

Doppler Imaging Pearls and Pitfalls

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Vanderbilt Radiology

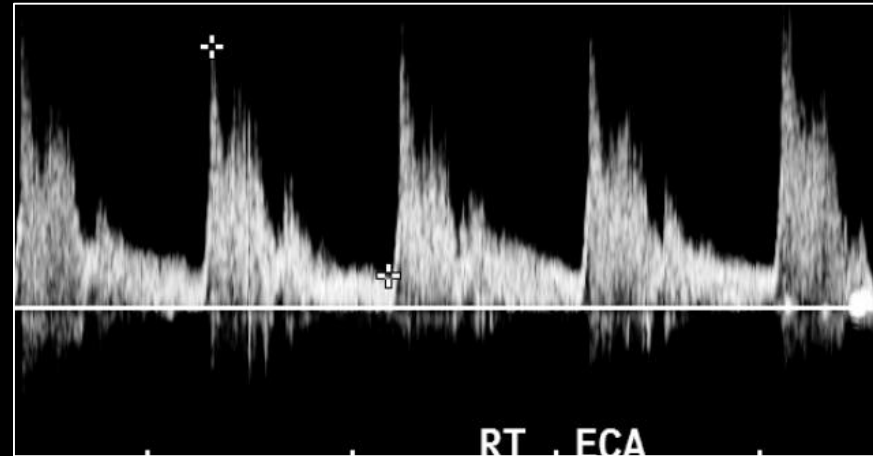
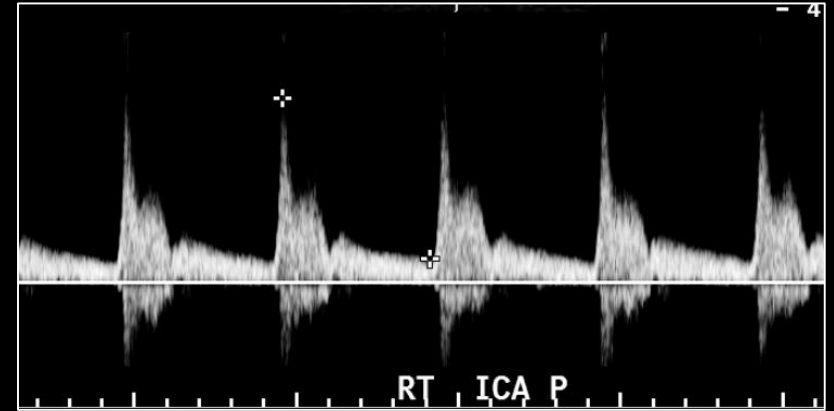
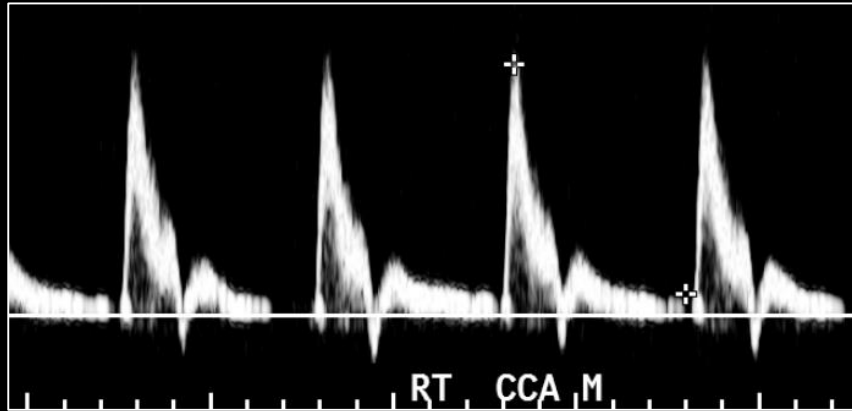
 @LoriDeitte

TRS 2019 Meeting

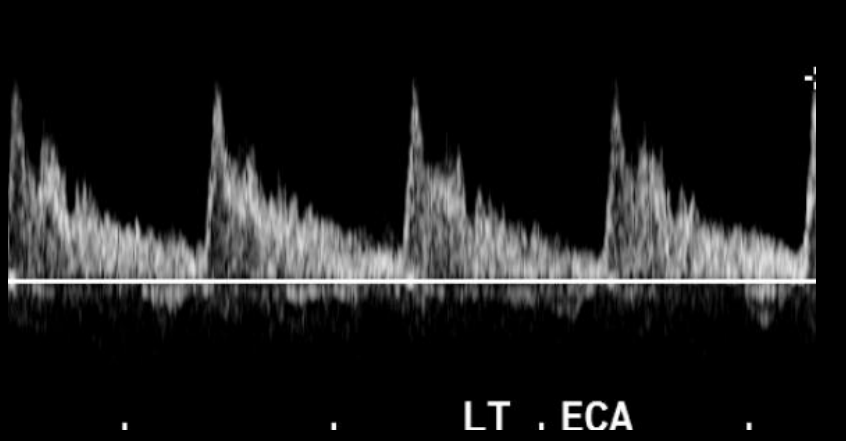
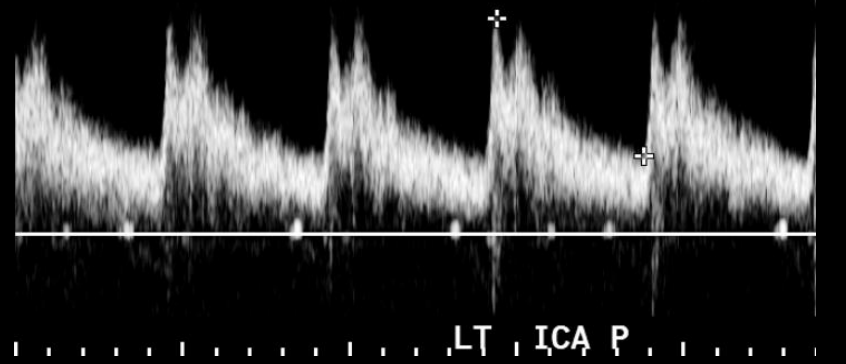
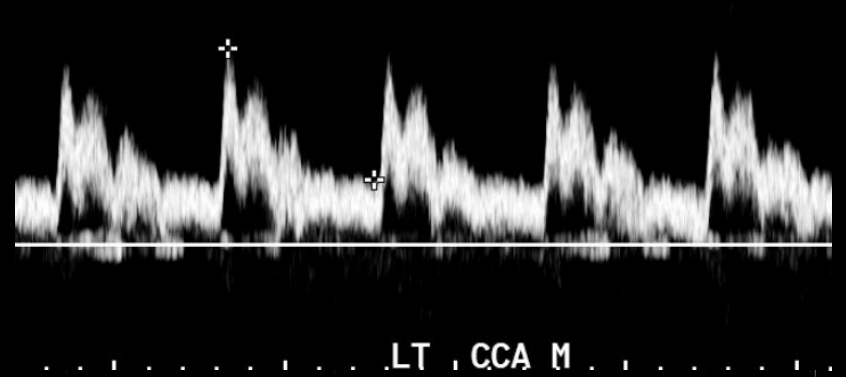
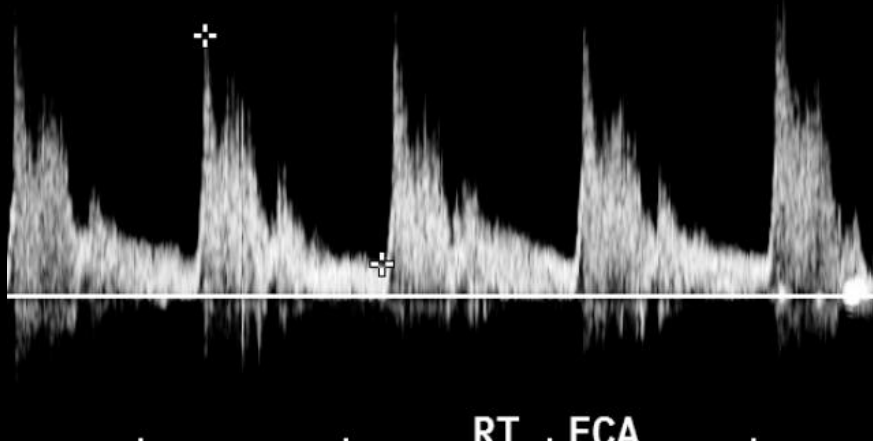
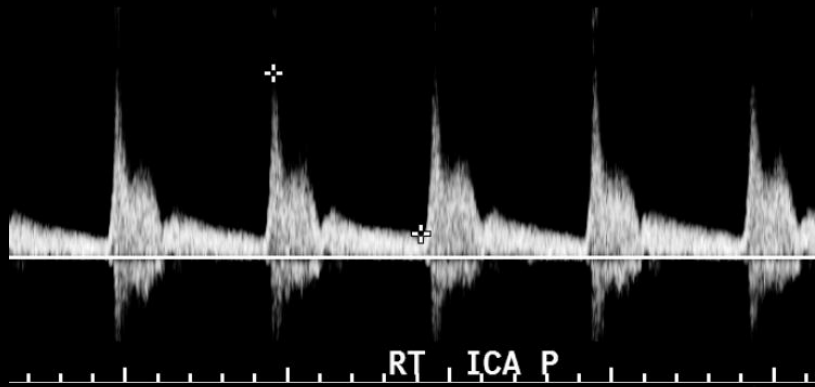
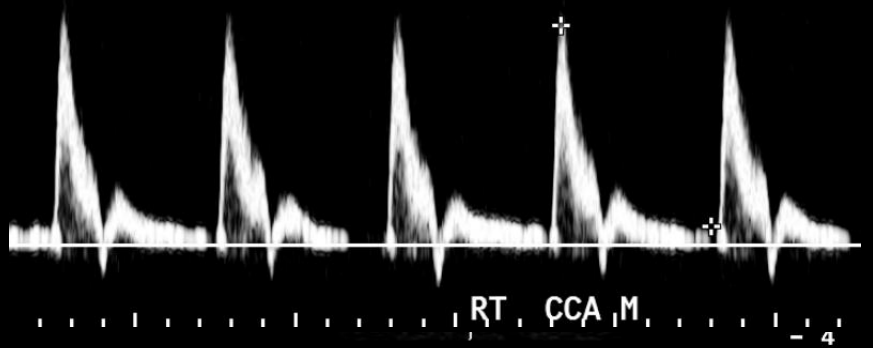


