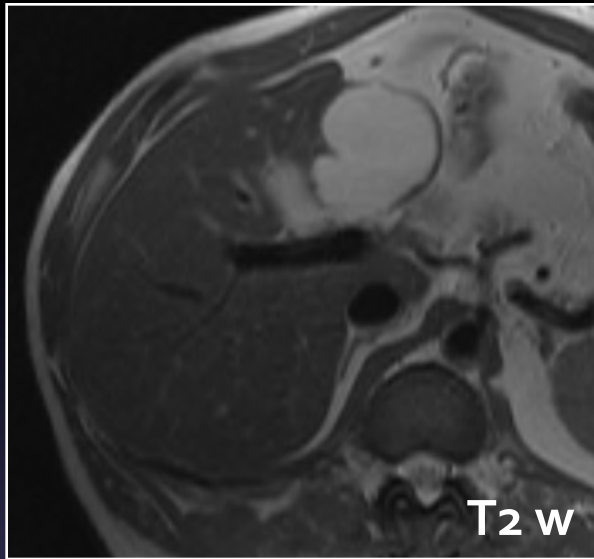
CEUS - Advantages -

- Safety
 - No ionizing radiation
 - Better safety profile compared to CT and MR contrast agent
 - No risk of nephrotoxicity, permitting safe use in patients with renal insufficiency
- Easy Accessibility
 - Can be portable
 - No anesthesia or sedation
 - More available
 - Lower cost
- Imaging advantages
 - Real time imaging: high temporal resolution
 - Superior spatial and contrast resolution
 - Pure intravascular agent
 - Can repeat injections

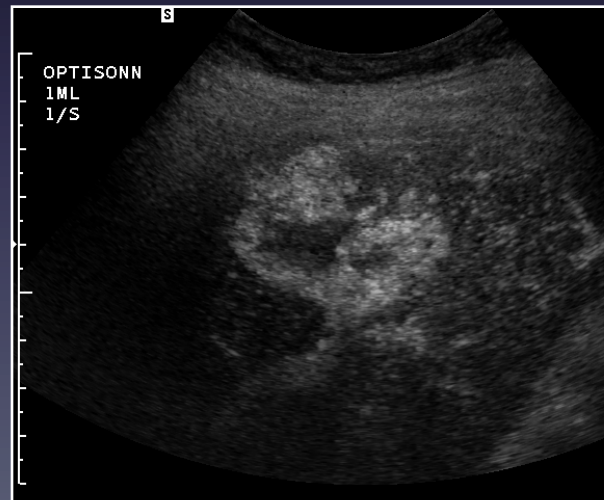
CEUS Liver Applications

- Tumor Imaging
 - Characterization
 - Tumor detection: screening
 - Assessment of treatment efficacy (ablation, chemoembolization, chemotherapy, radiation)
- Vascular Imaging
 - TIPS (transjugular intrahepatic porto-systemic shunt)
 - post OLT (orthotopic liver transplantation) HAT, PV patency
- Trauma/liver laceration

Hemangioma: MRI



Hemangioma: CEUS

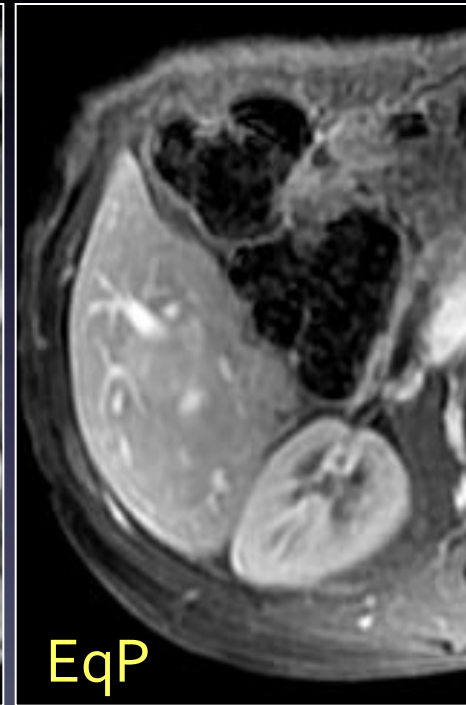
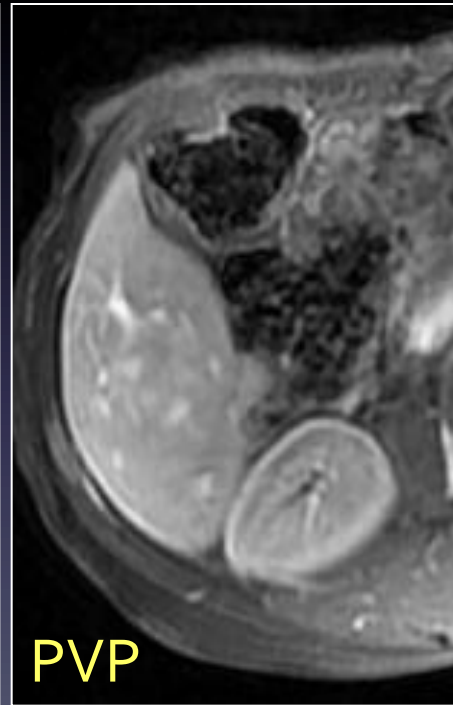
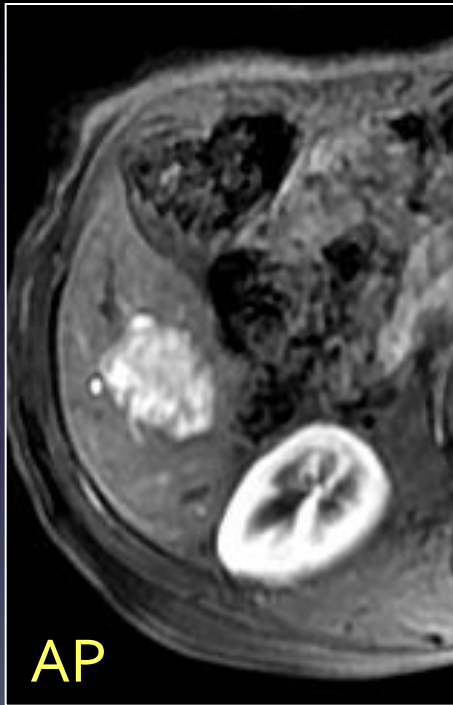
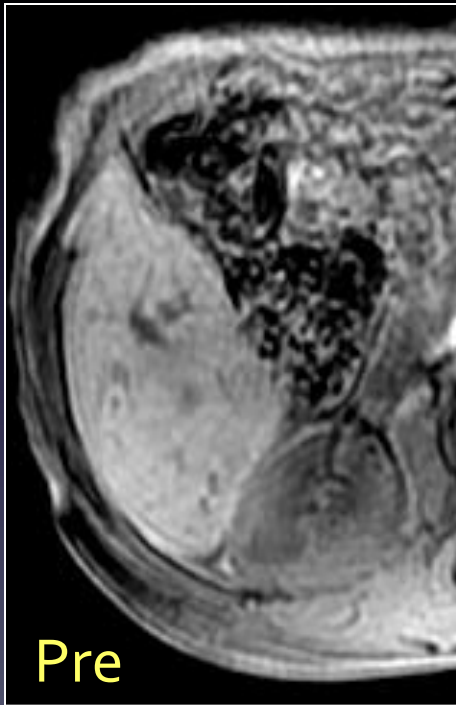