45 year old with TIA

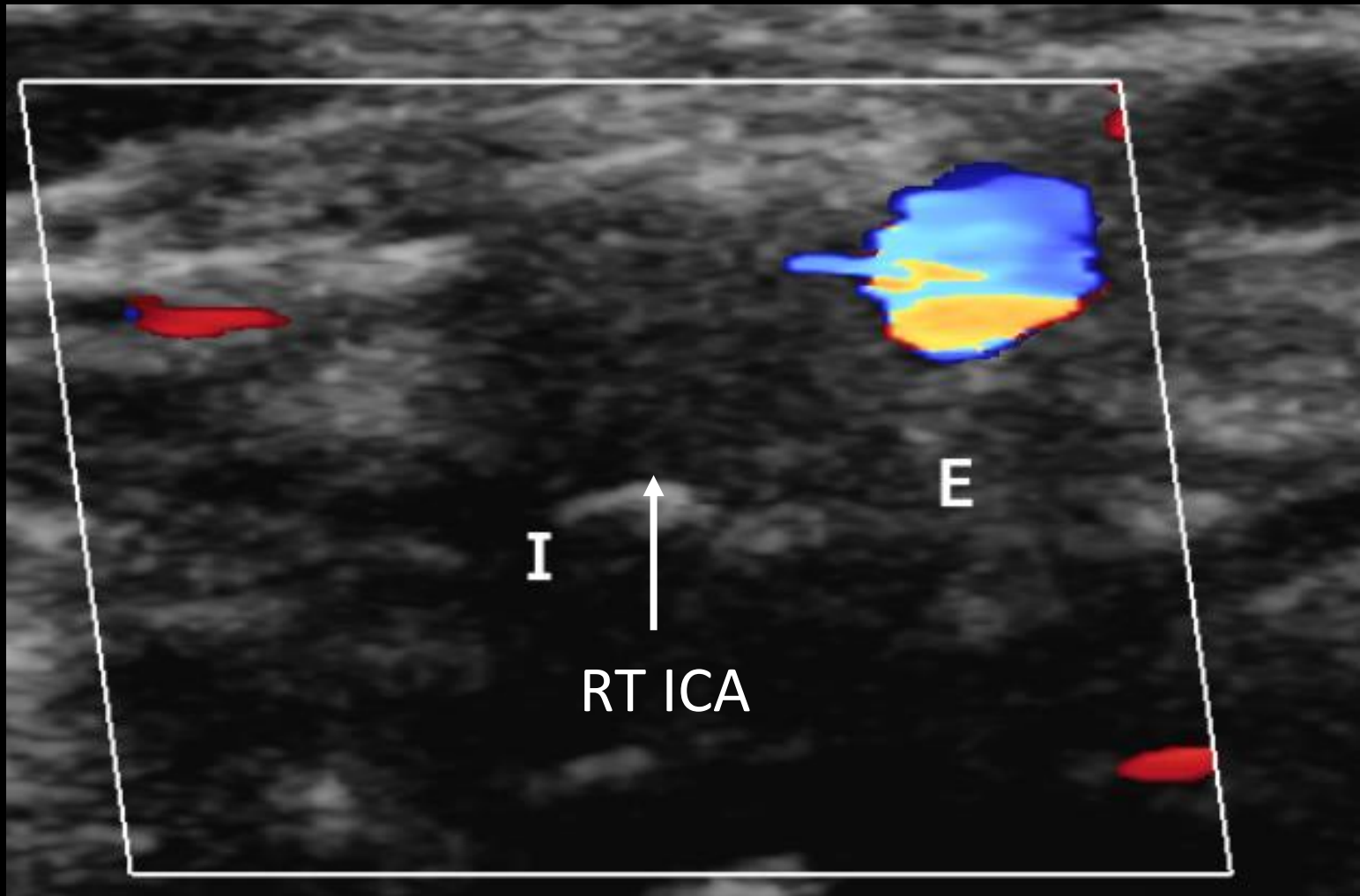
45 year old with TIA



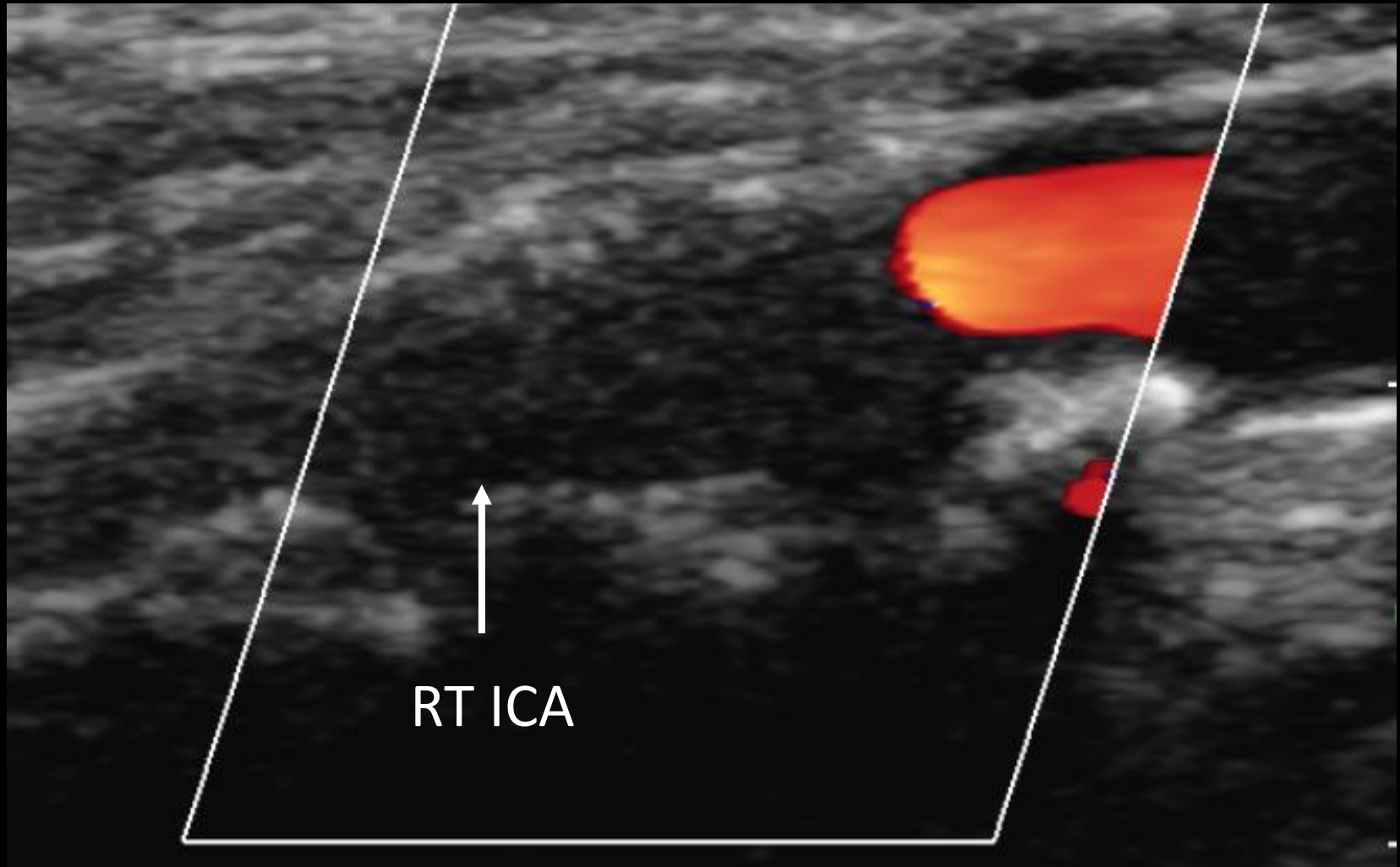
45 year old with TIA



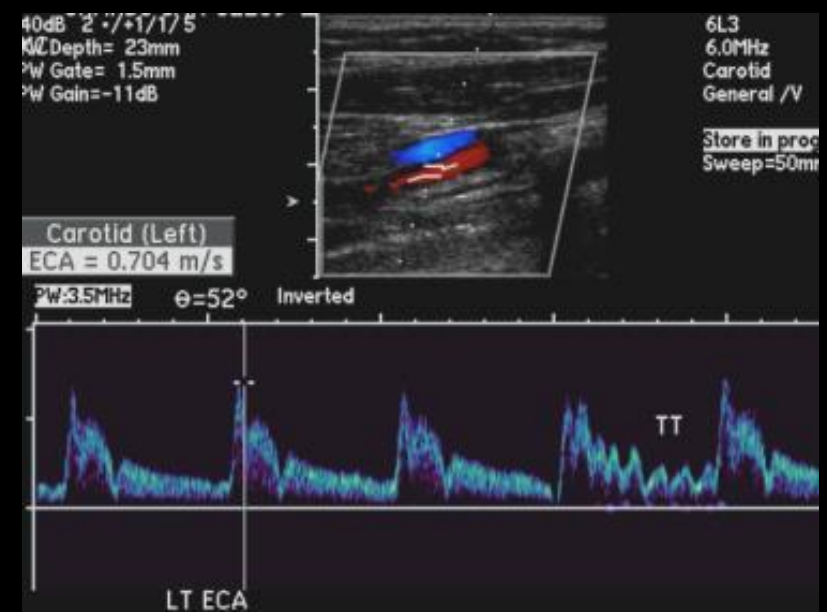
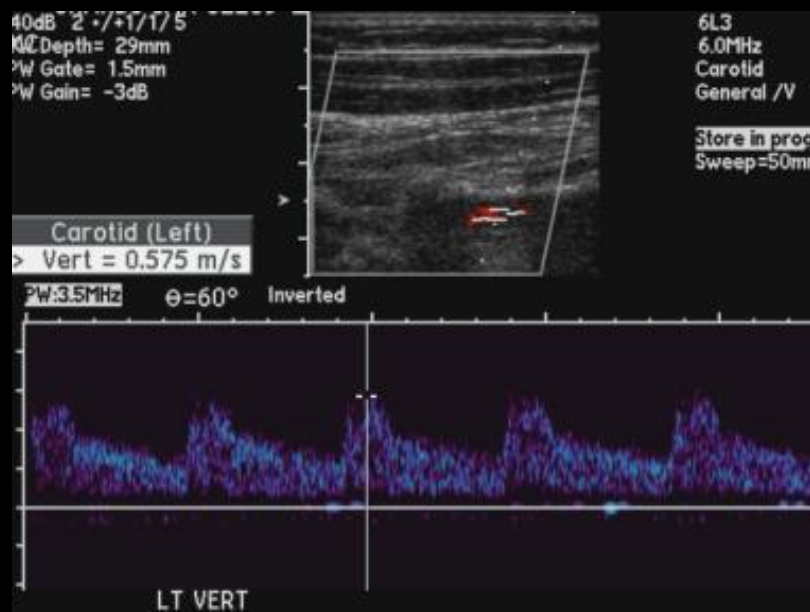
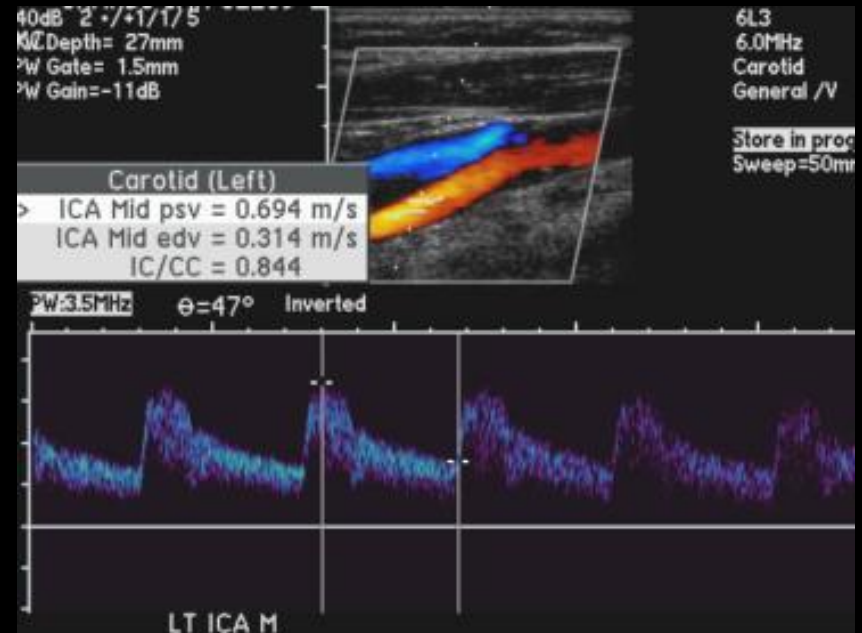
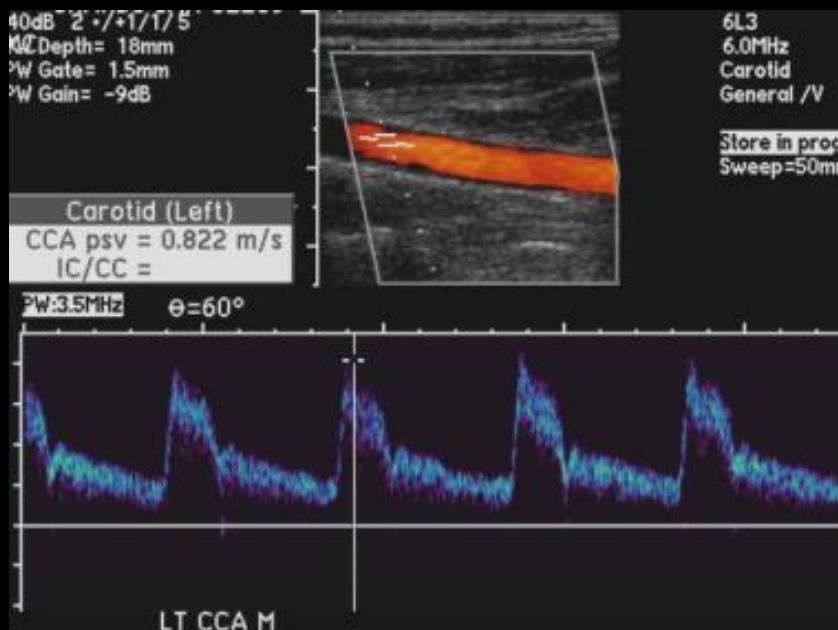
45 year old with TIA: Repeat Images



ICA Occlusion



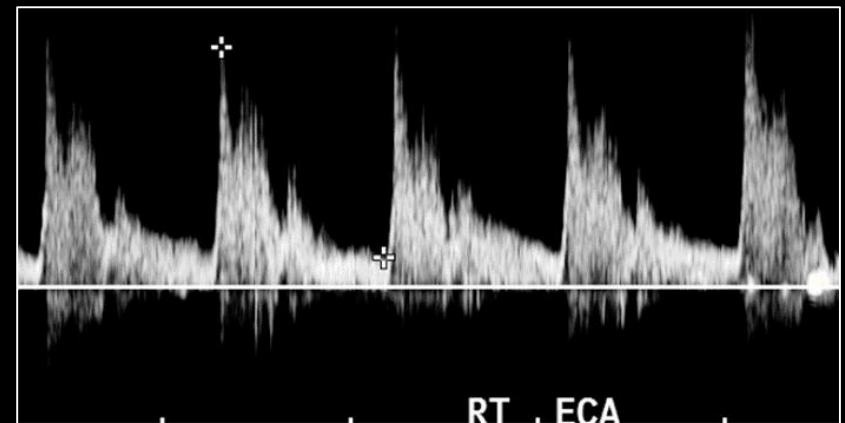
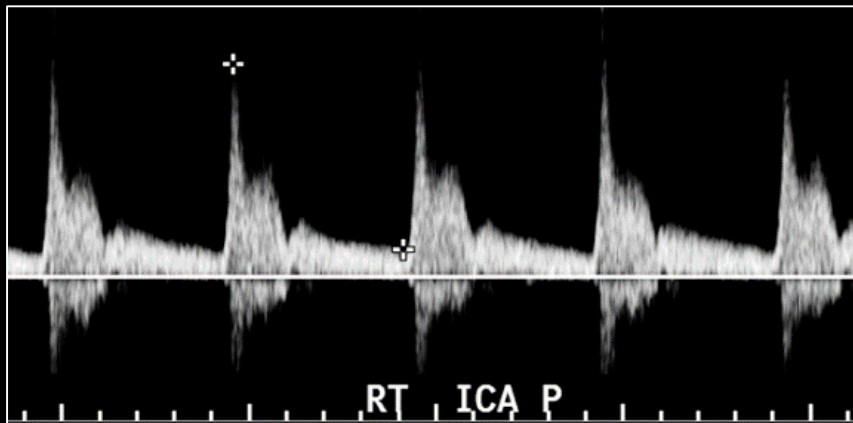
Normal spectral waveforms



ICA versus ECA

<u>ICA</u>	<u>ECA</u>
Low resistance	High resistance
No cervical branches, usually posterior lateral to ECA	Cervical branches
Lesser degree transmission temporal tap	Greater degree transmission temporal tap

Pitfall #1: Failure to identify correct waveforms

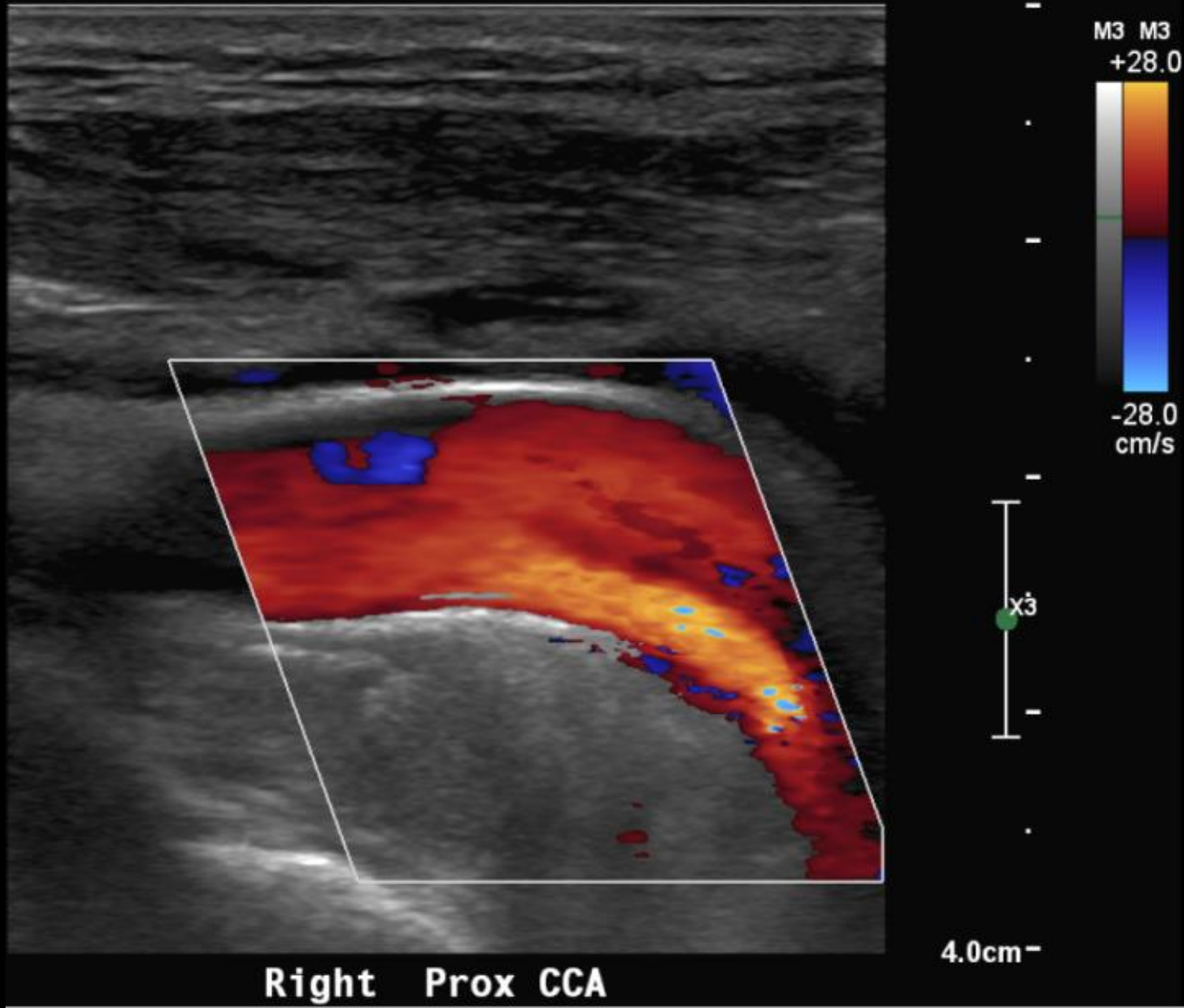


Learning Objectives

- Compare and contrast normal and abnormal Doppler waveforms
- Describe pitfalls in Doppler interpretation
- Apply Doppler principles to diagnose urgent vascular findings

Left facial drooping

Left facial drooping - diagnosis?



Left facial drooping - diagnosis?