Hemangioma: CEUS



FNH: MRI

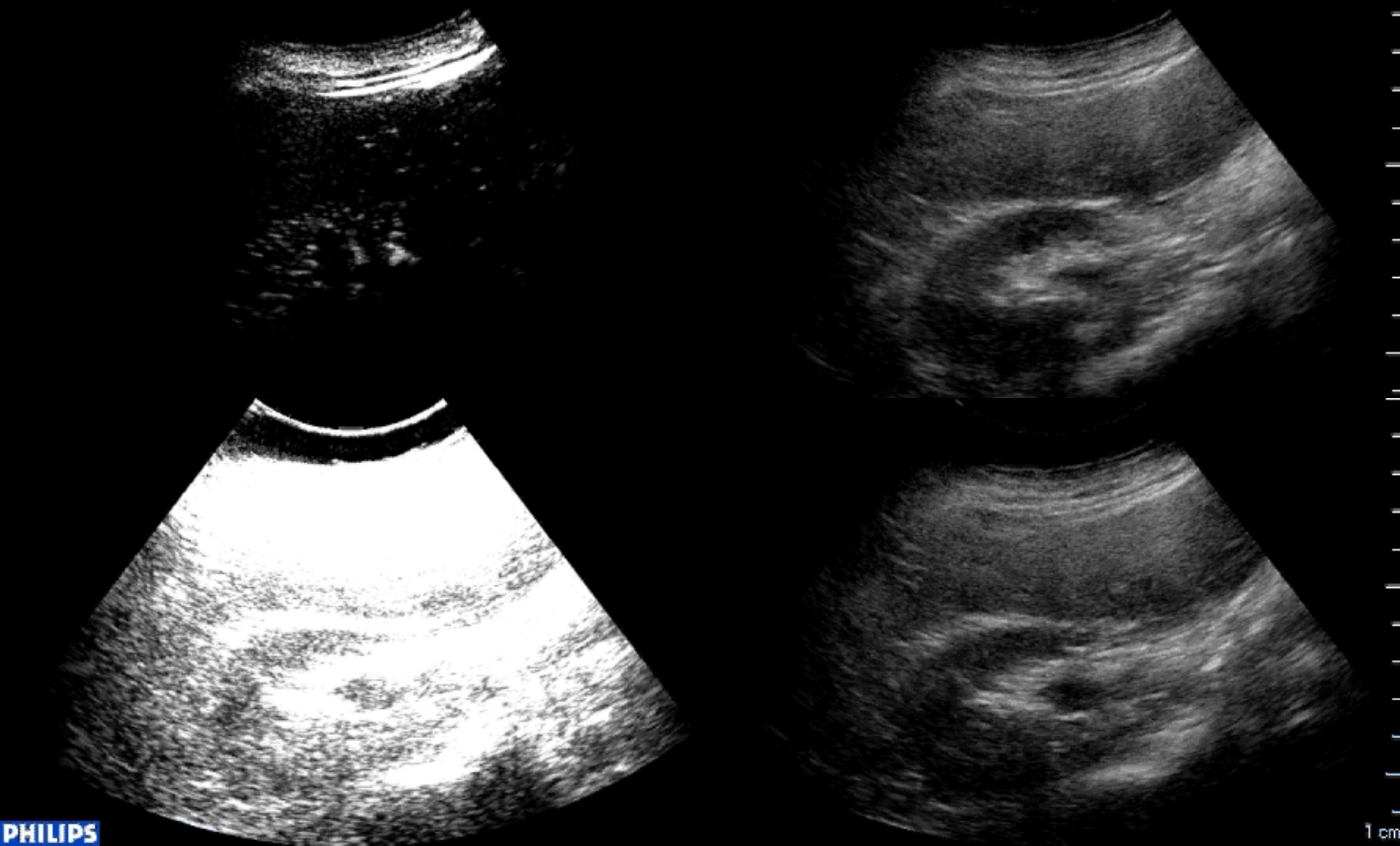
Focal Nodular Hyperplasia: Benign Liver Tumor



FNH: CEUS

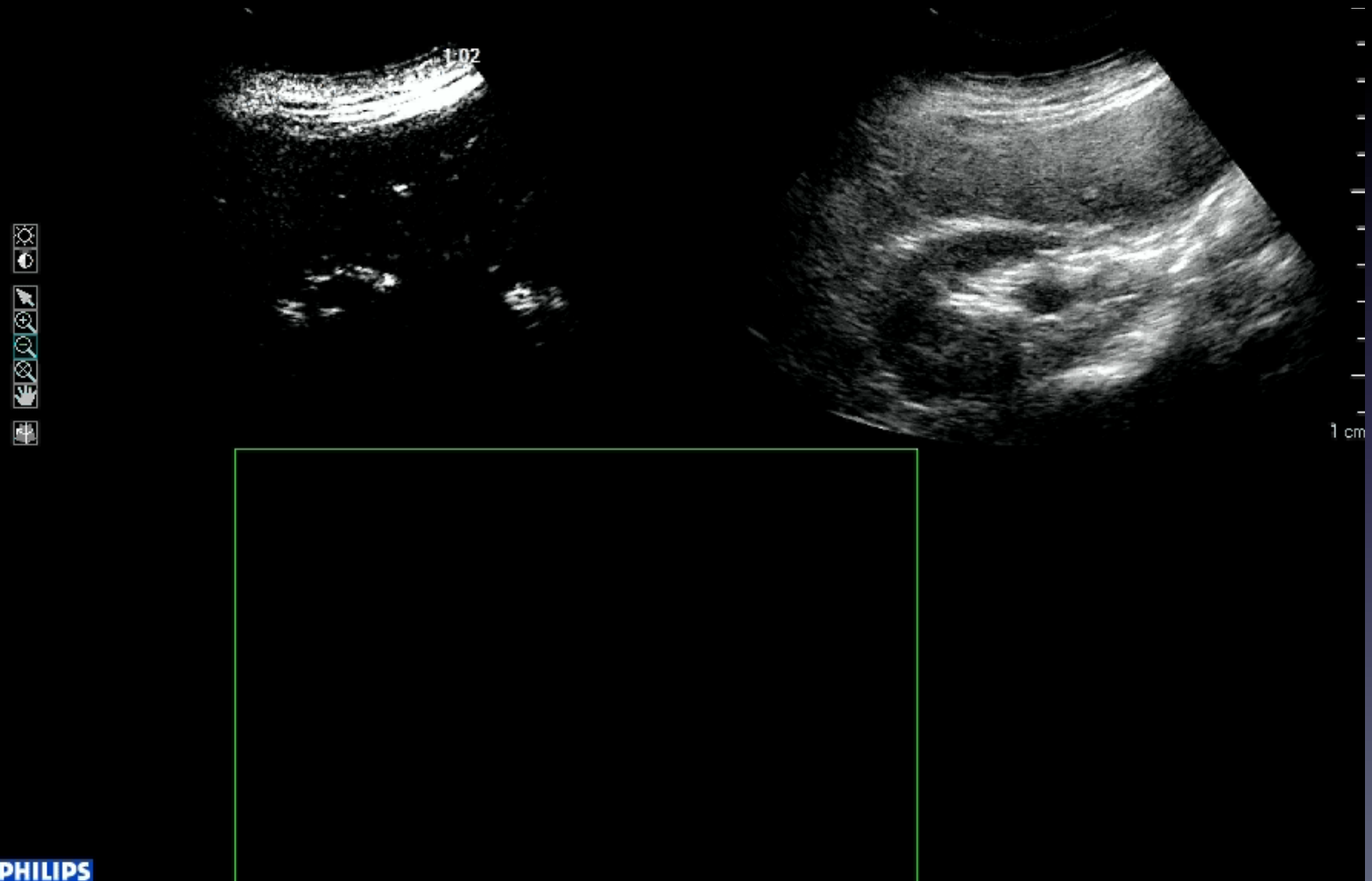


FNH: CEUS



MIP

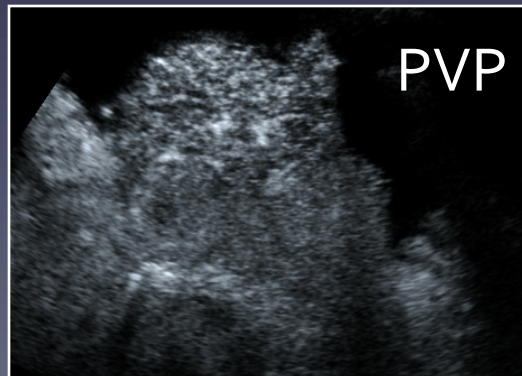
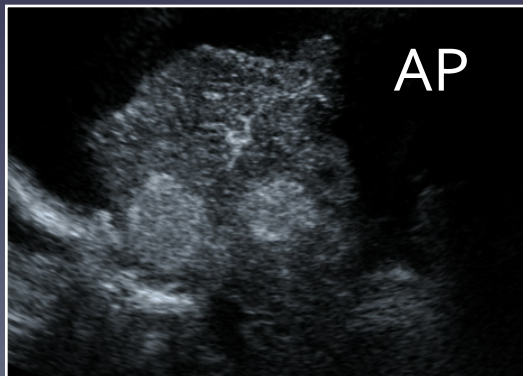
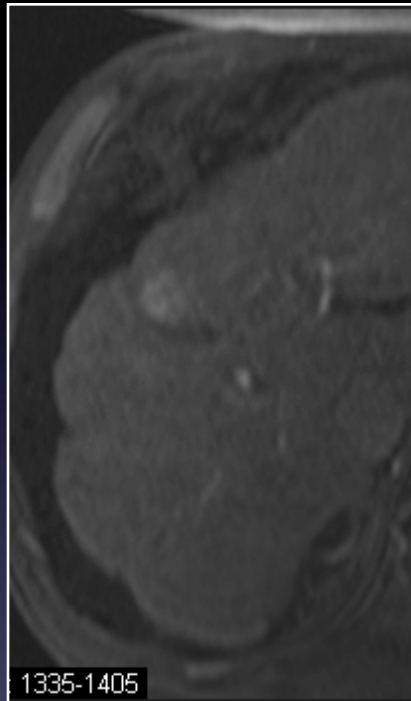
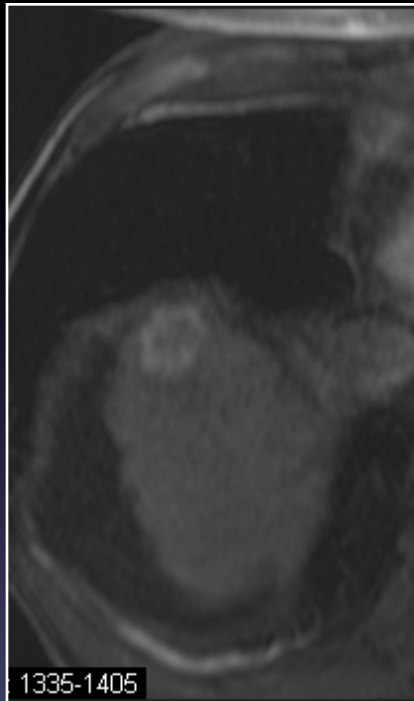
maximum intensity projection