Right Prox CCA

Aortic and right carotid dissection

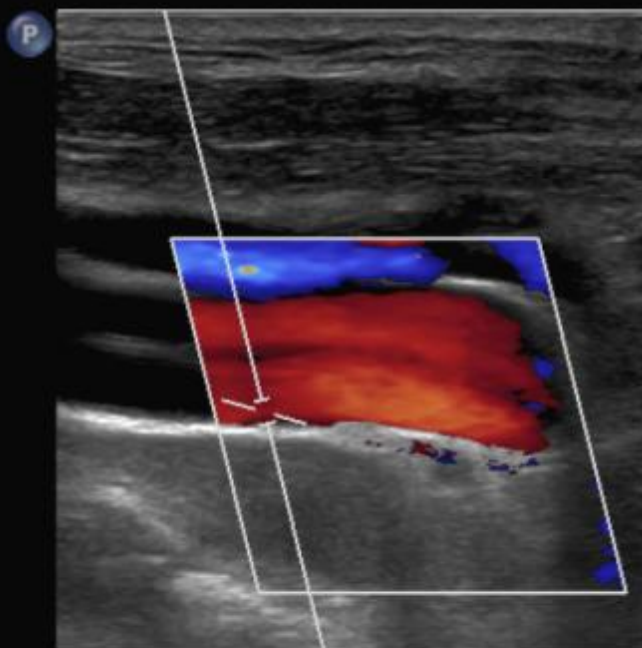
Vasc Carotid

L12-3
28Hz 60°

2D
58%
Dyn R 50
P Low
HGen

CF
51%
2545Hz
WF 139Hz
3.5MHz

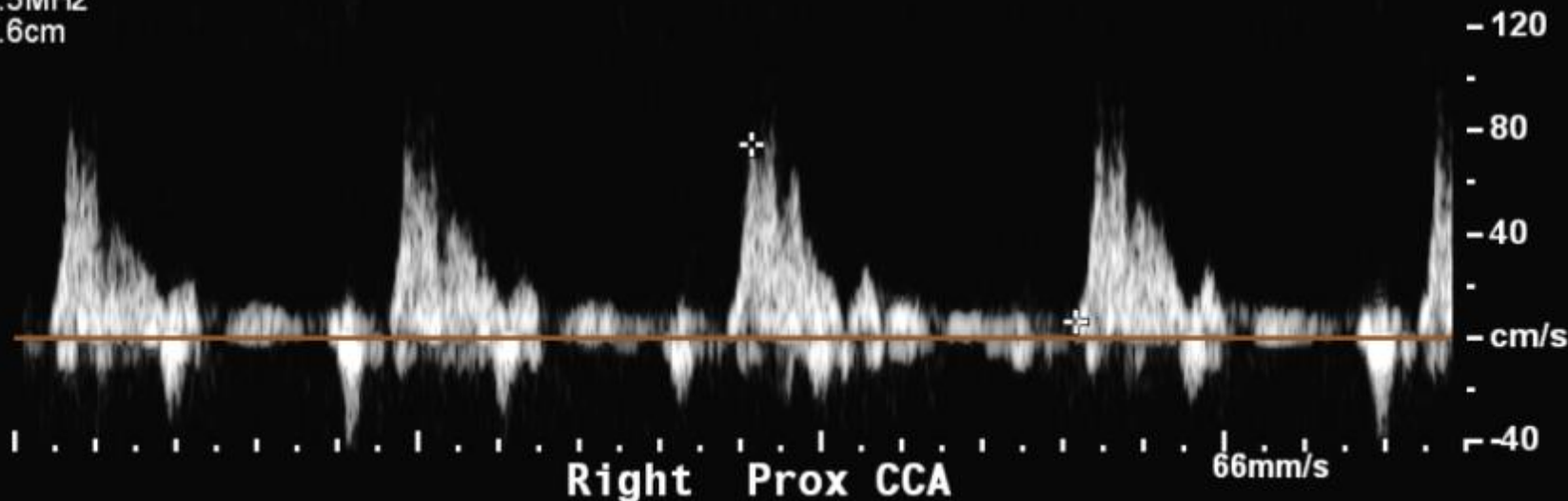
PW
50%
WF 60Hz
SV 1.5mm
3.5MHz
2.6cm



TIS 0.3 MI 0.6

M3 M3
+28.0
+ PSV 74.6 cm/s
EDV 6.21 cm/s
RI 0.92
-28.0
cm/s

4.0cm -

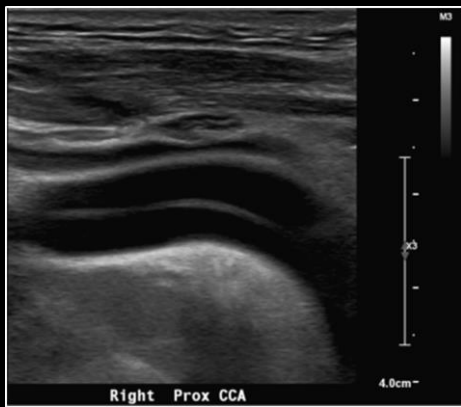


Aortic and right carotid dissection

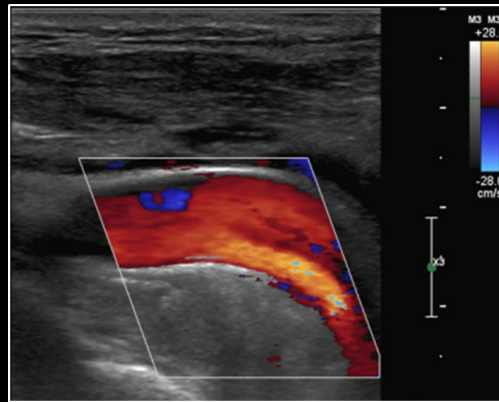


Pearl #1: Systematic approach

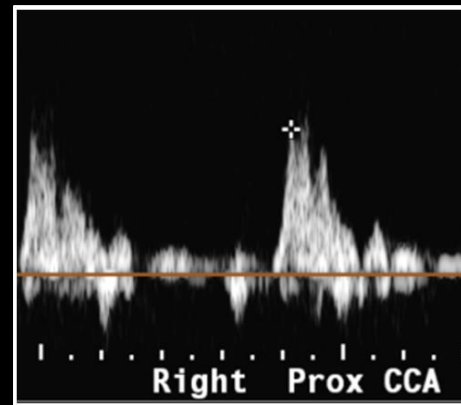
✓ grayscale



✓ color



✓ spectral

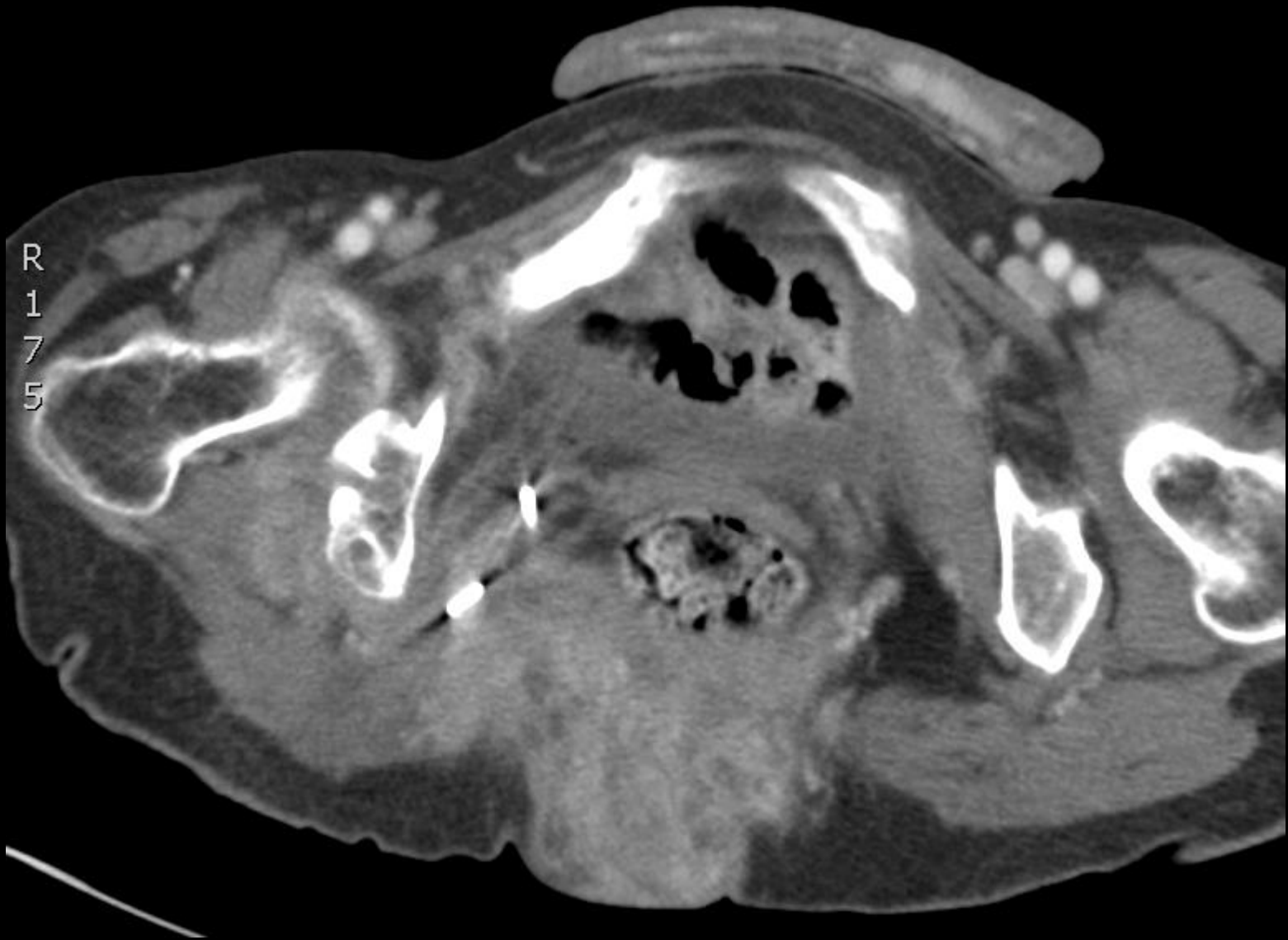


✓ velocities

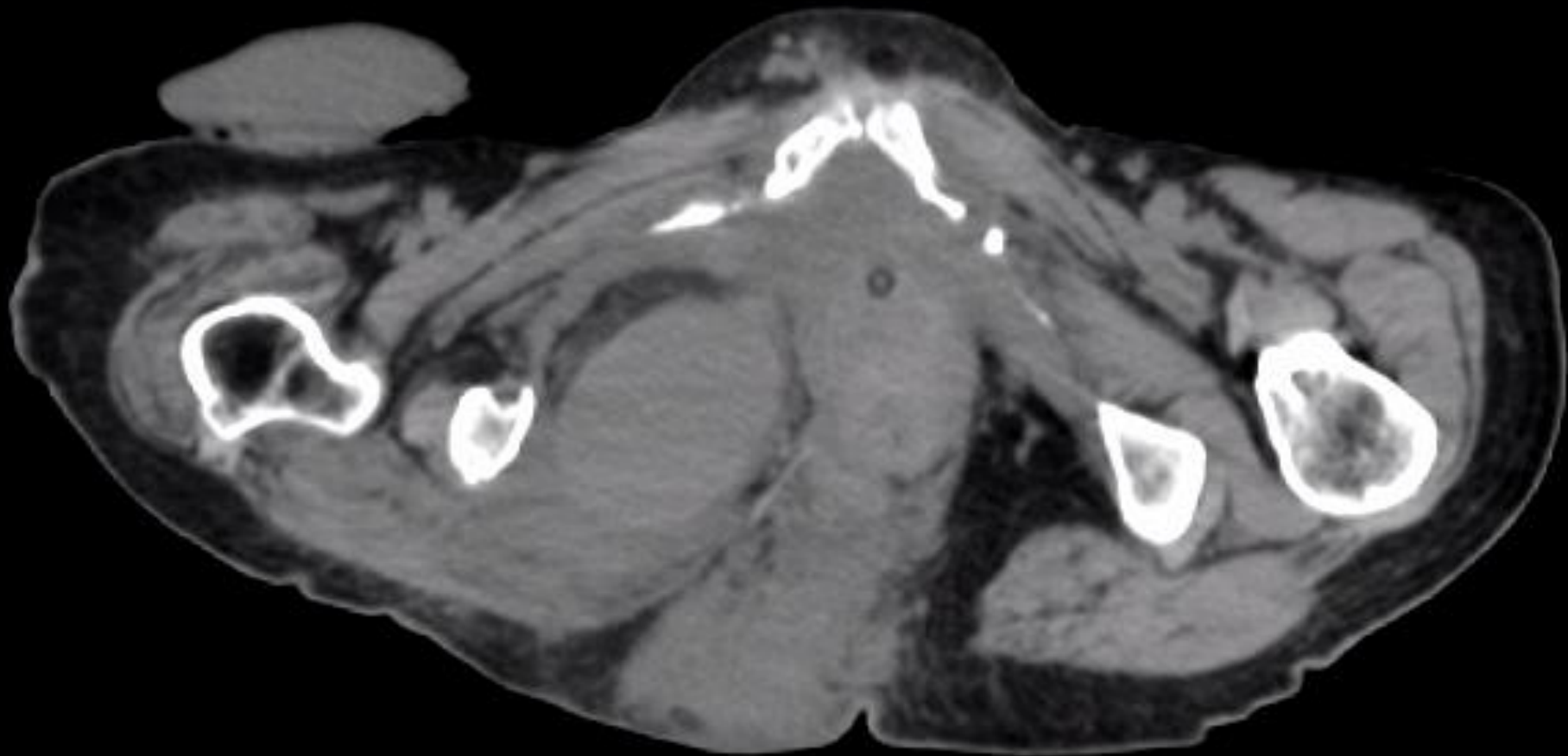
Bulb	θ	52 °
PSV		-136 cm/s
EDV		-16.9 cm/s
Prox ICA	θ	40 °
PSV		-206 cm/s
EDV		-62.2 cm/s
Mid ICA	θ	34 °
PSV		-187 cm/s
EDV		-51.2 cm/s
Dist ICA	θ	34 °
PSV		-194 cm/s
EDV		-42.9 cm/s
Prox ECA	θ	52 °
PSV		-115 cm/s
EDV		-9.9 cm/s

70 year old with a history
of neurofibromatosis

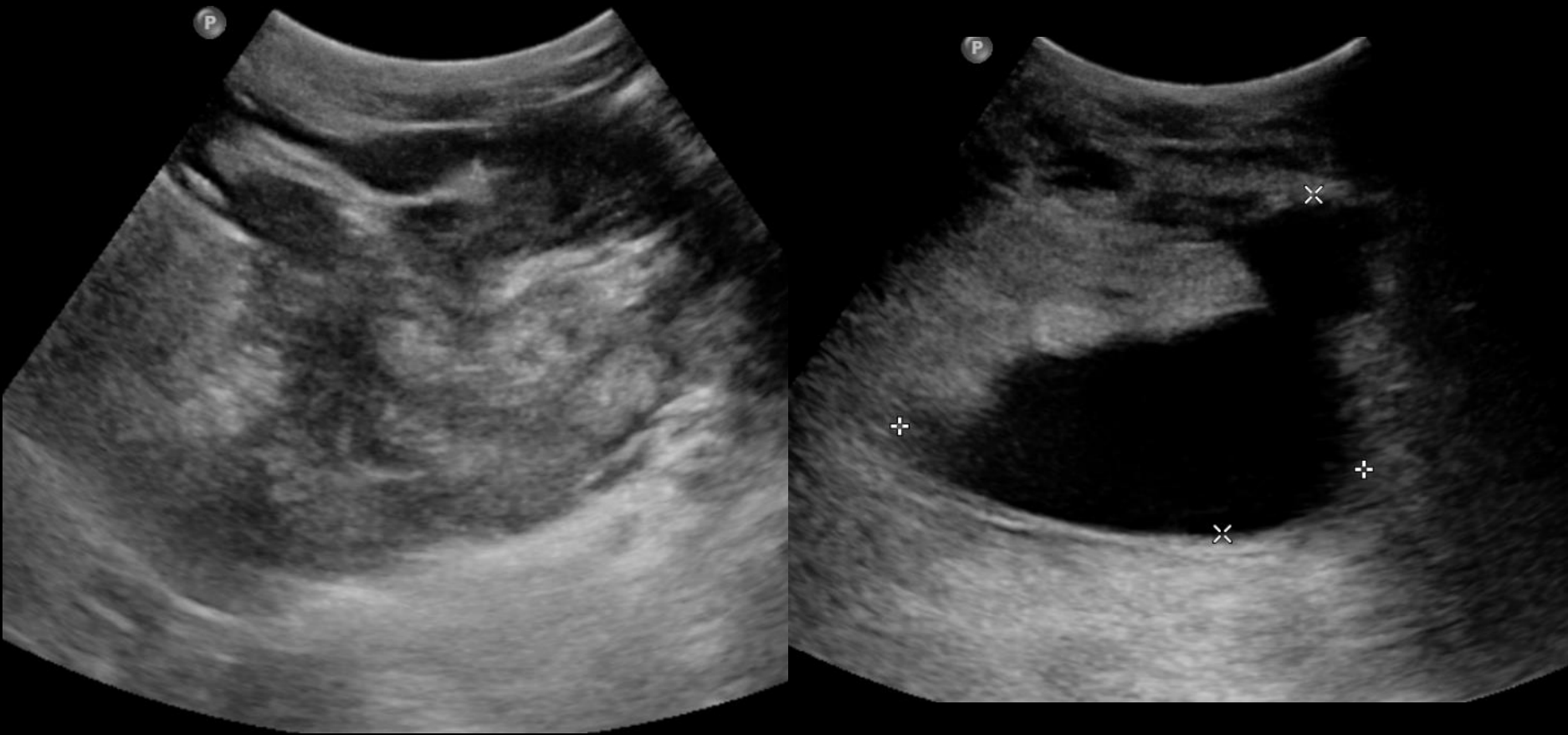
Neurofibromatosis, malignant transform?



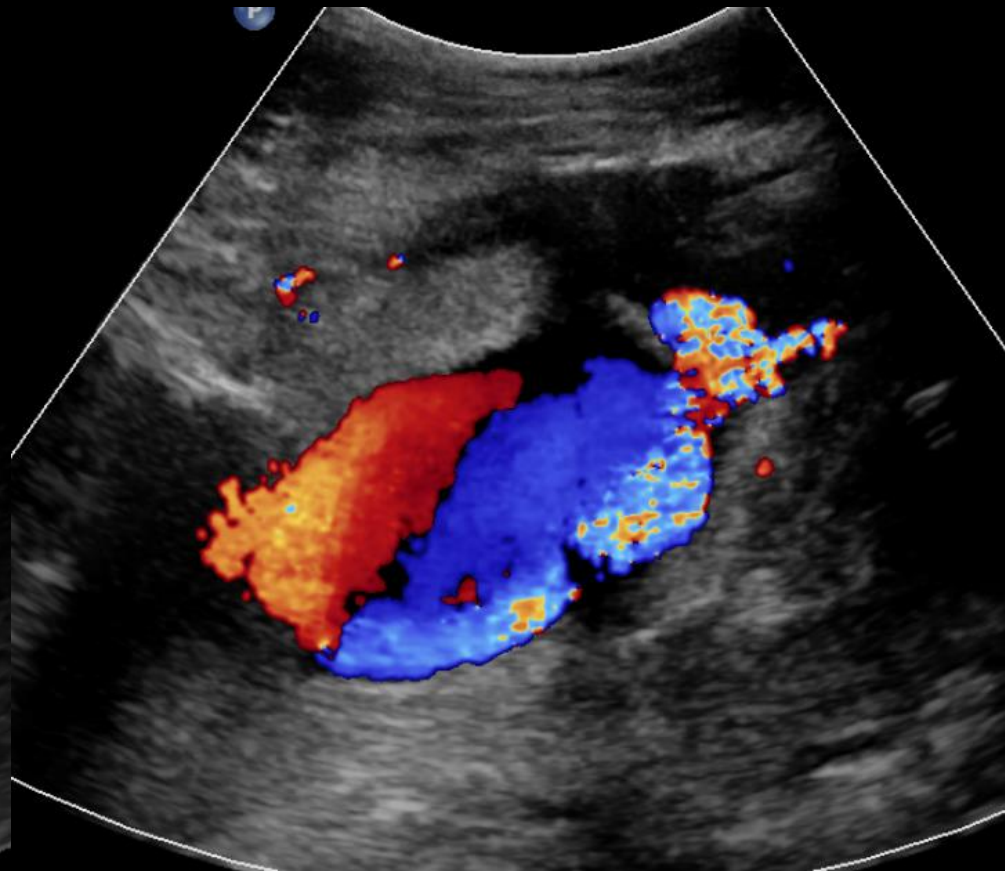
6 weeks later pre-biopsy CT



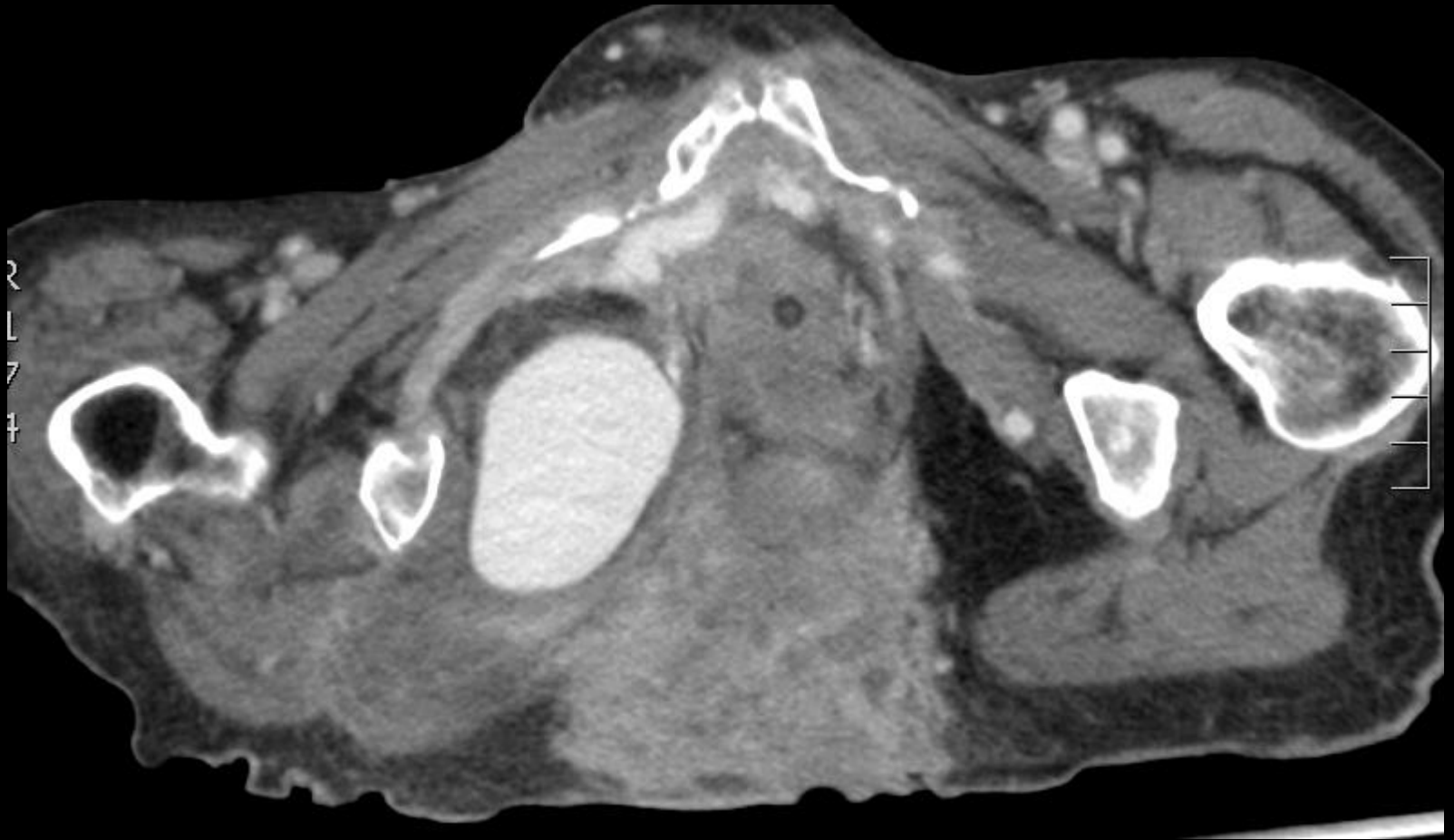
Biopsy deferred; US performed.
What's next?



Diagnosis?



Pseudoaneurysm



Pseudoaneurysm

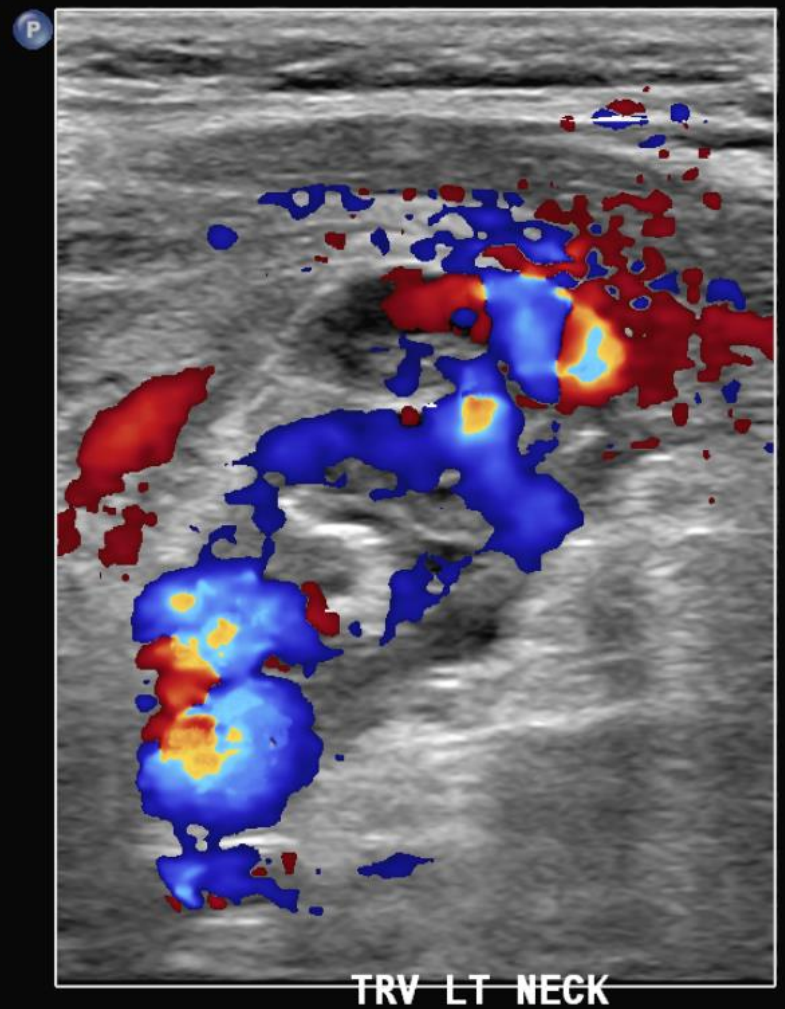
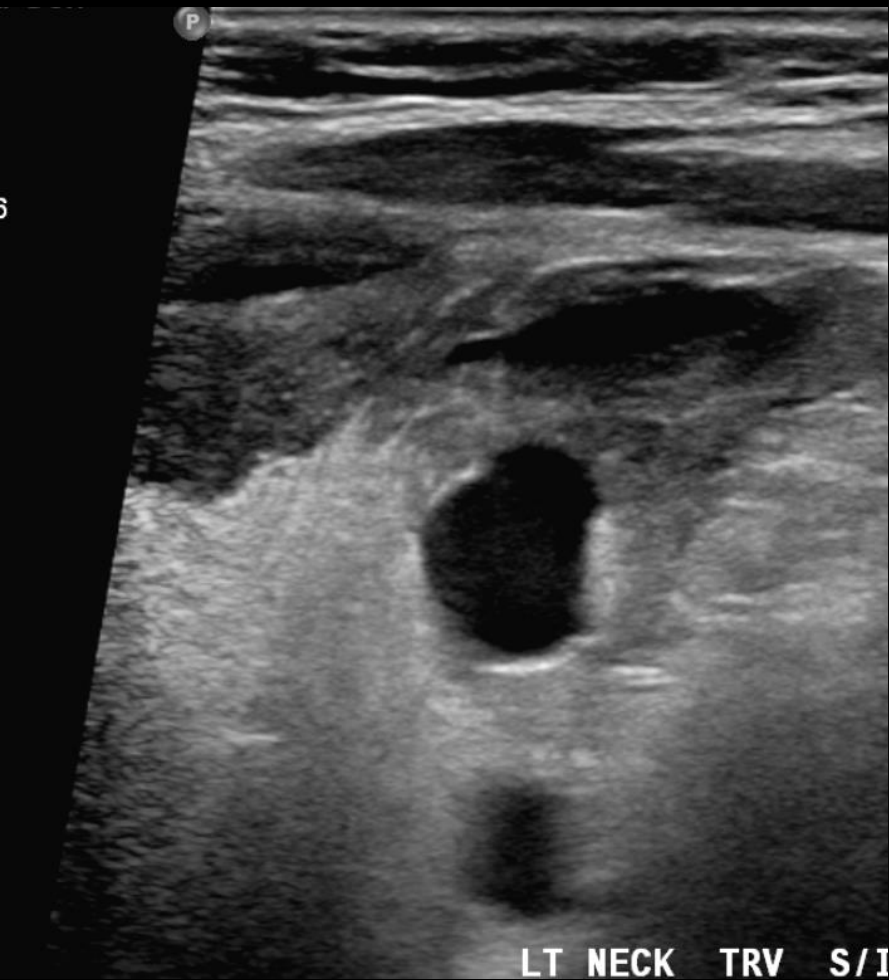


Central line attempt:
evaluate for hematoma

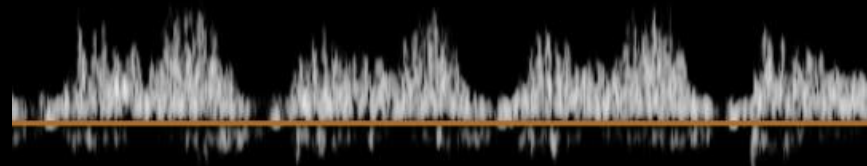
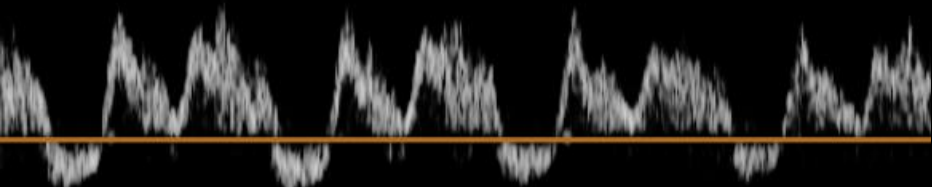
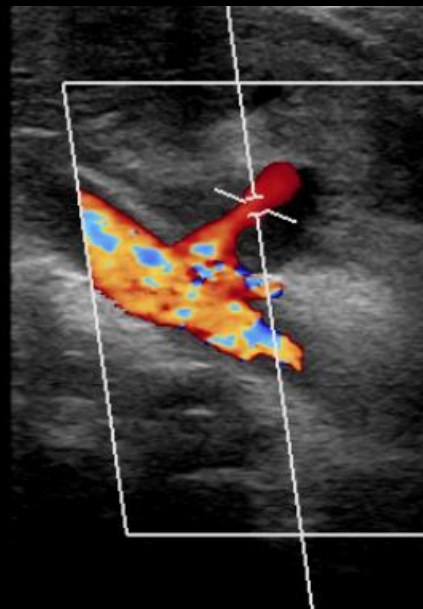
Evaluate neck hematoma



Evaluate neck hematoma: next?