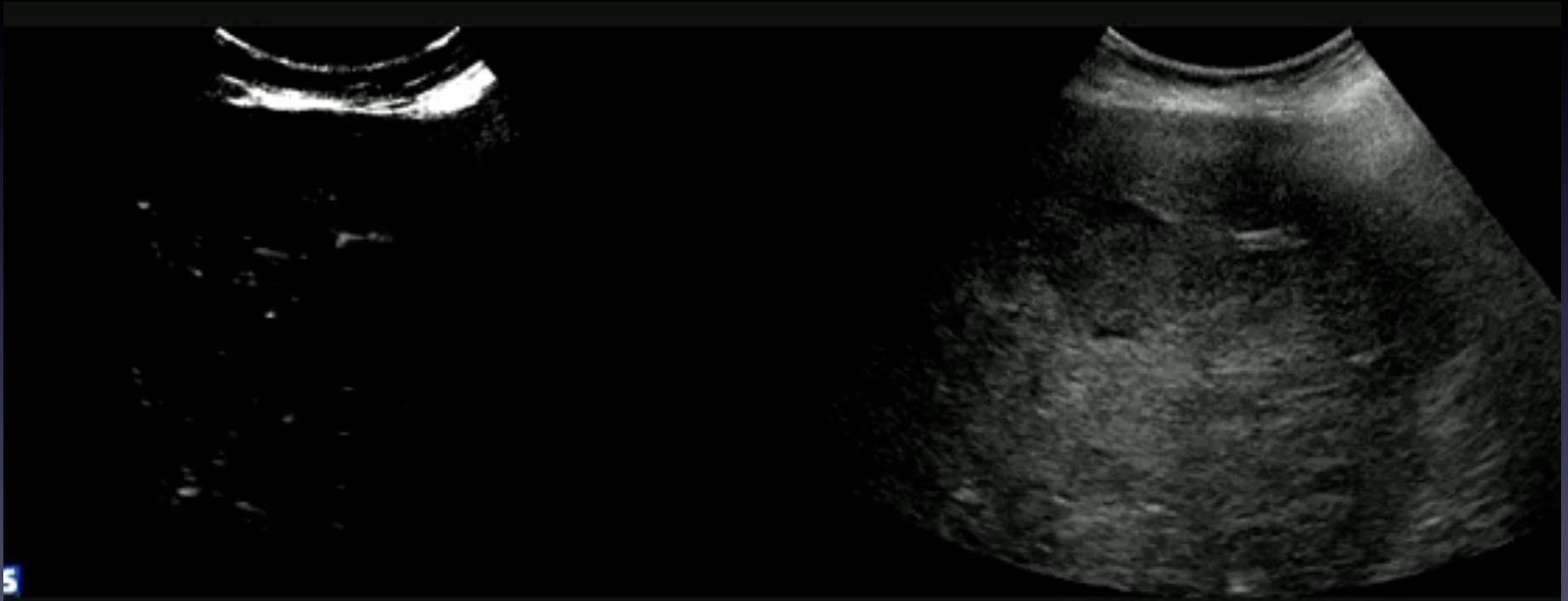
HCC: Hepatocellular Carcinoma

Gd enhanced MRI AP

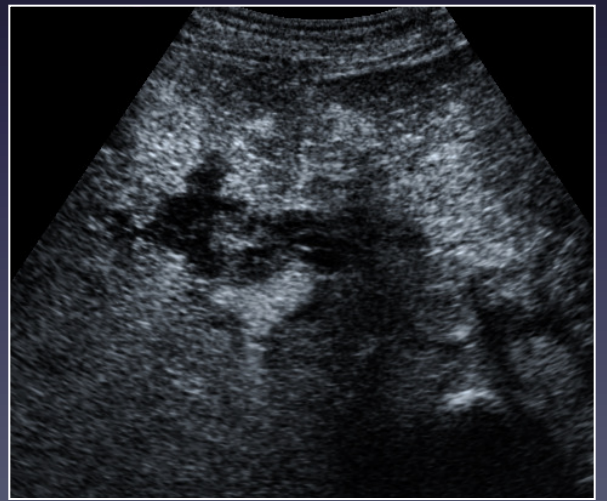
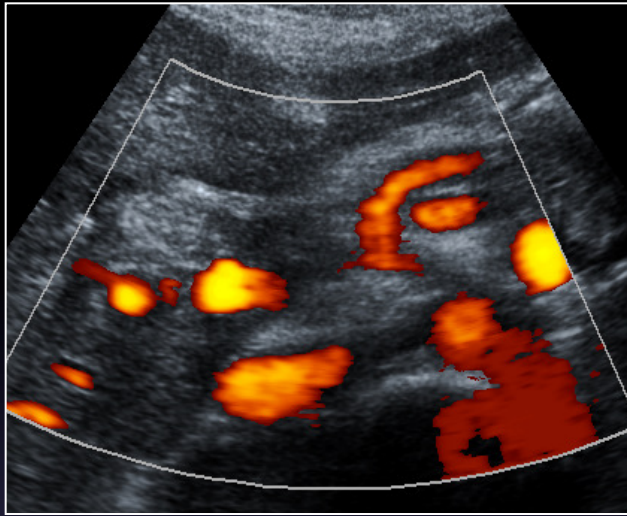
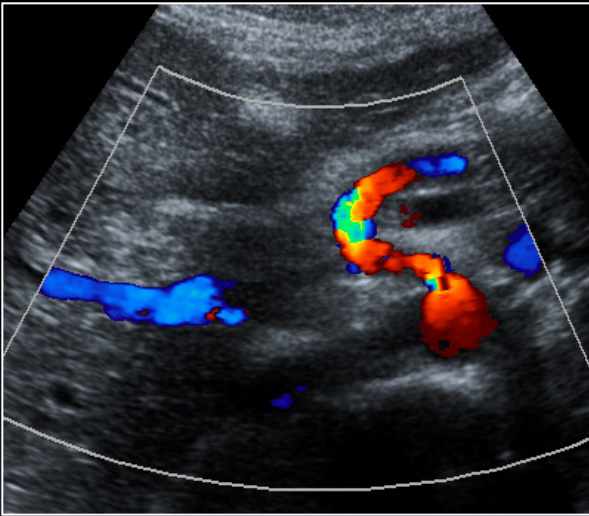
CEUS



Metastasis: Colorectal Cancer

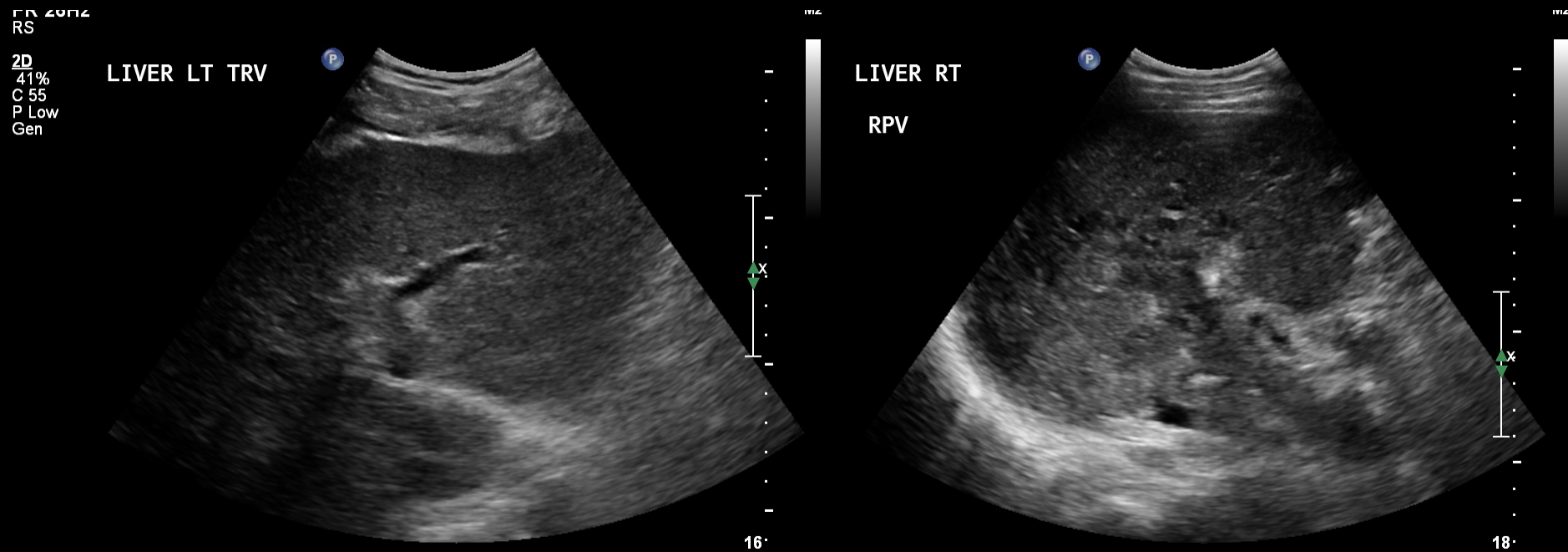


48 yo female, s/p OLT 2 weeks ago, suspected HAT



HAT: hepatic artery thrombosis

PVT (portal venous thrombosis)

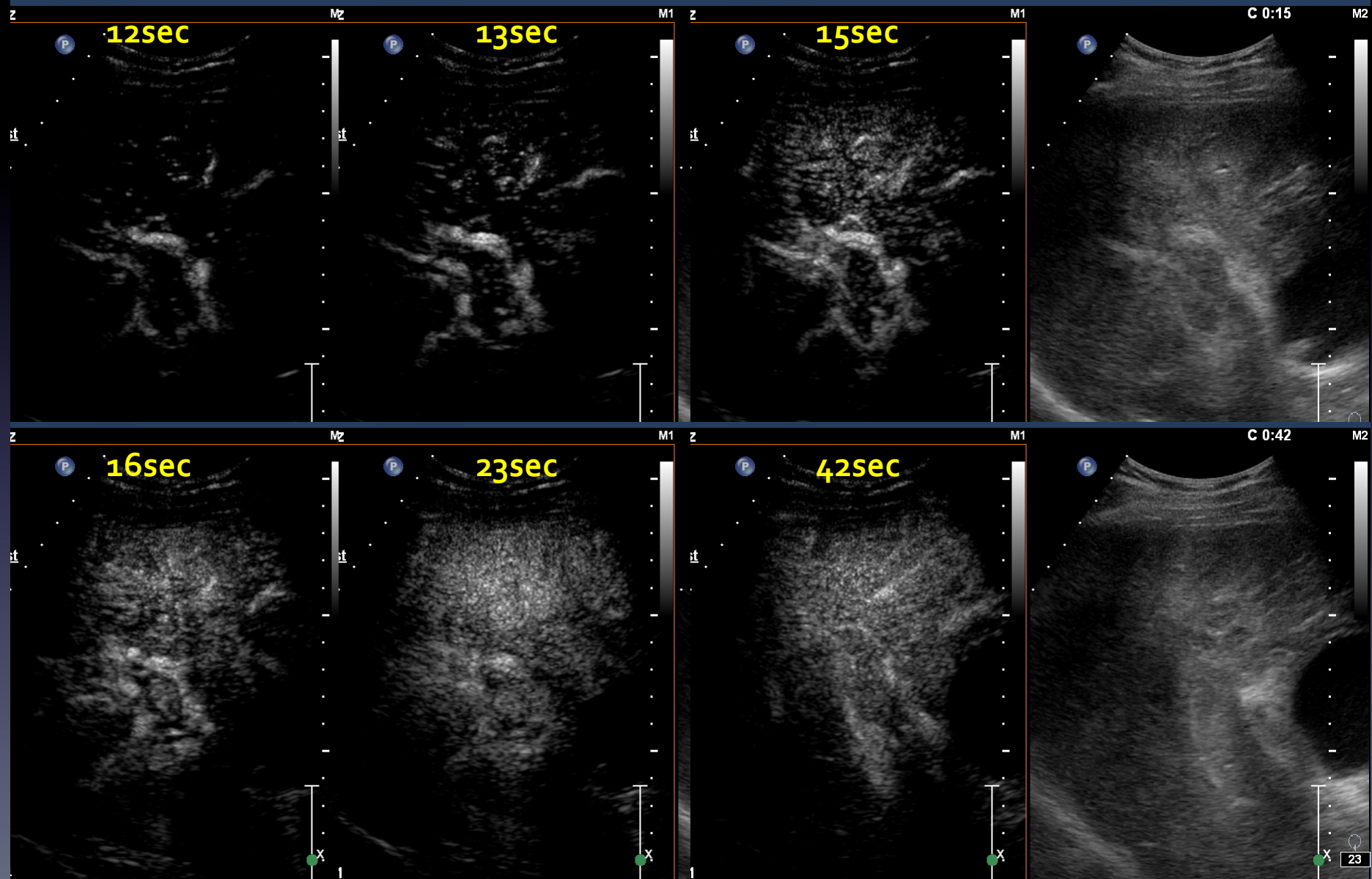


52 yo man with HCV/EtOH cirrhosis, with PVT

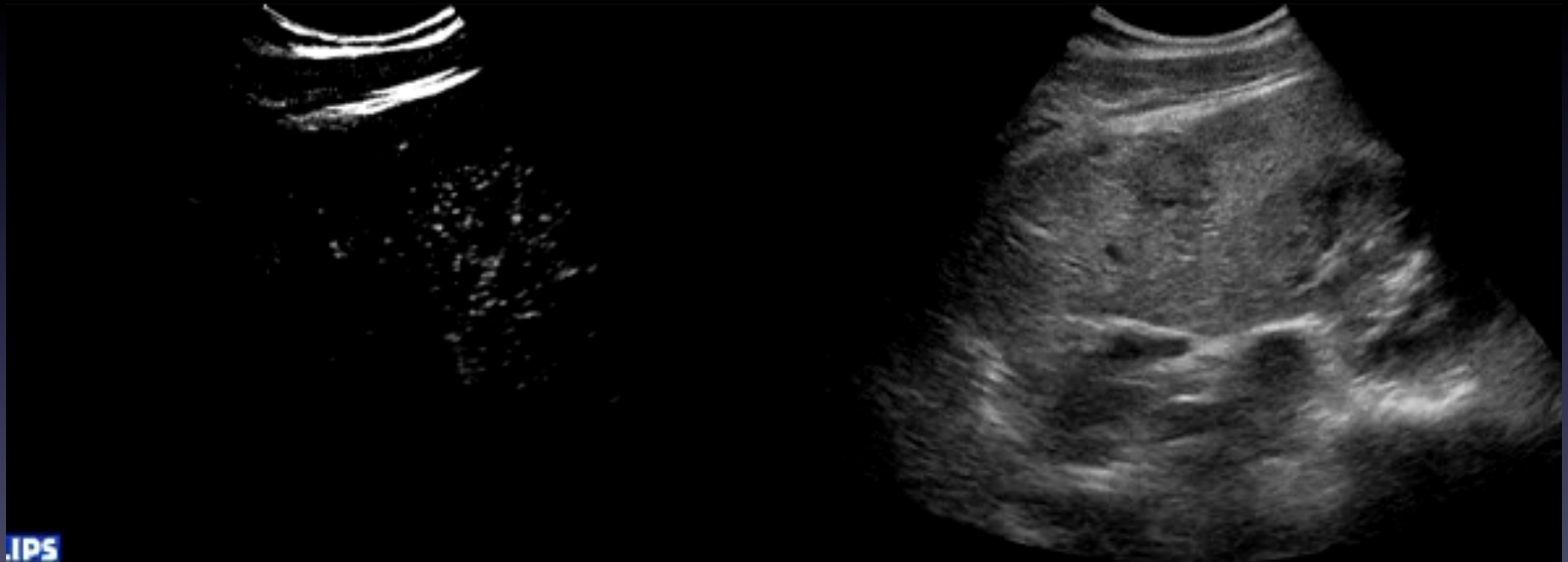
PVT: CEUS



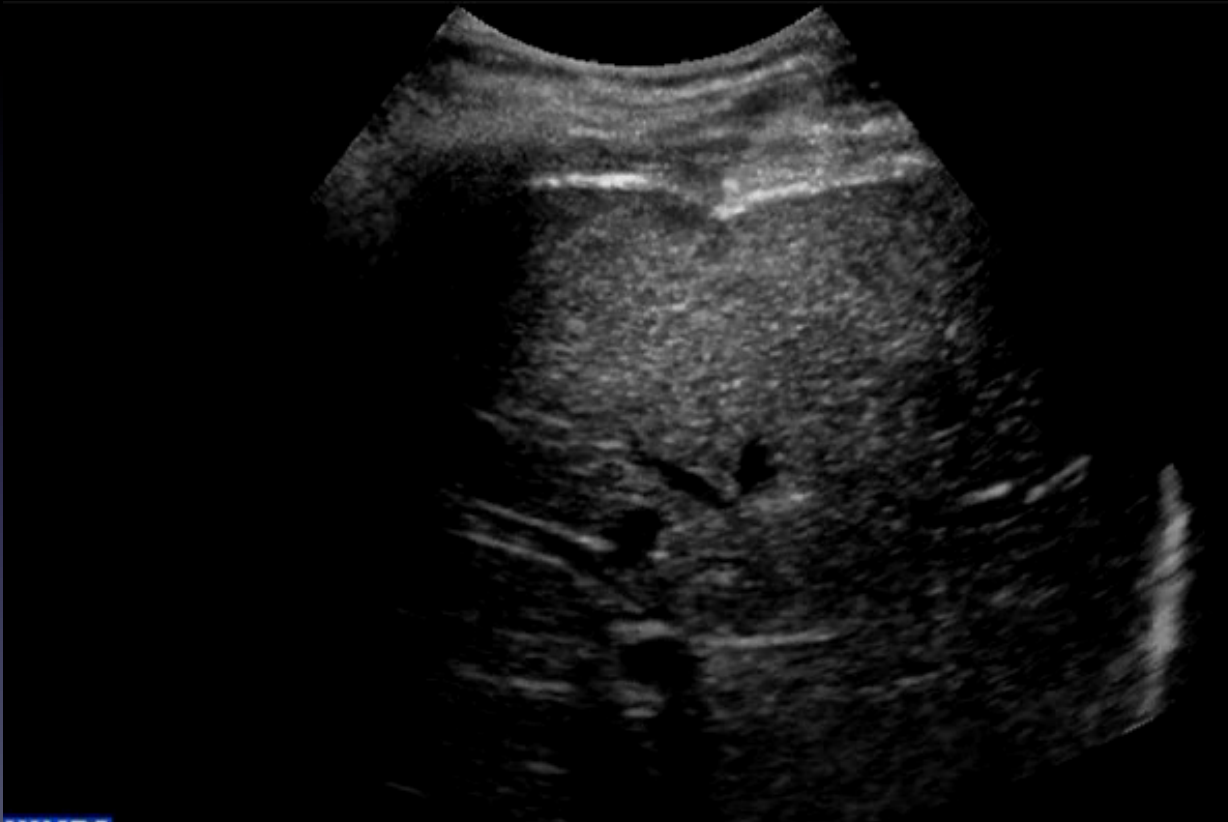
PVT: Tumor Thrombus



21 y.o. male with metastatic liver
tumors-nasopharyngeal carcinoma-

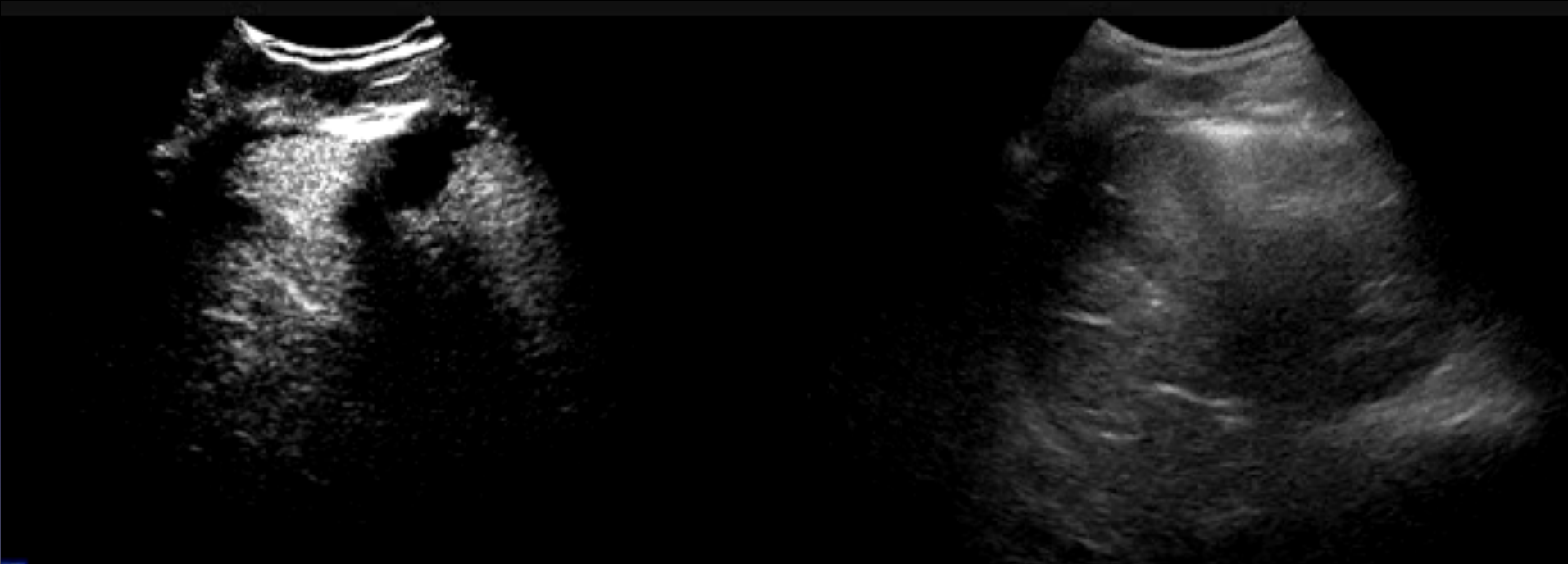


Radiofrequency Ablation



21 y.o. male with metastatic liver tumors
-nasopharyngeal carcinoma-

Post Ablation