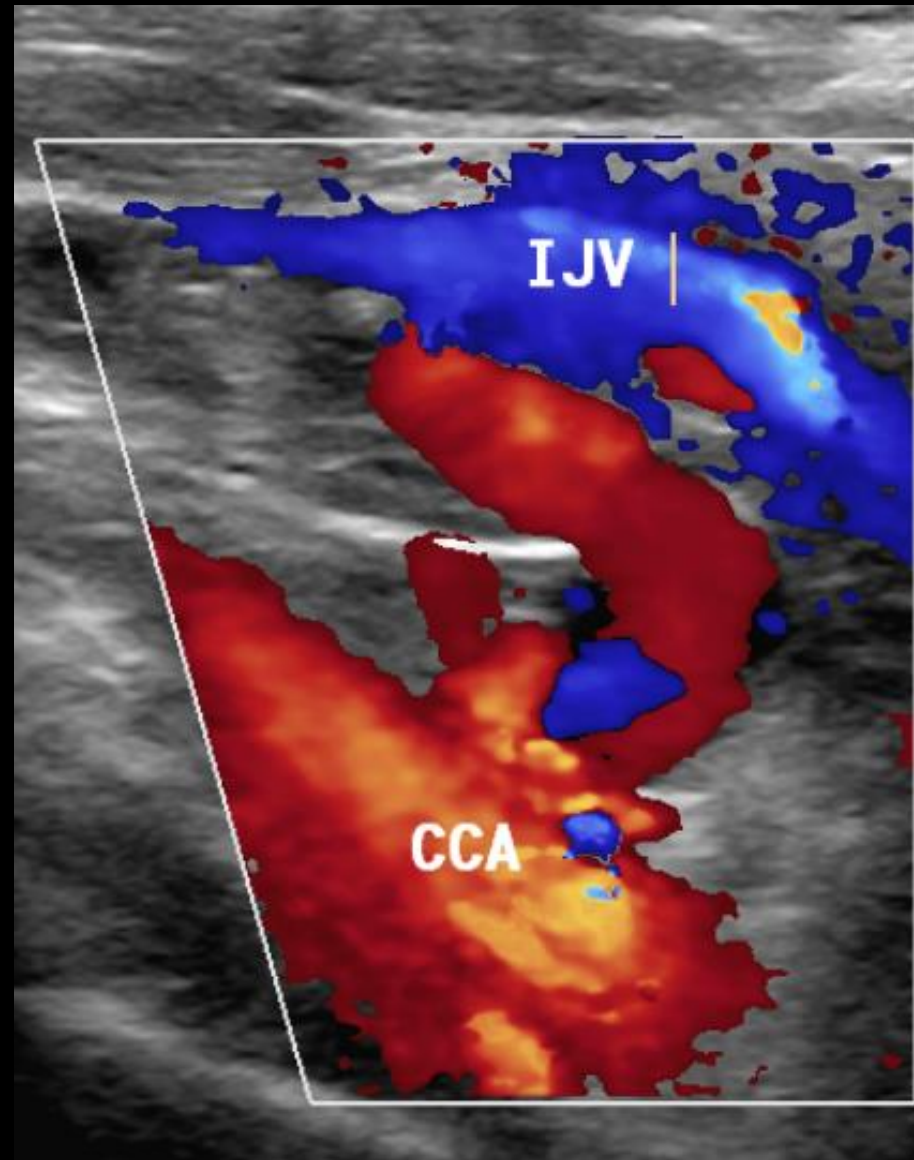
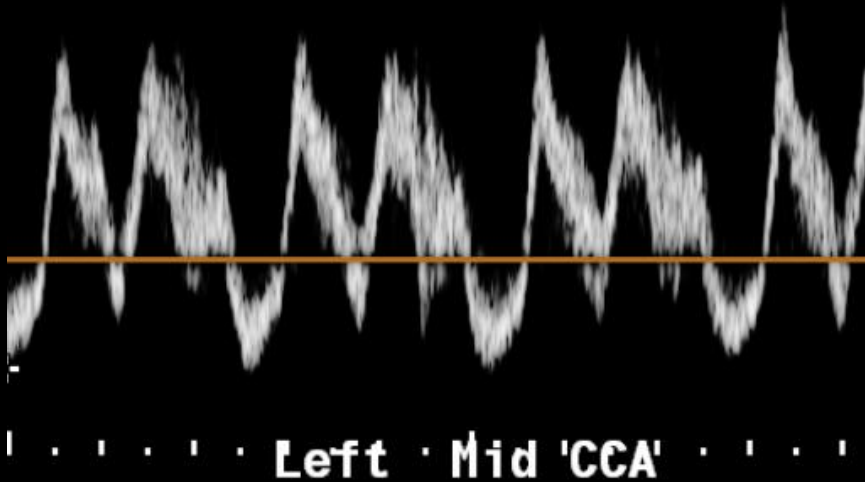
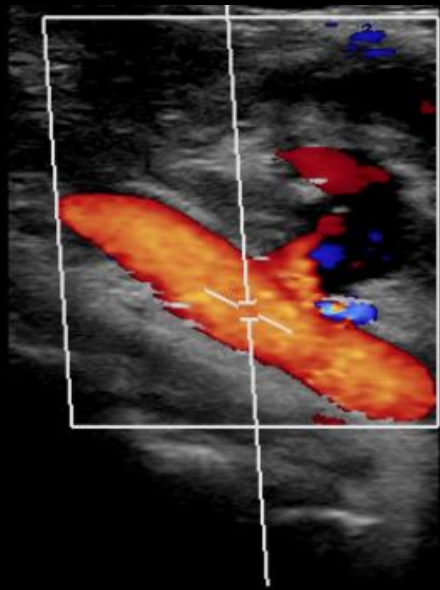


Spectral Doppler



· · · · · SAG · LT 'CCA' · · · · ·

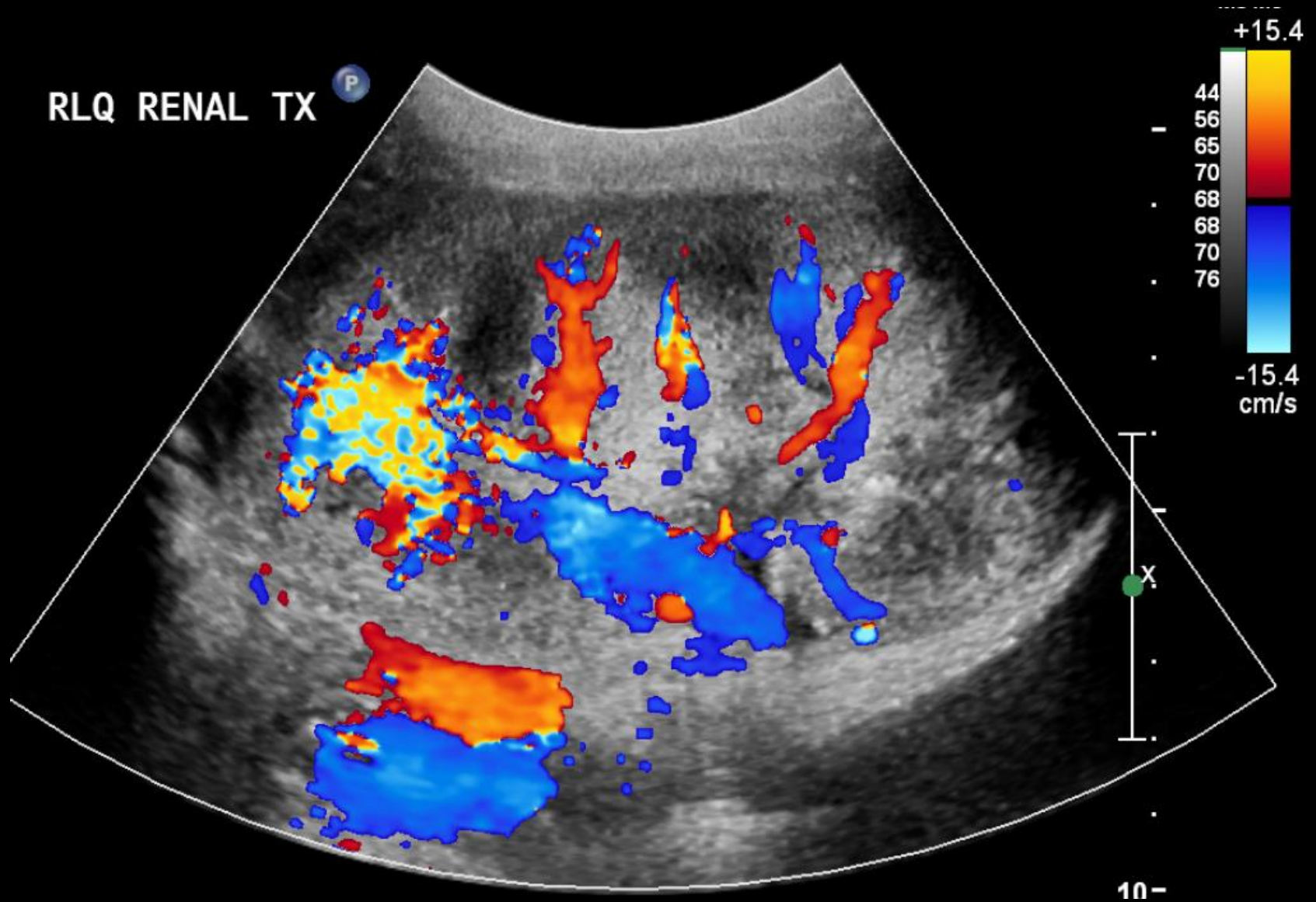
Aortic Balloon Pump. CCA-IJ Fistula



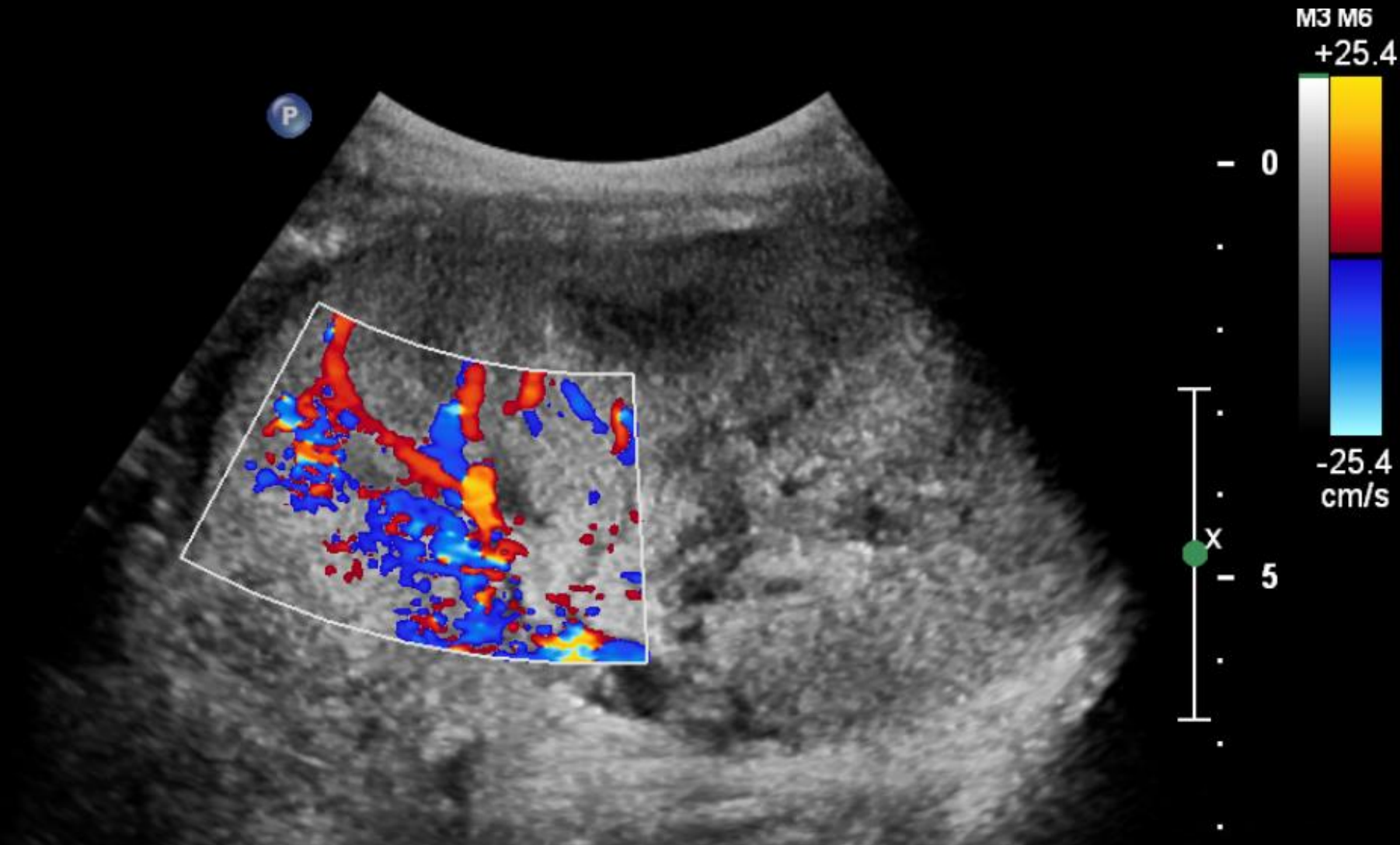
Pearl #2: Always turn on color

History of recent renal transplant biopsy

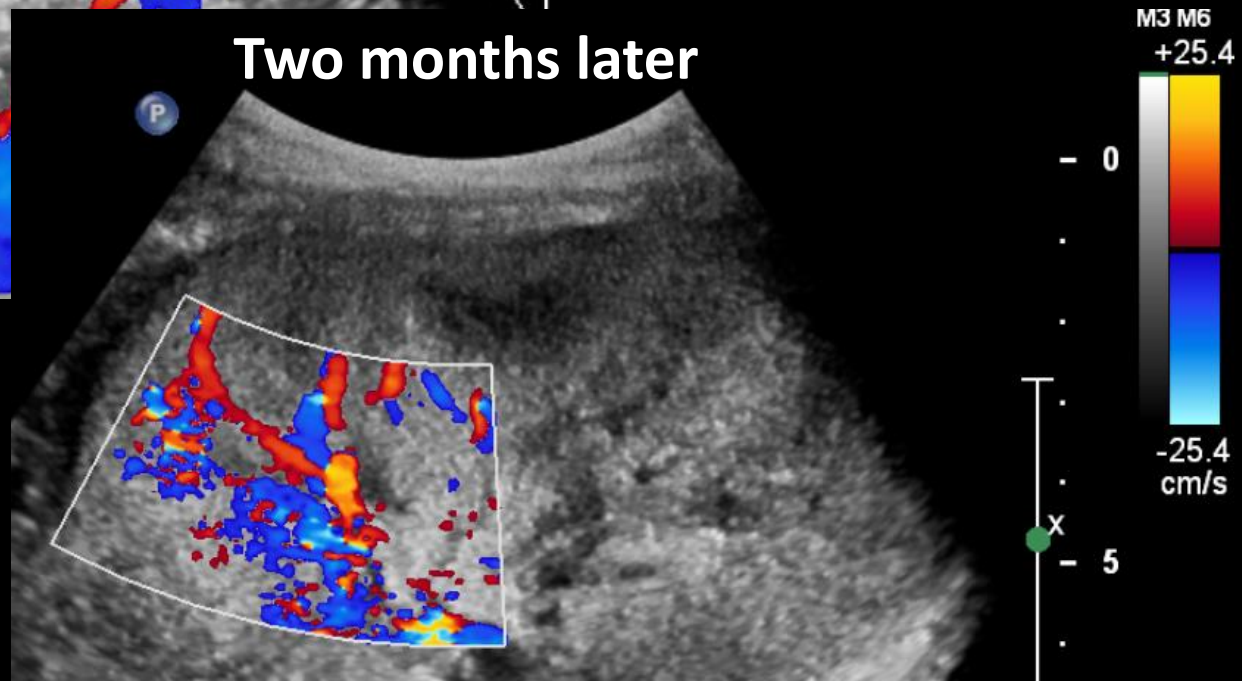
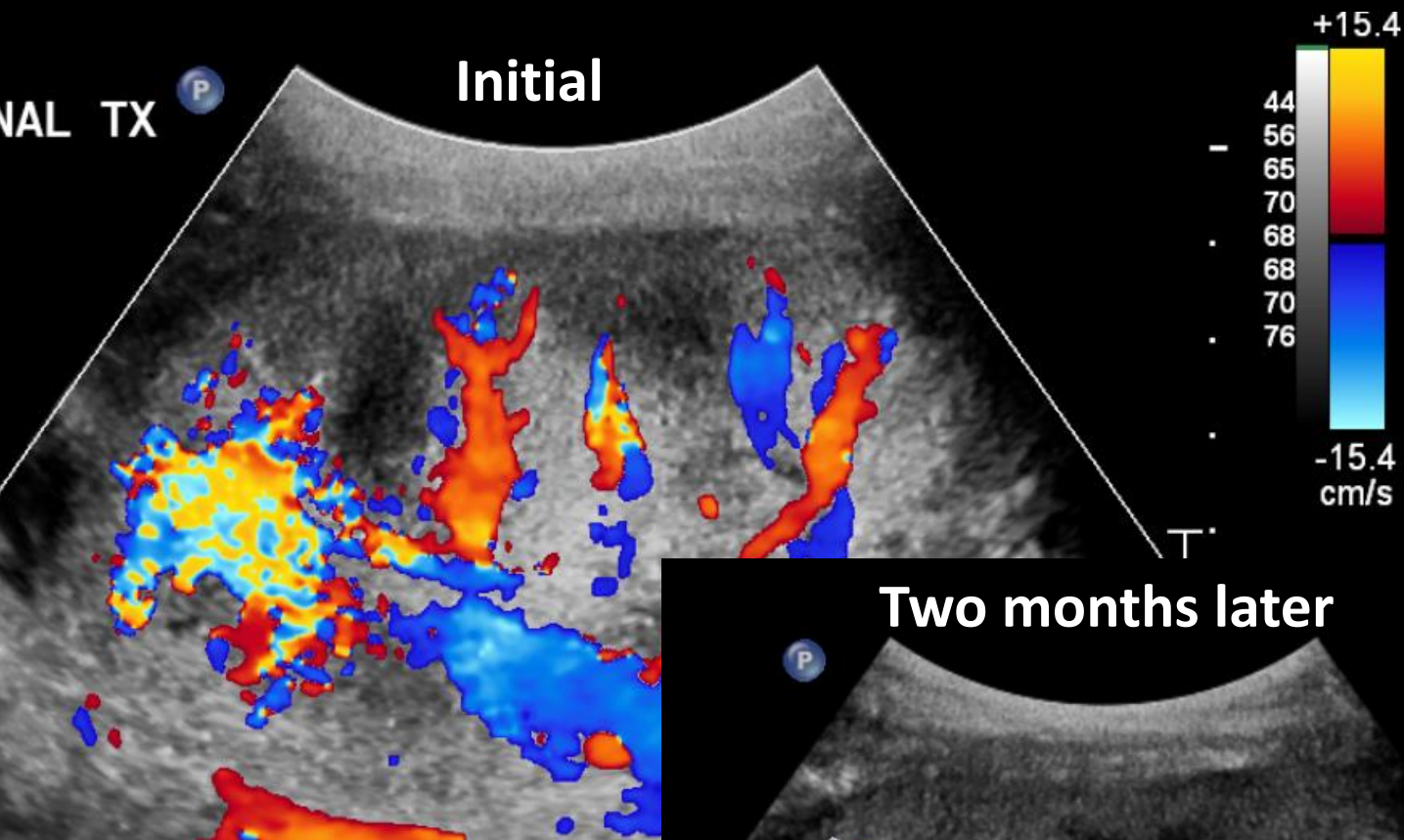
Renal transplant biopsy: Diagnosis?



Two months later: AV fistula gone?

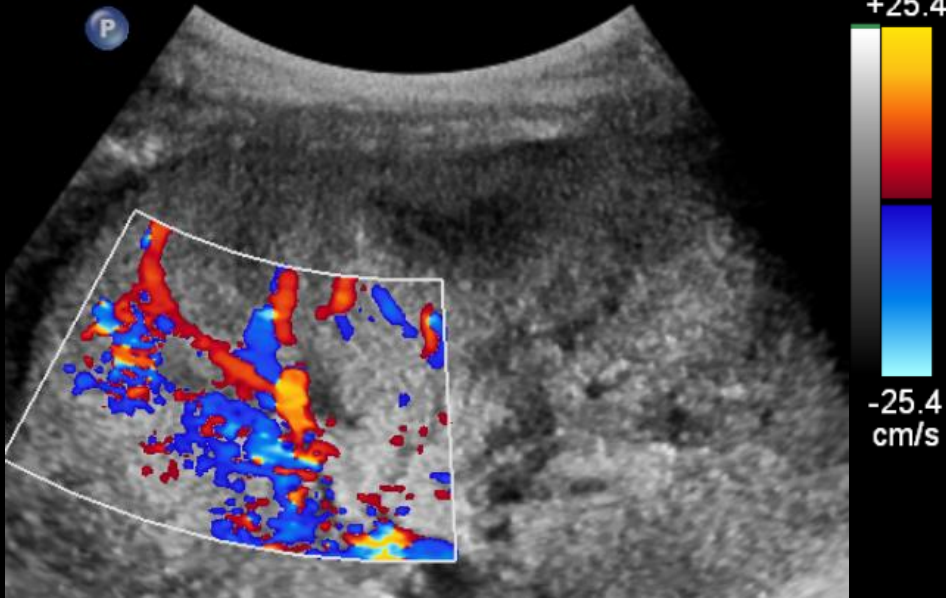


Two months later: AV fistula gone?

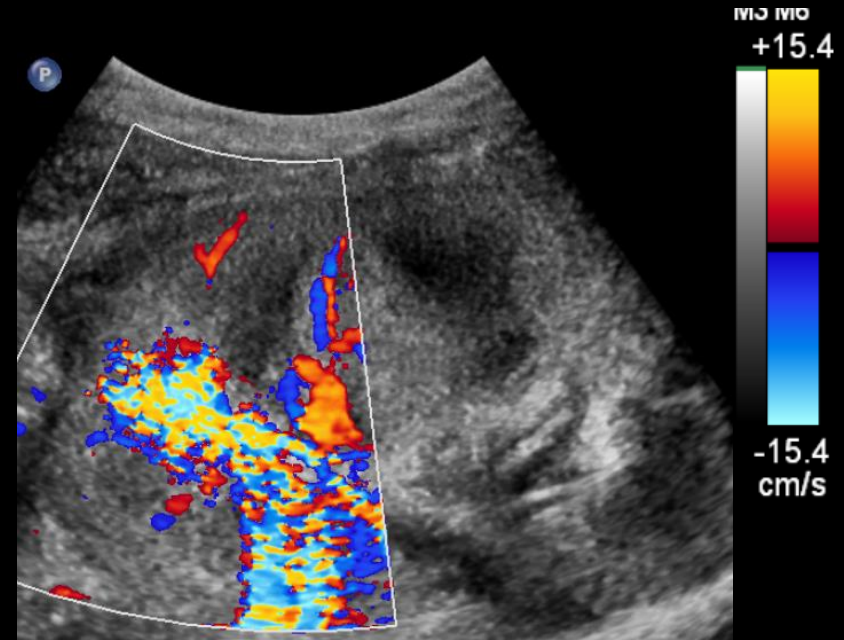


Repeat imaging

First set of images



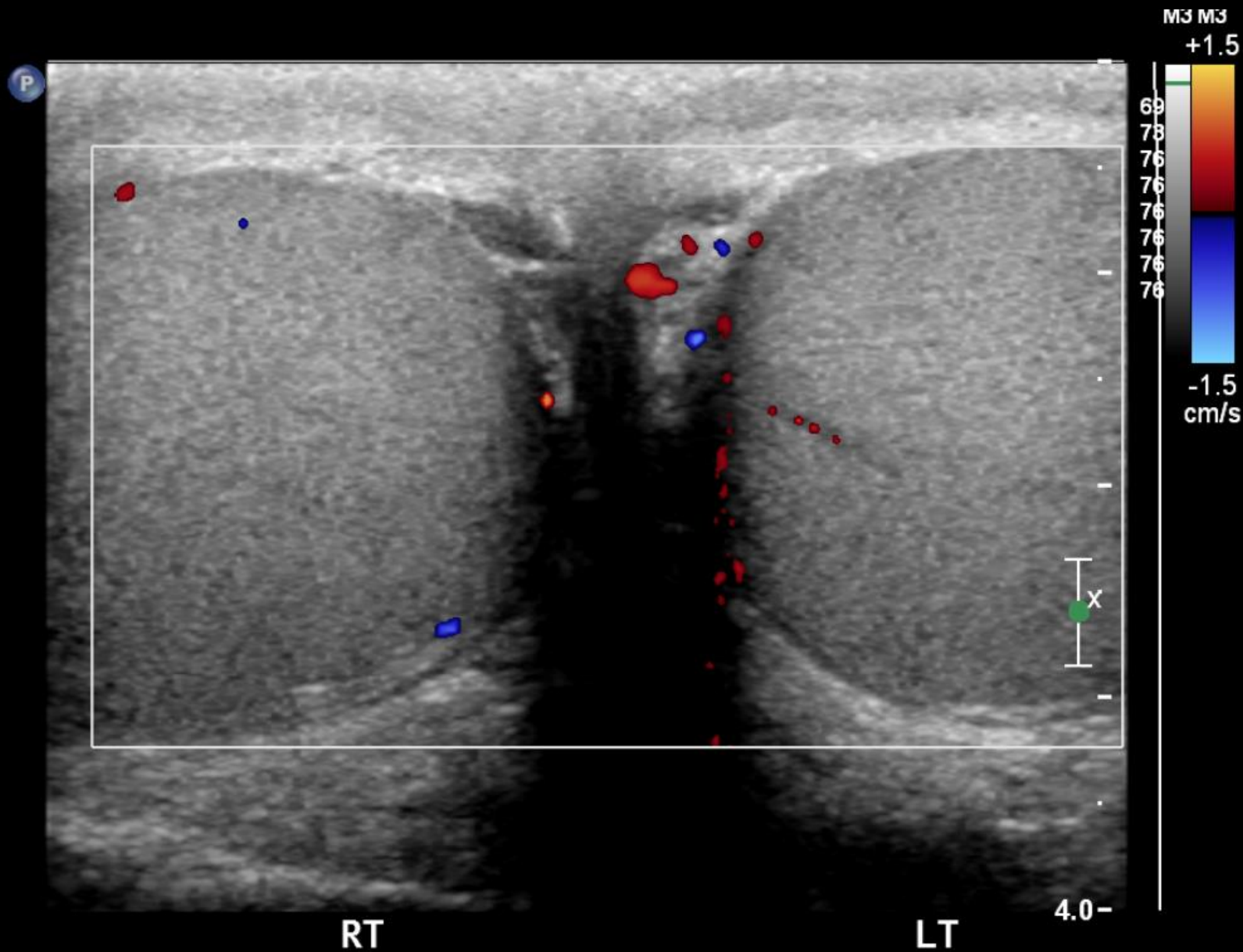
Repeat images same day



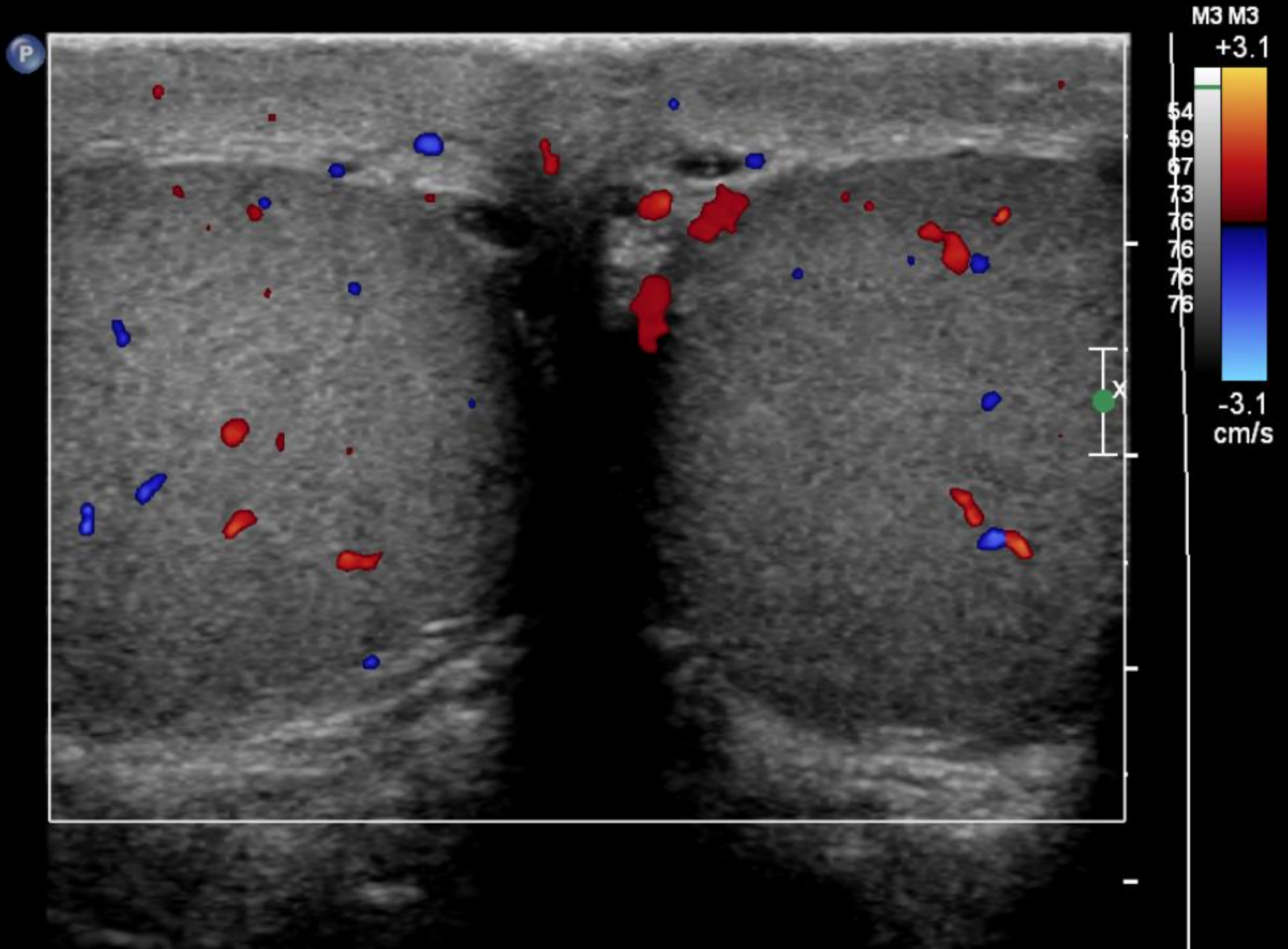
Effect of adjusting the scale

22 year old with scrotal pain:
rule out torsion

Rule out torsion: initial images

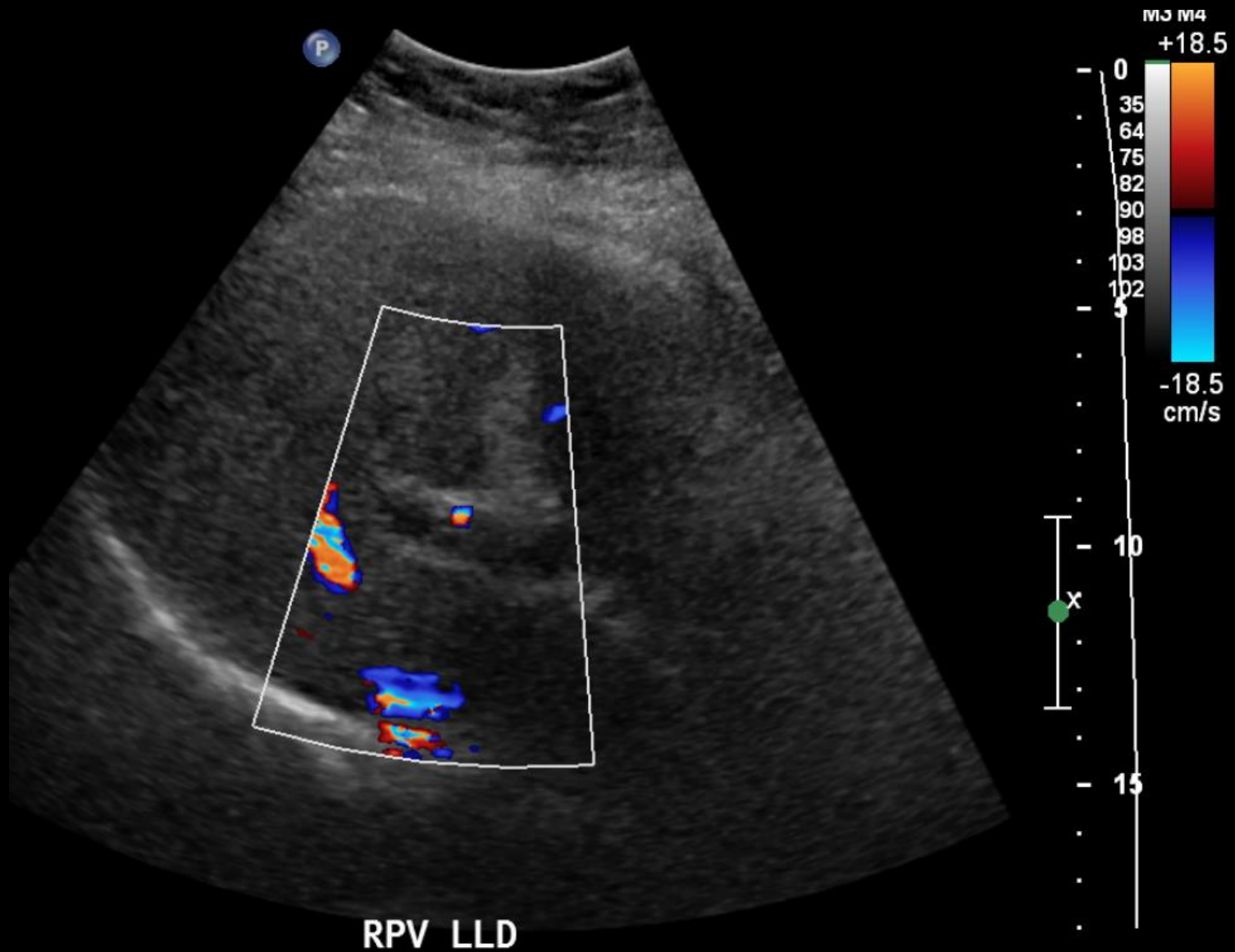


Repeat images after scale adjustment

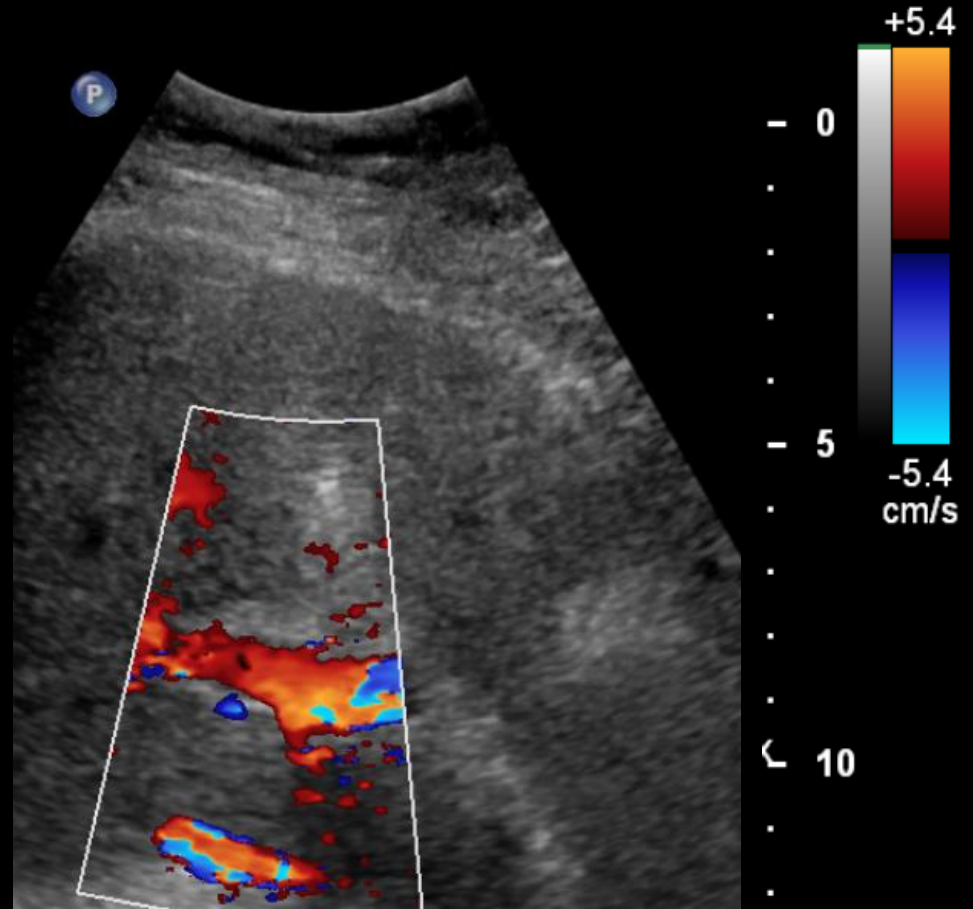
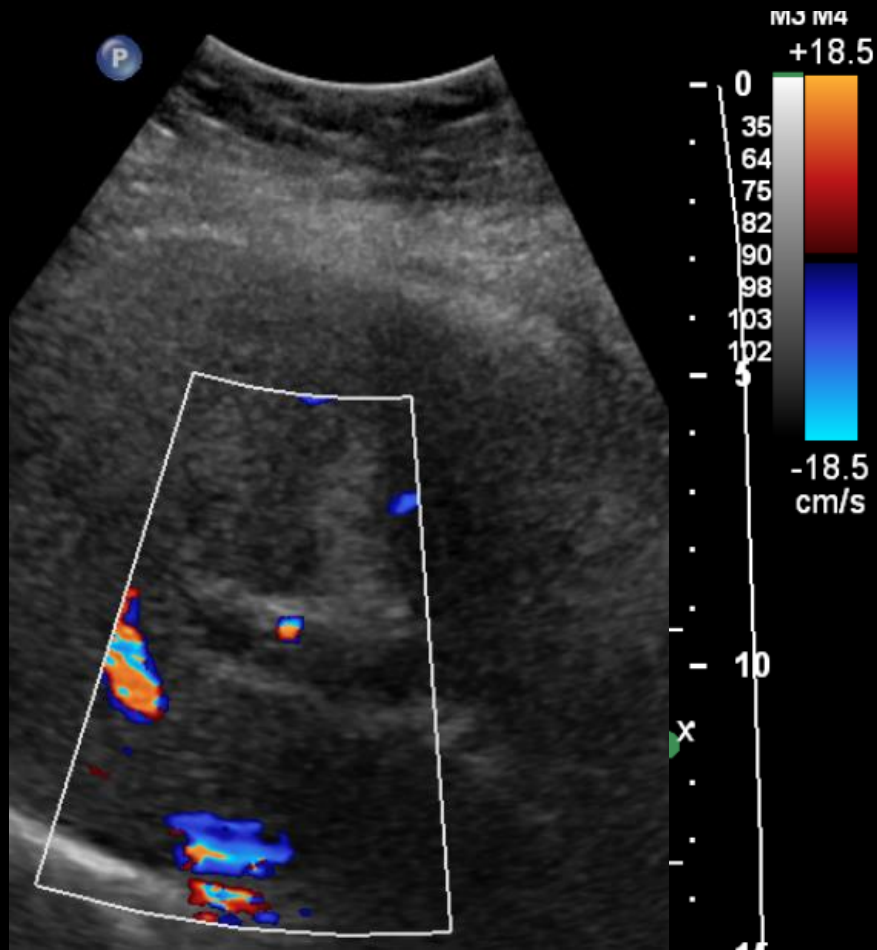


Pre-operative bariatric surgery

Pre-op: portal vein thrombosis?