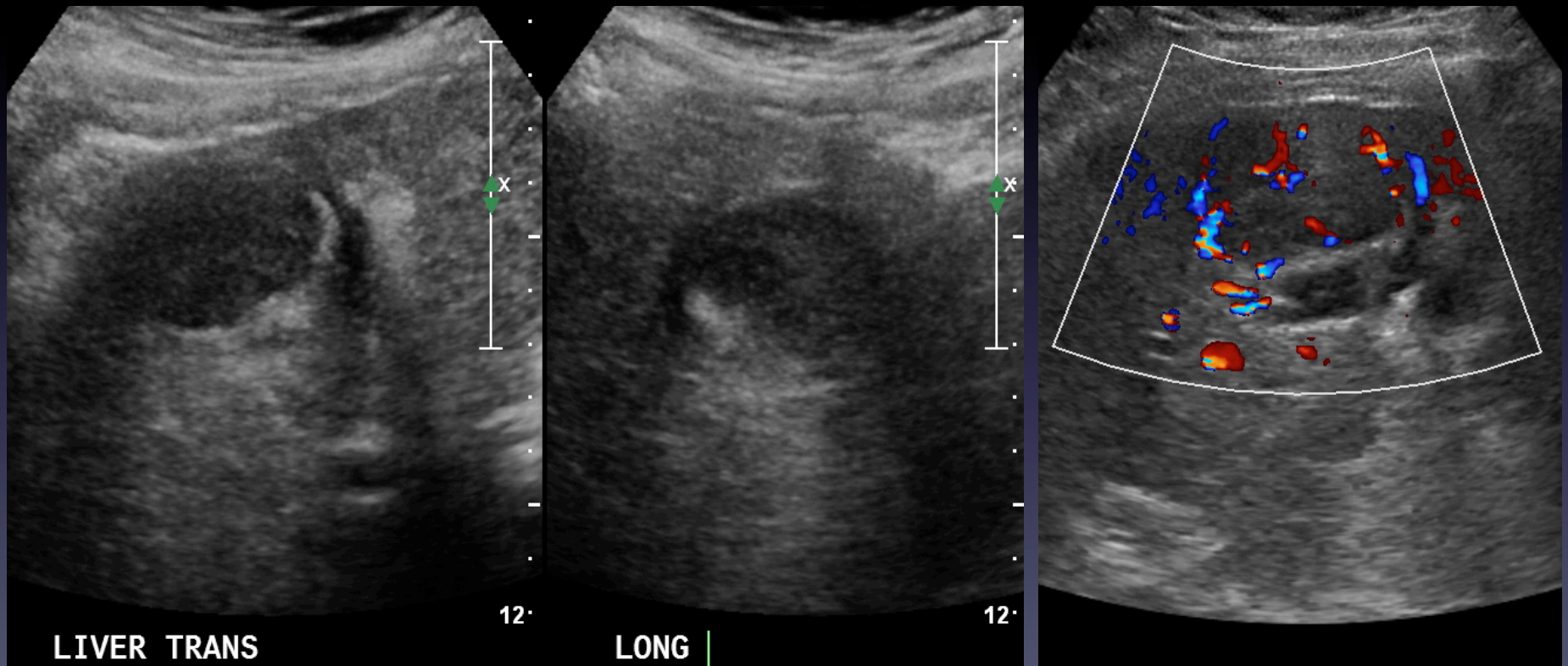


21 y.o. male with metastatic liver tumors
-nasopharyngeal carcinoma-

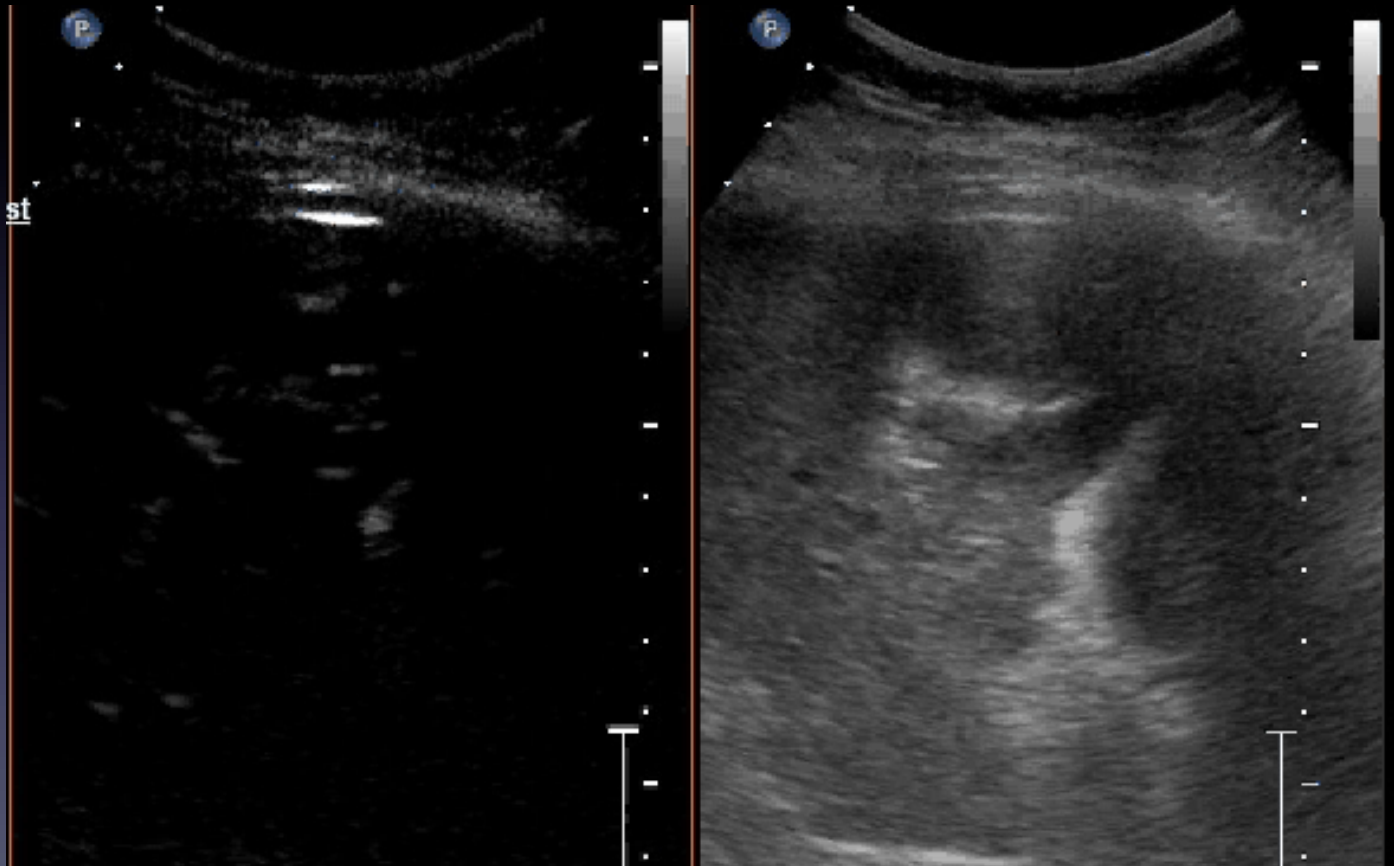
Case

- 77 year old female with well compensated cirrhosis (EtOH) who was found to have a mass in the liver by an ultrasound at OSH
- No contrast CT was done due to chronic kidney disease, GFR ~30
- No MRI was done due to pacemaker