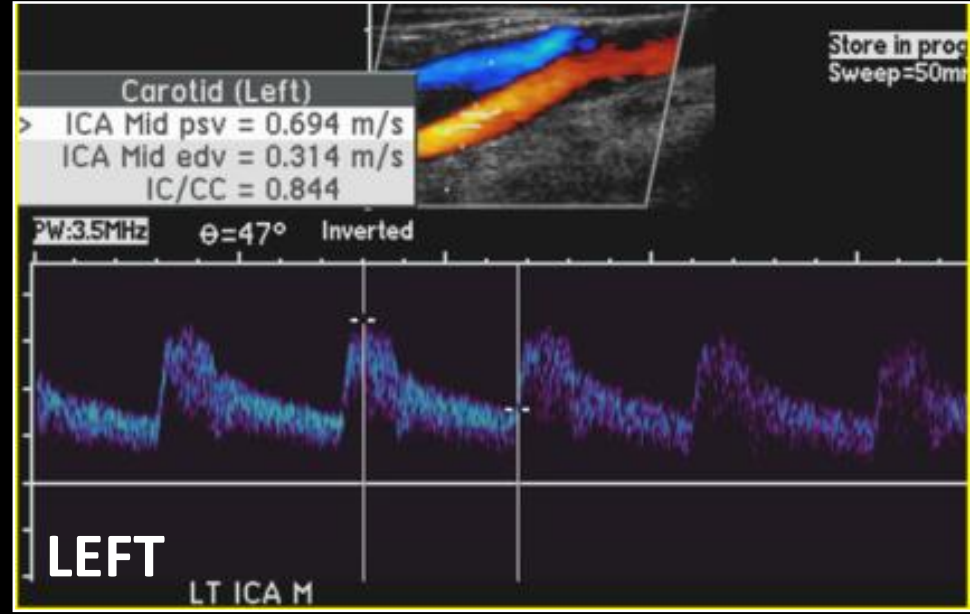
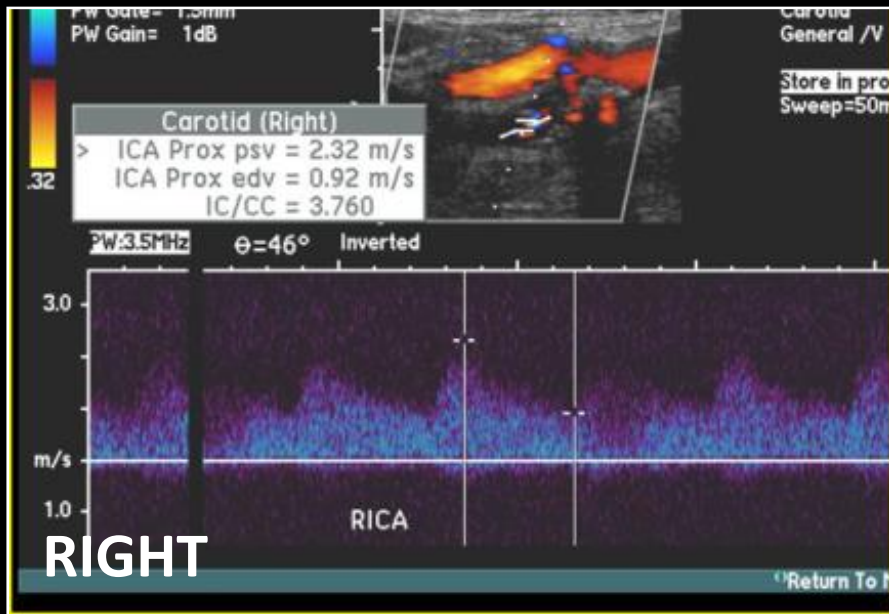
Repeat: no thrombus



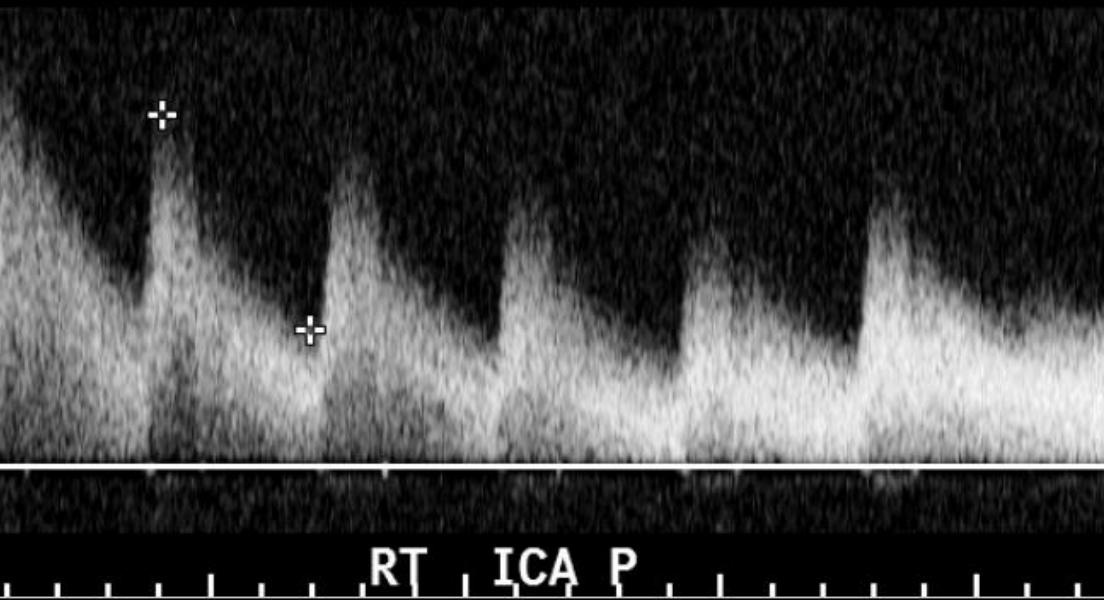
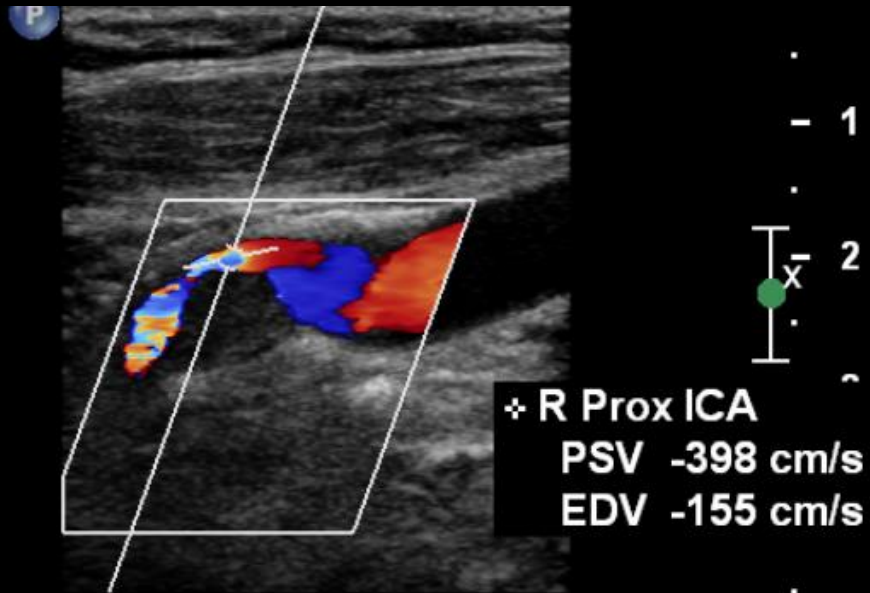
Pitfall #2: Incorrect Doppler scale

Pearl #3: These 3 waveforms

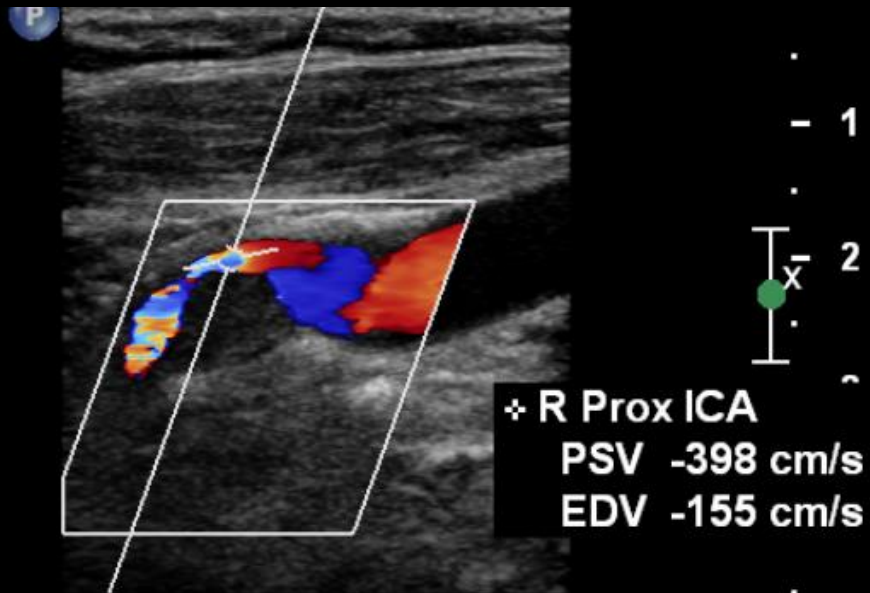
Right ICA waveform?



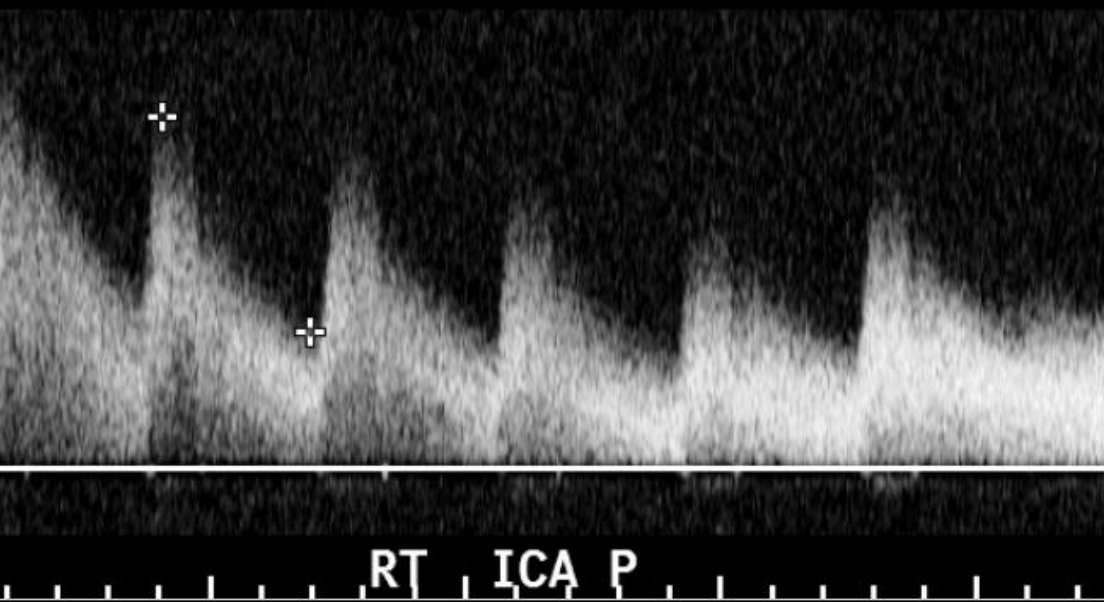
Spectral broadening: causes?



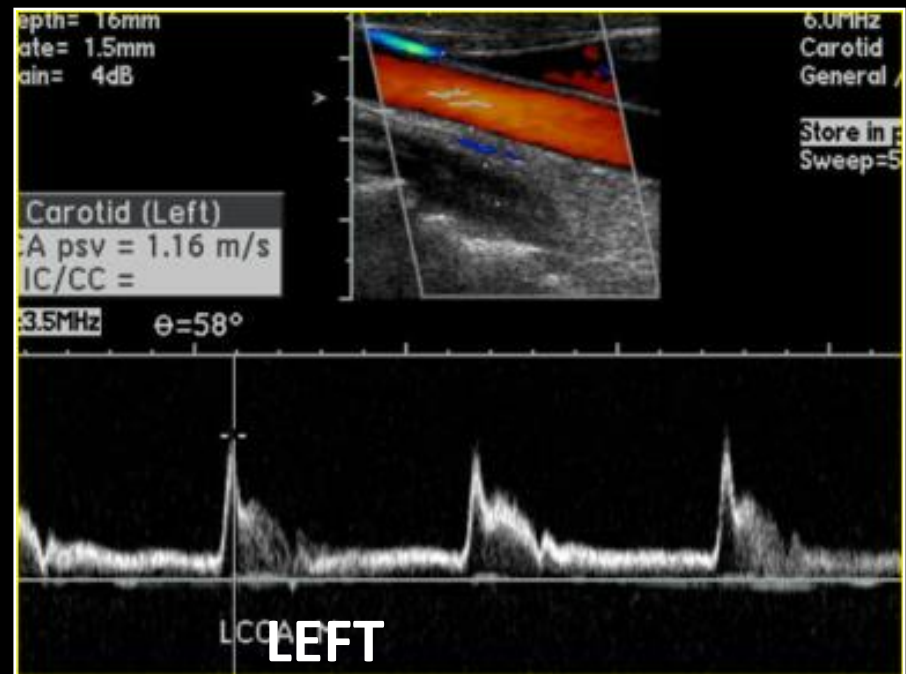
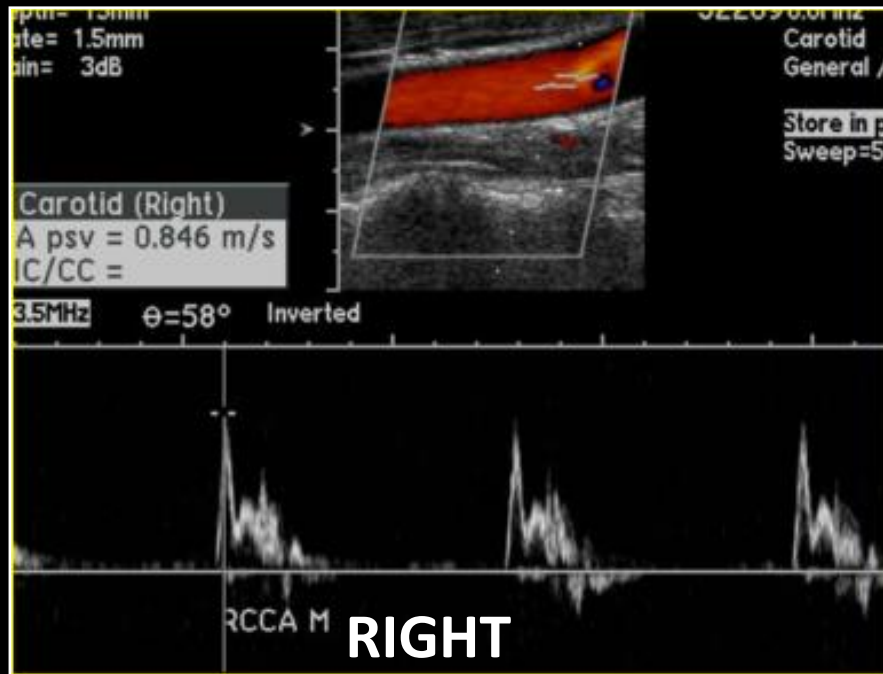
Spectral broadening: causes?



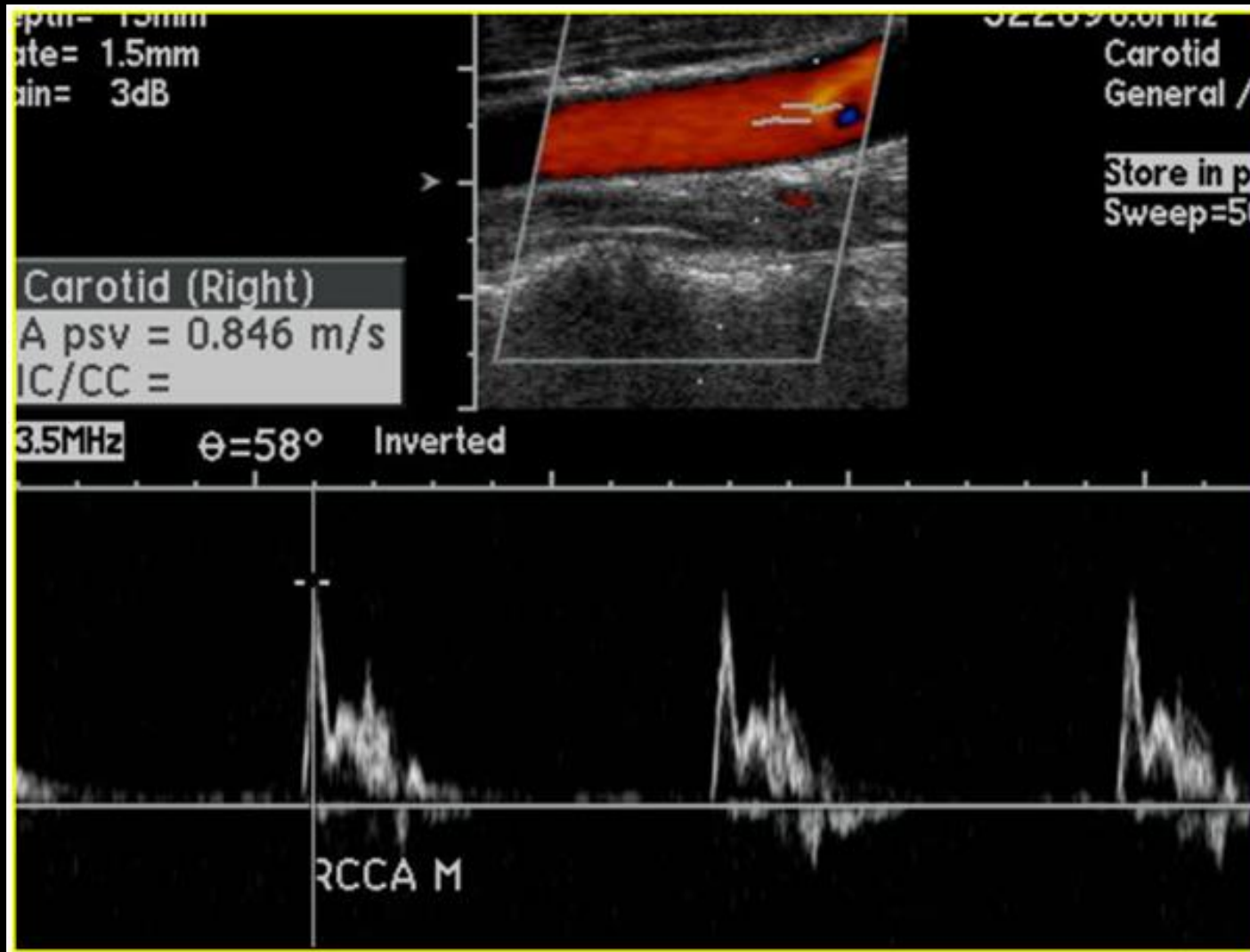
- Turbulent flow
- Gain too high
- Doppler sample too close to wall
- Too large Doppler sample volume



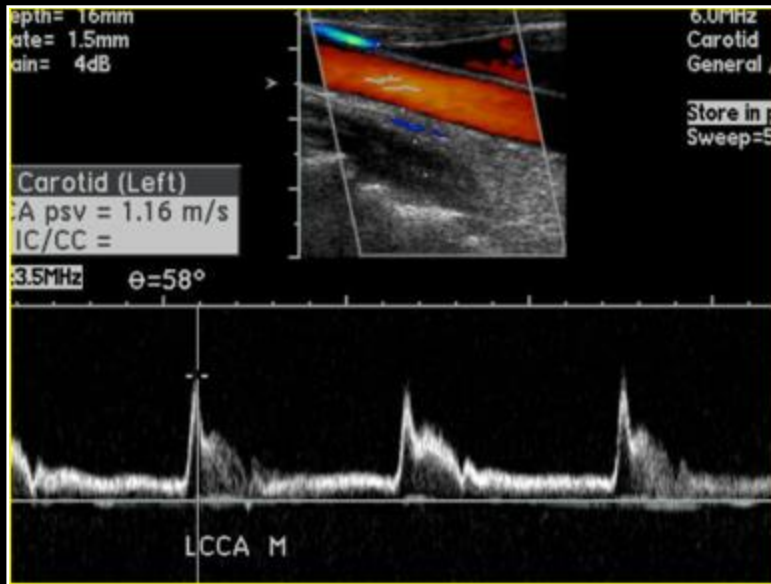
Abnormal RCCA waveform?



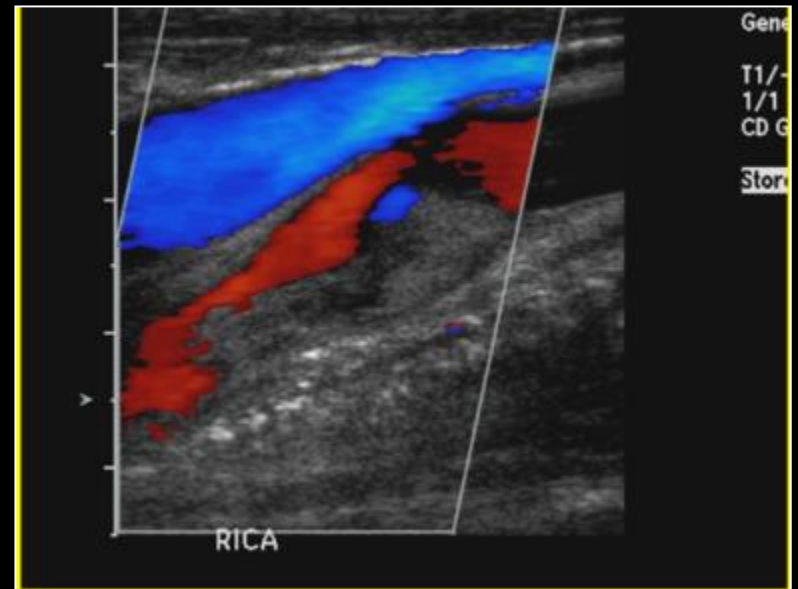
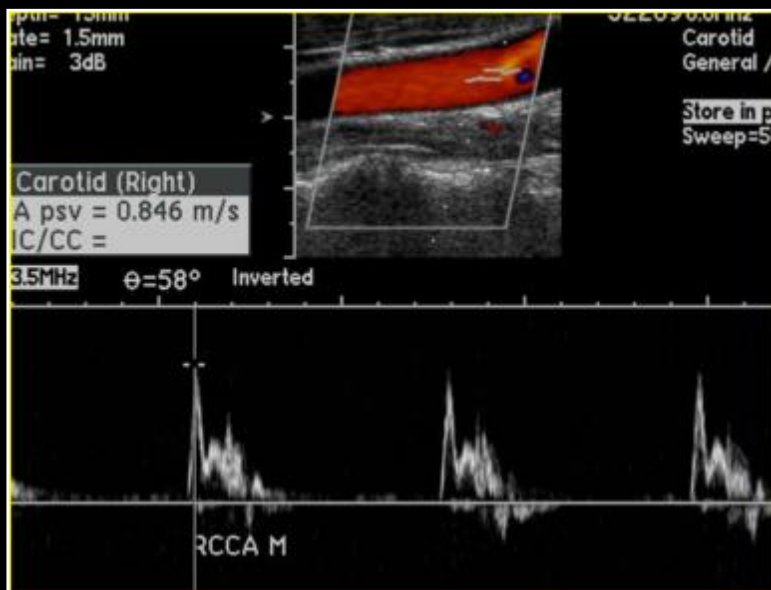
High resistive waveform: cause?



Causes of high resistive waveform

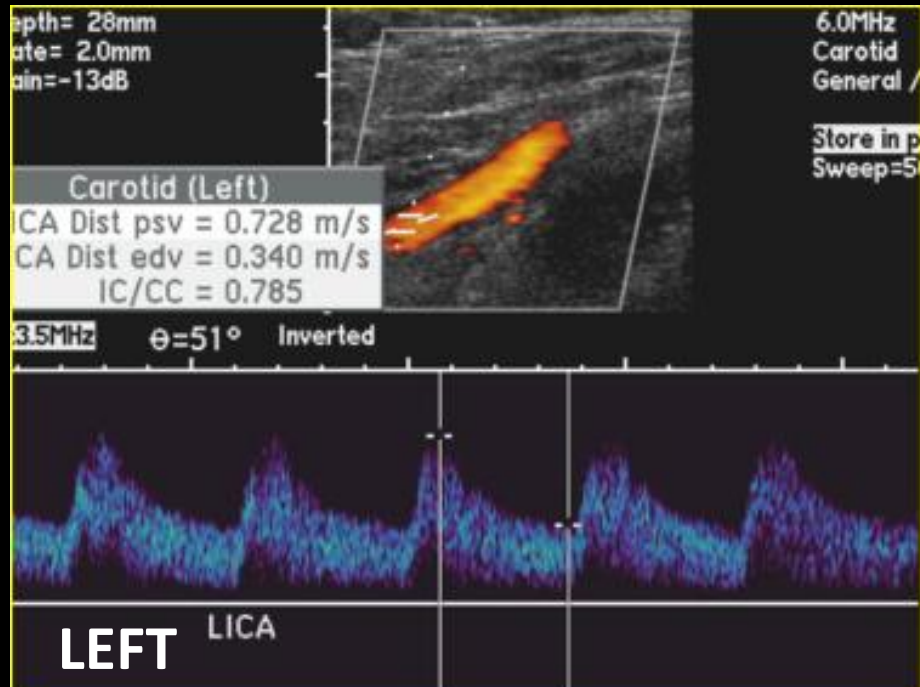
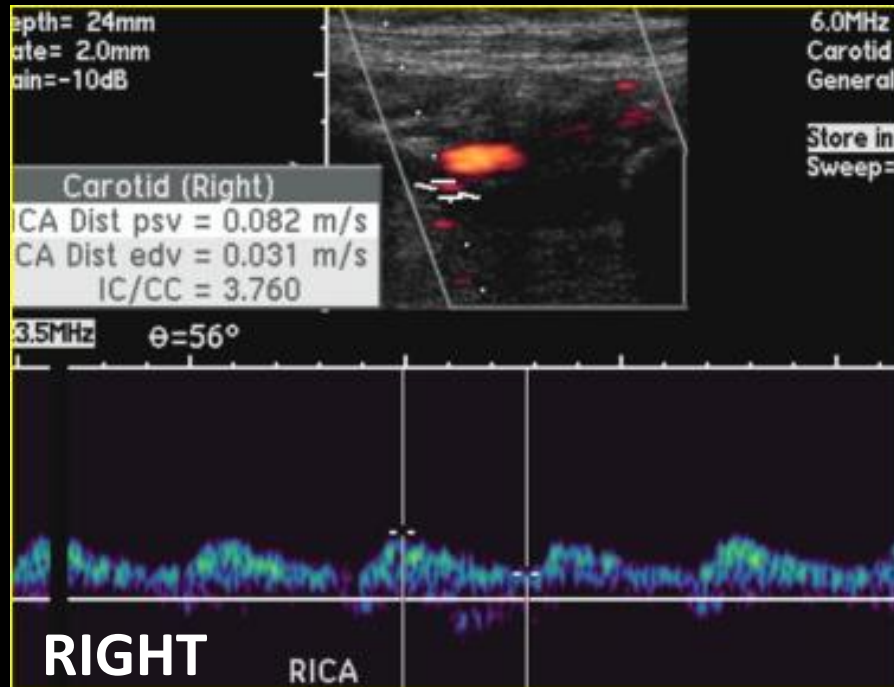


Stenosis distal to sampling point

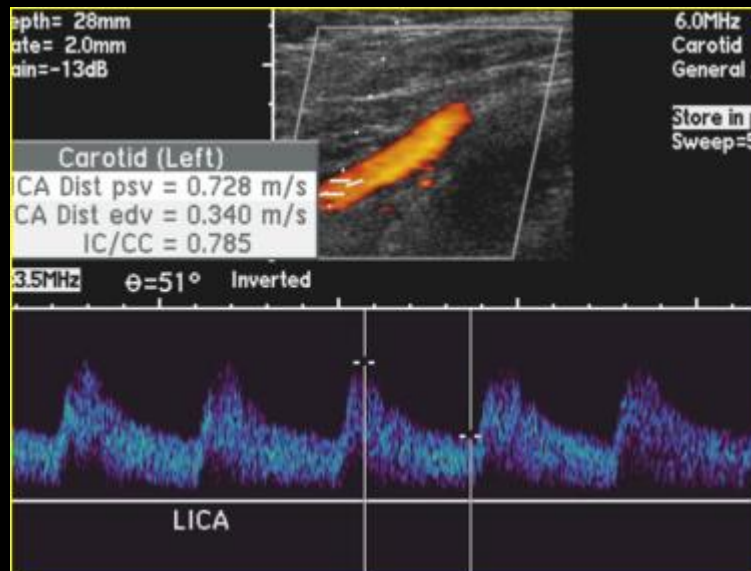
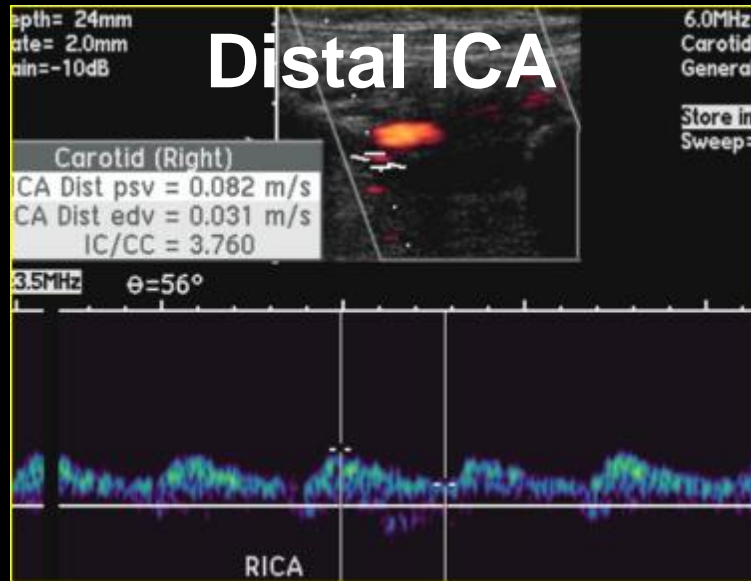


Abnormal right ICA waveform?

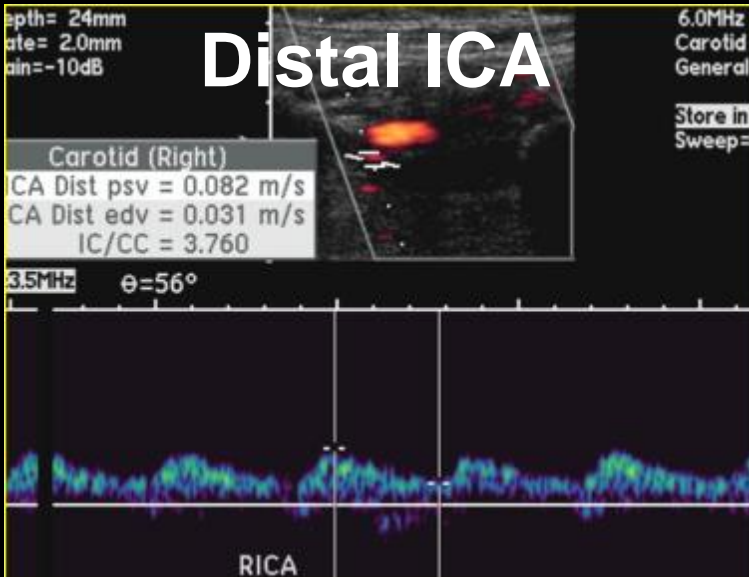
Distal ICA



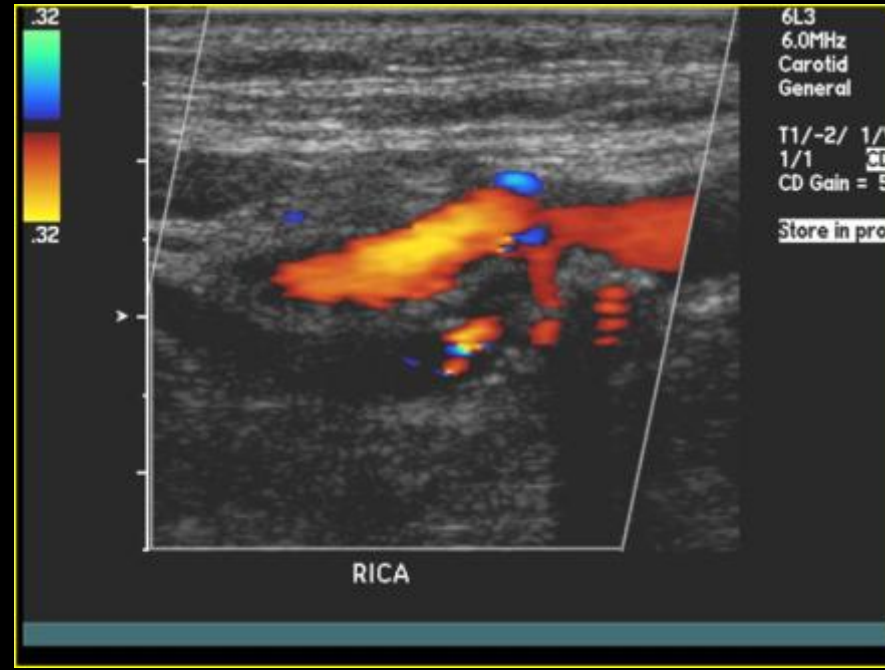
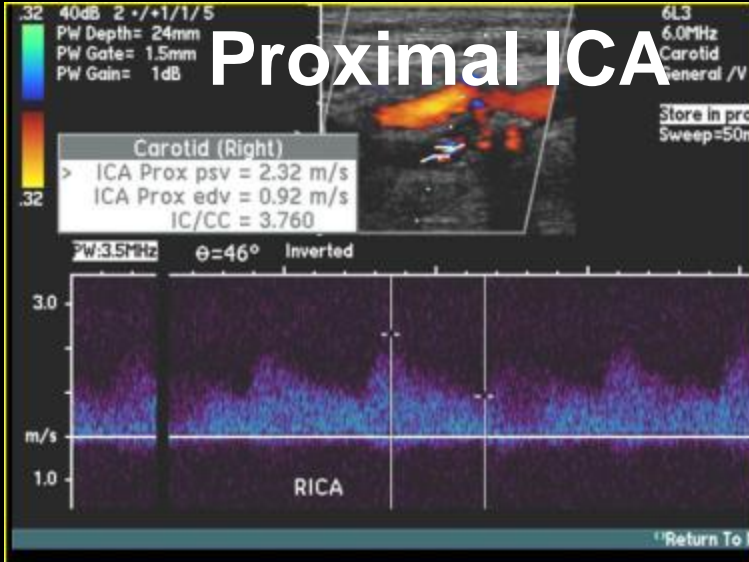
Parvus tardus waveform: cause?



Parvus tardus waveform: cause?



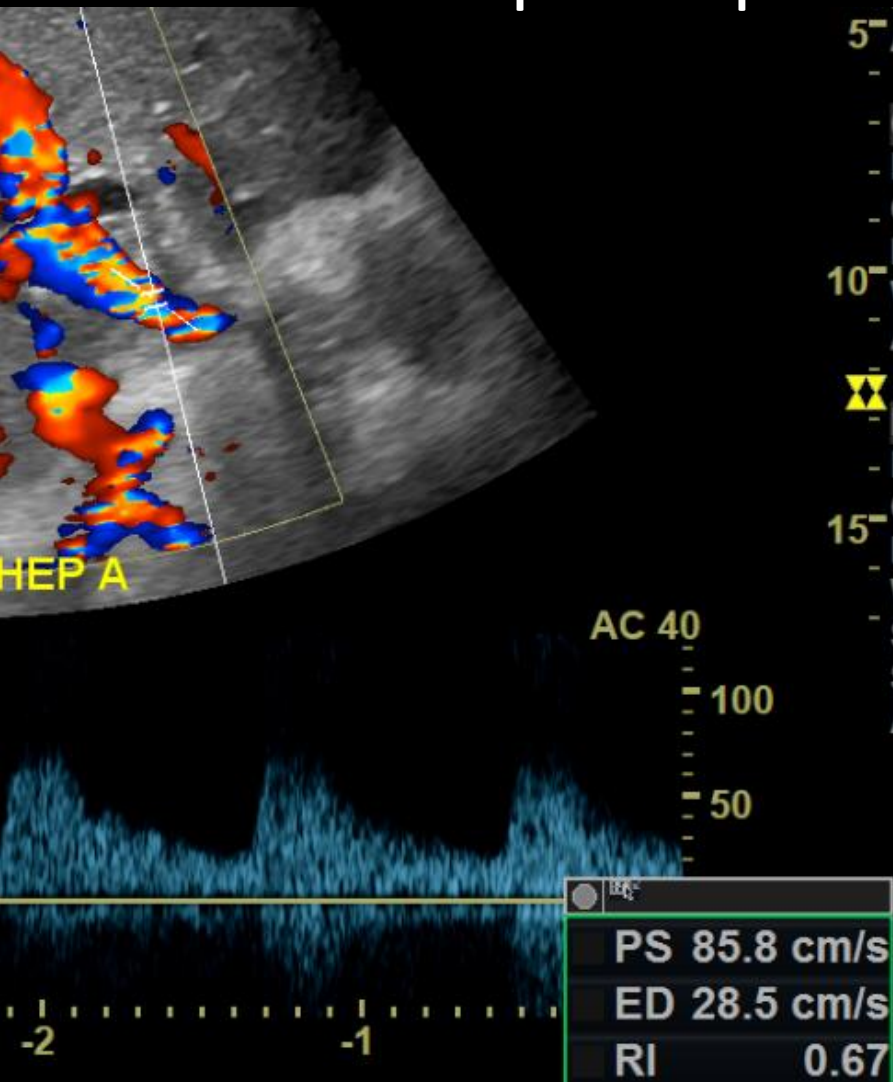
Stenosis proximal to sampling point



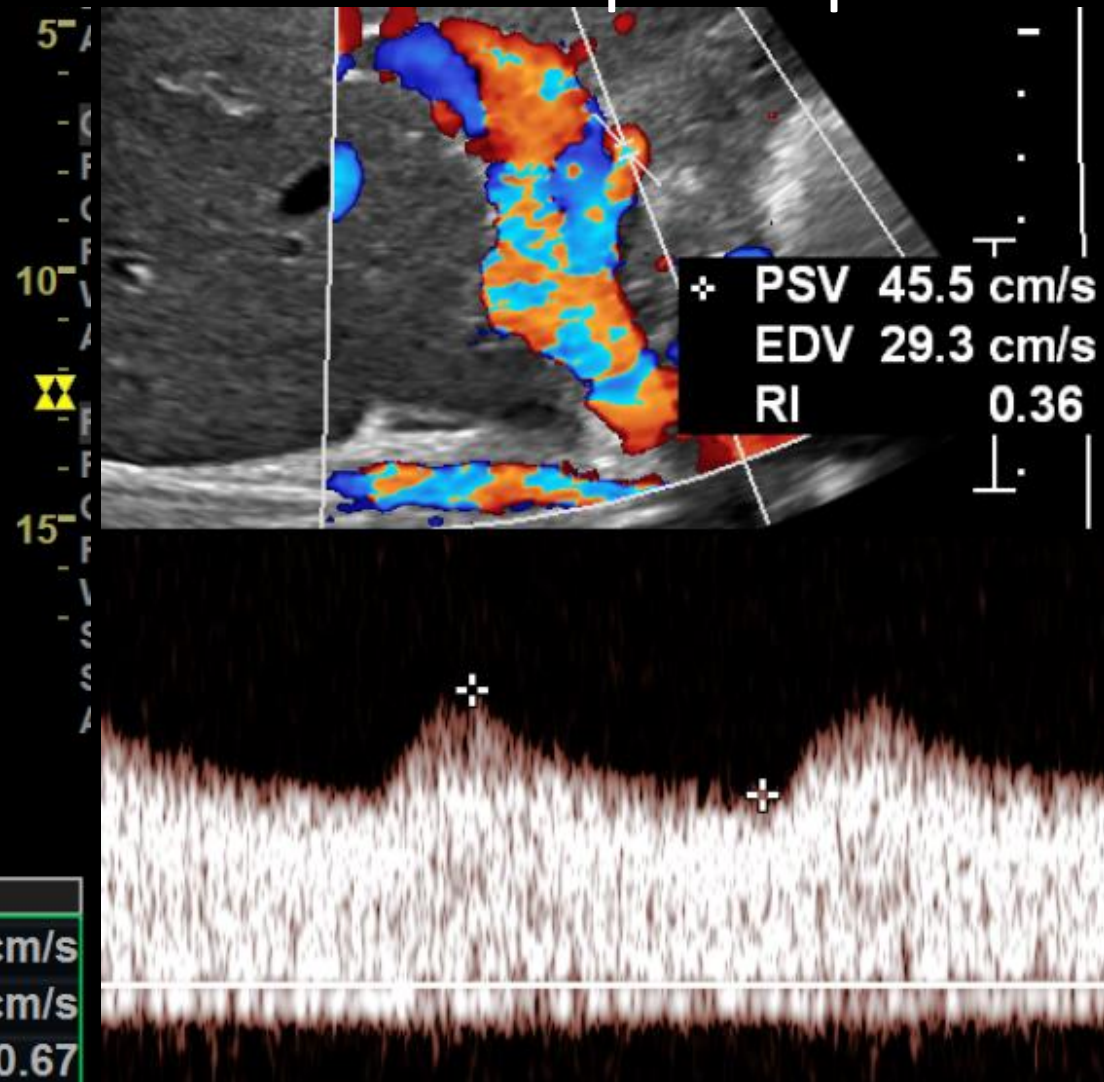
Liver Transplant

Liver transplant: What's next?