- Biopsy of the lesion was attempted but failed due to the location (adjacent to GB)

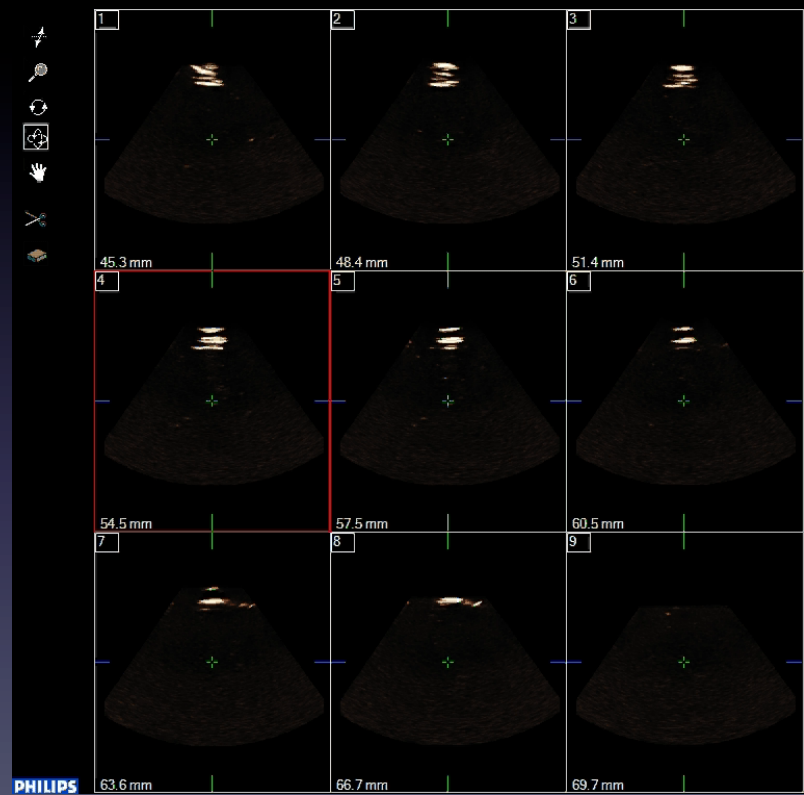
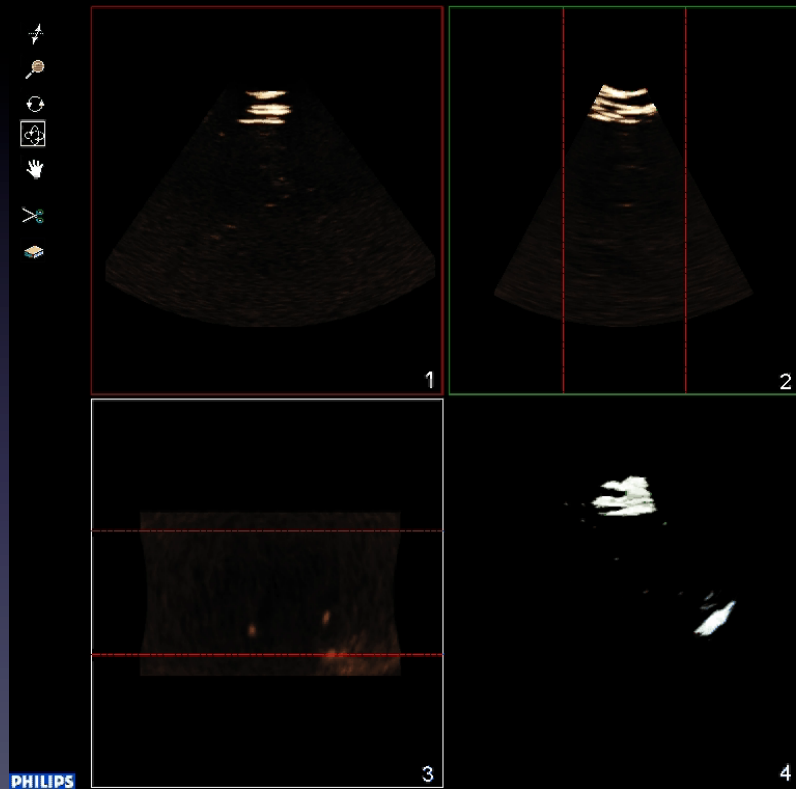
77 yo F, cirrhosis



HCC



4D CEUS



Clinical Impact of CEUS

A.	No effect	24 (25%)
B.	Increased confidence	31 (33%)
C.	Could have changed Mx	7 (7%)
D.	Changed Dx in a minor degree	14 (15%)
E.	Changed Dx in a major degrees, but did not affect management	1 (1%)
F.	Changed or made the diagnosis, eliminated another test	10 (11%)
G.	Changed management	8 (8%)

95 contrast ultrasound cases performed for clinical need @ UCSD

CEUS: Current & Future Clinical Use

- Many many advantages!
 - Safety, accessibility, imaging superiority
- Need urgent approval for Radiology applications
- More institutions have started using it off label, including pediatrics
- Future Applications
 - Molecular imaging
 - Therapeutic applications