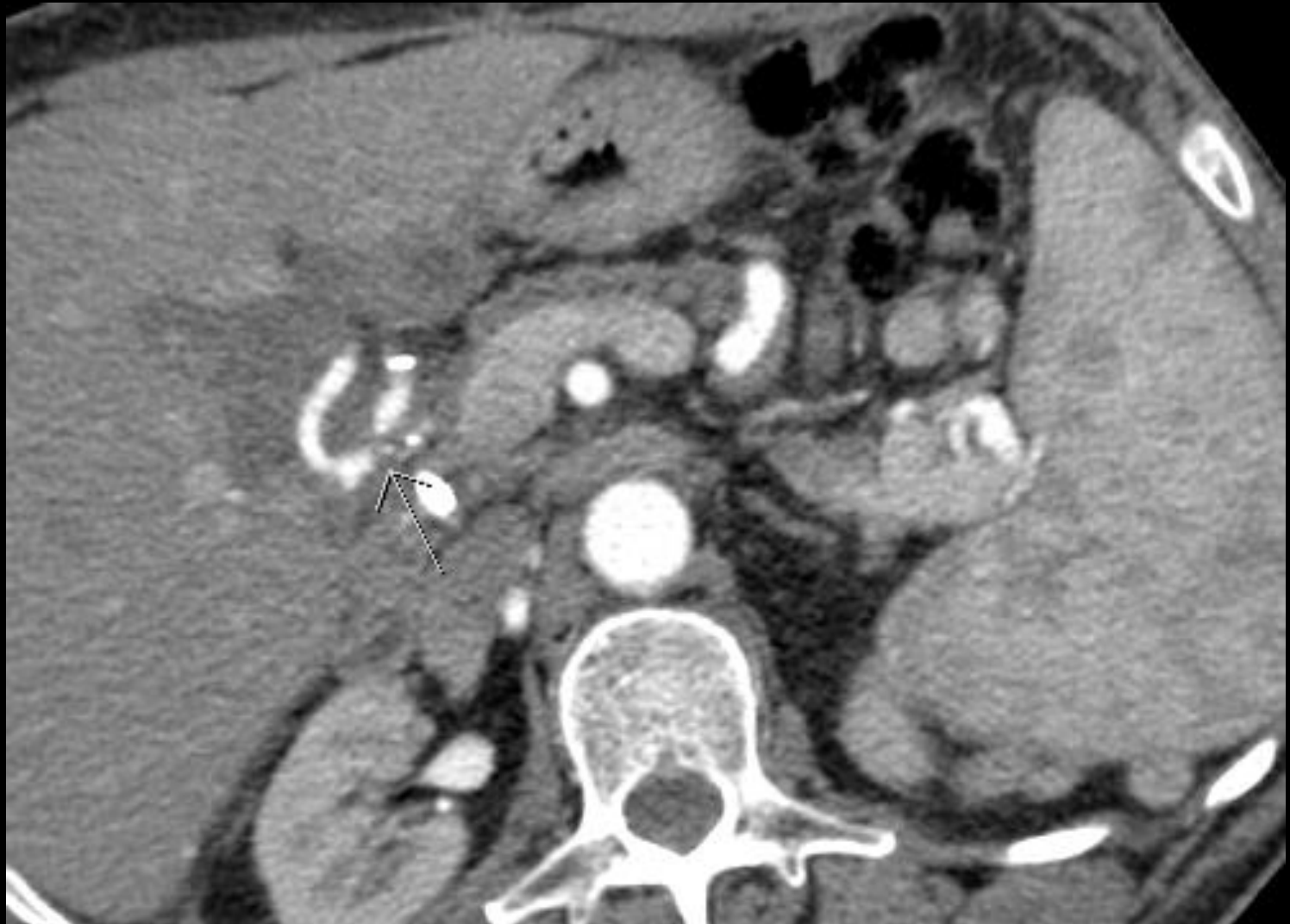
3 weeks post-op



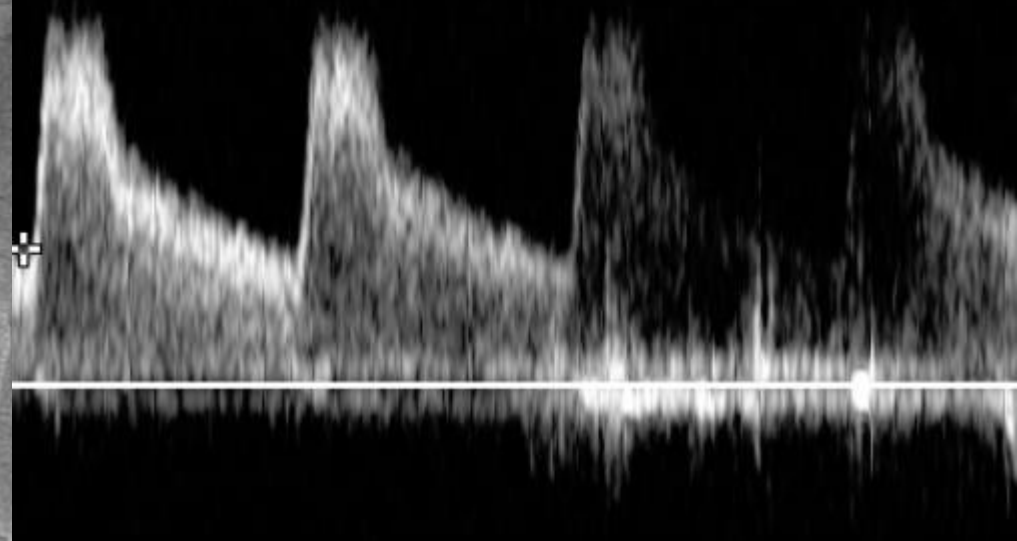
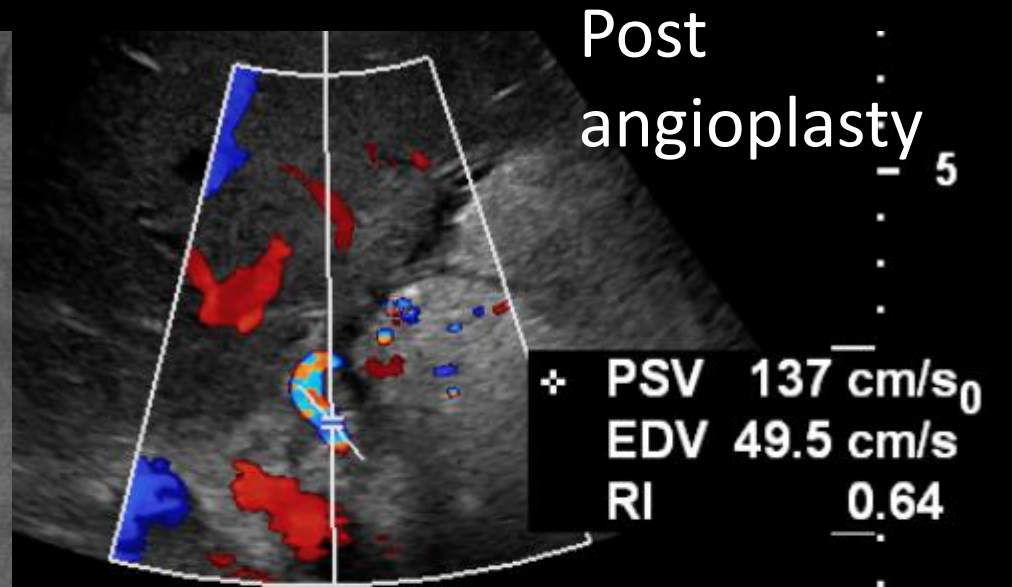
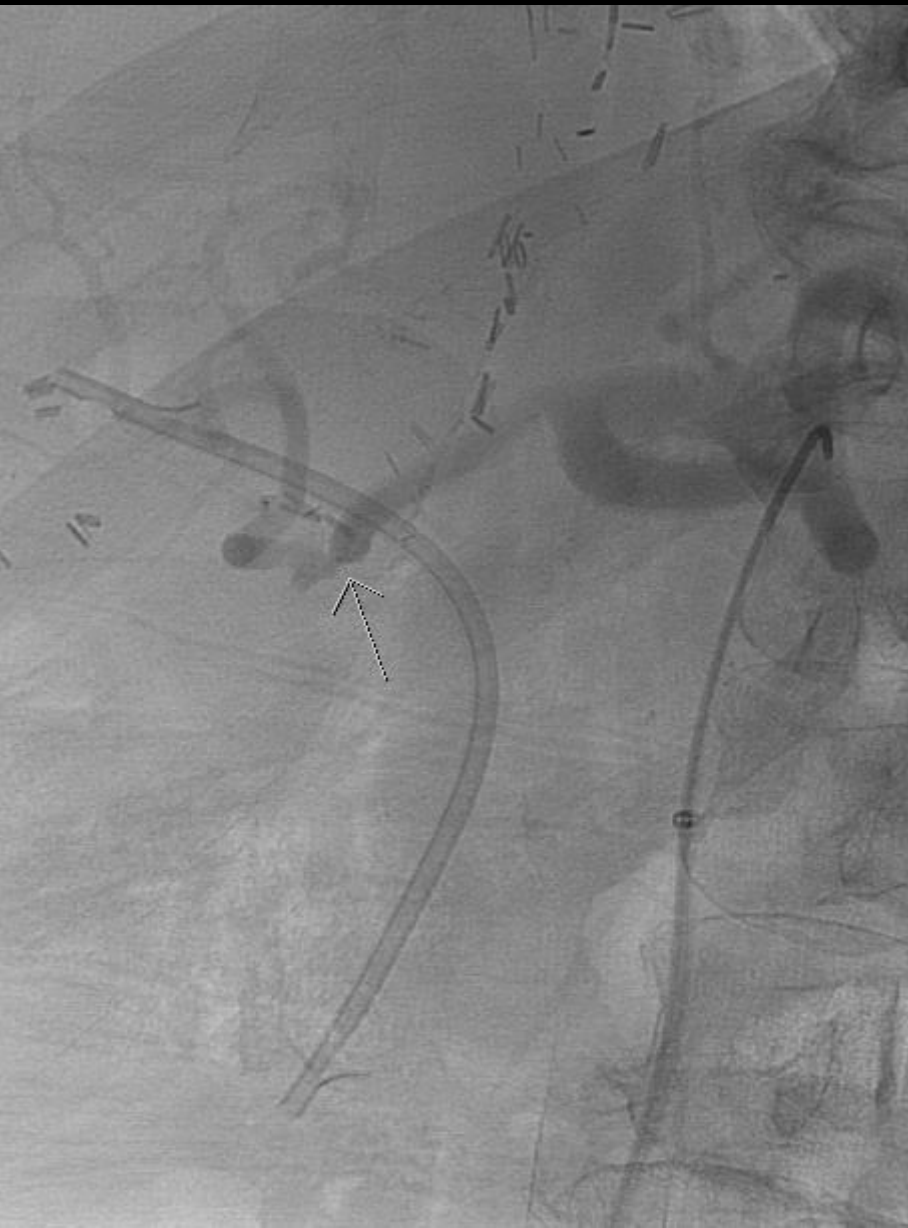
12 weeks post-op



Liver transplant: HA stenosis

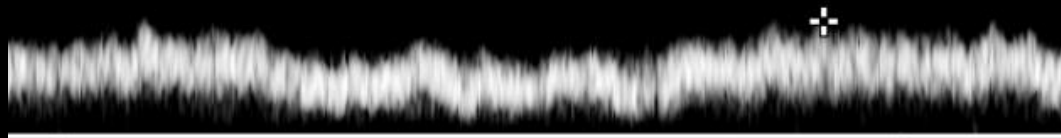


Liver transplant: 90% HA stenosis

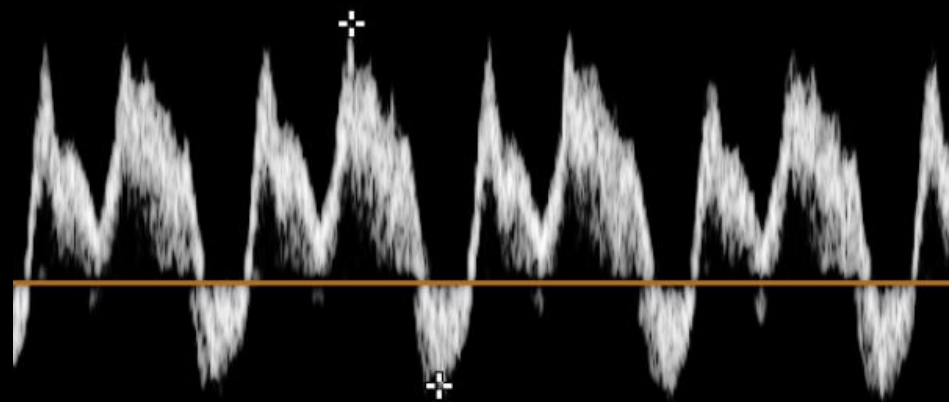
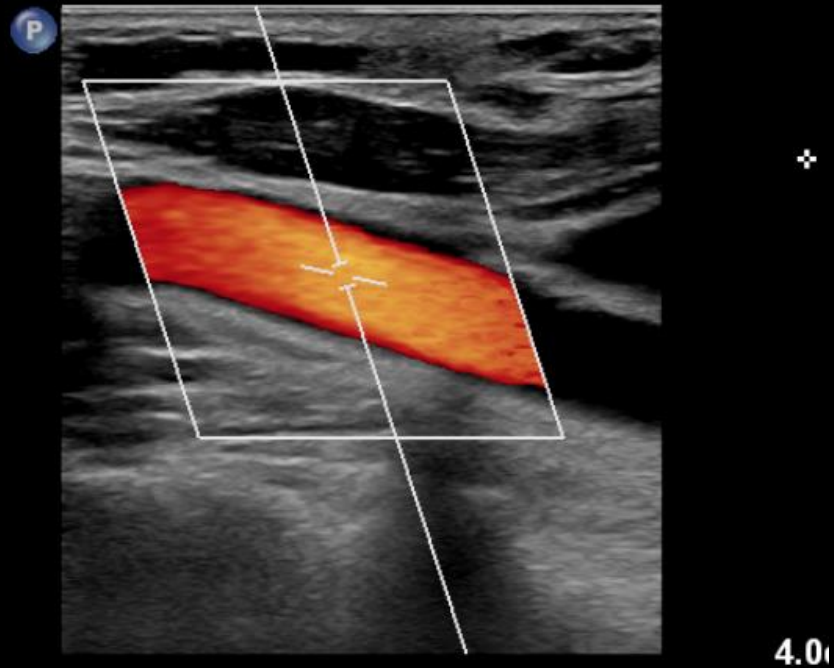


Unusual Waveforms

LVAD



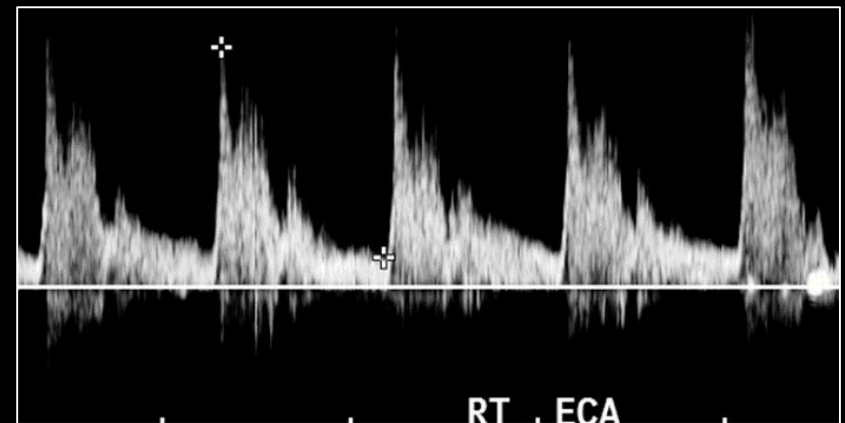
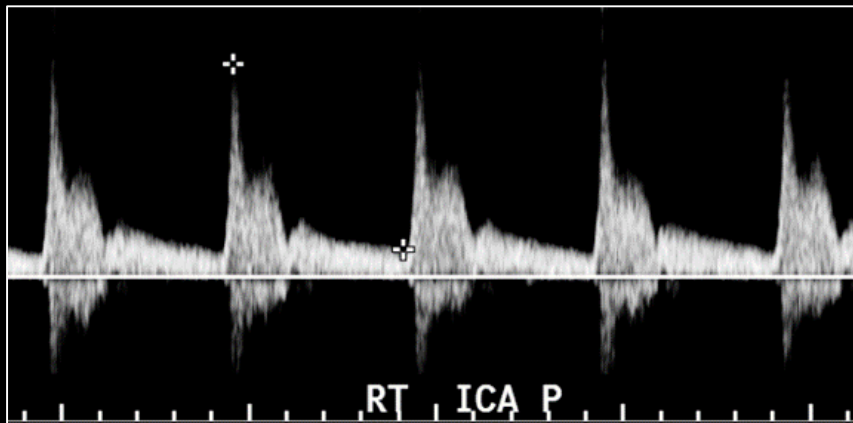
Aortic Balloon Pump



Right Mid CCA

Summary: Pearls and Pitfalls

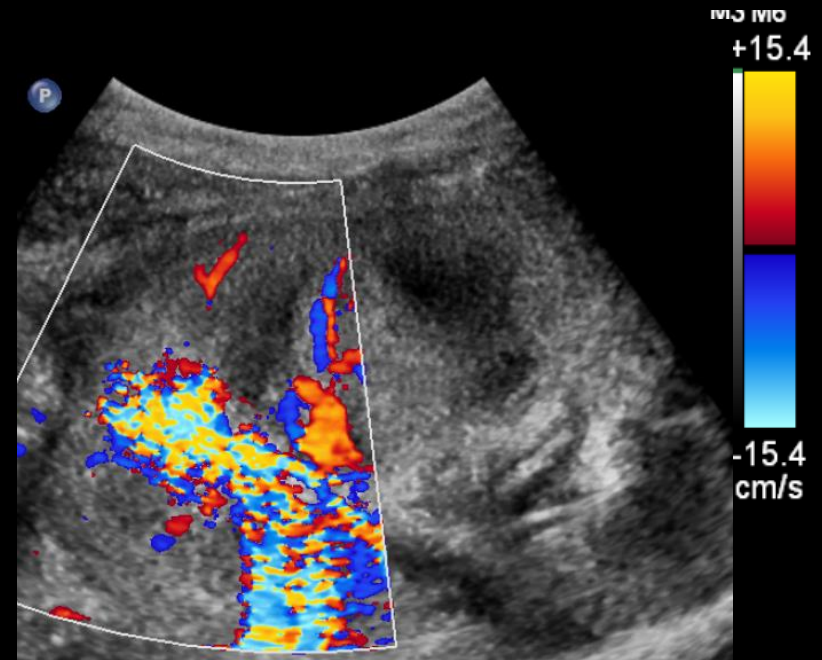
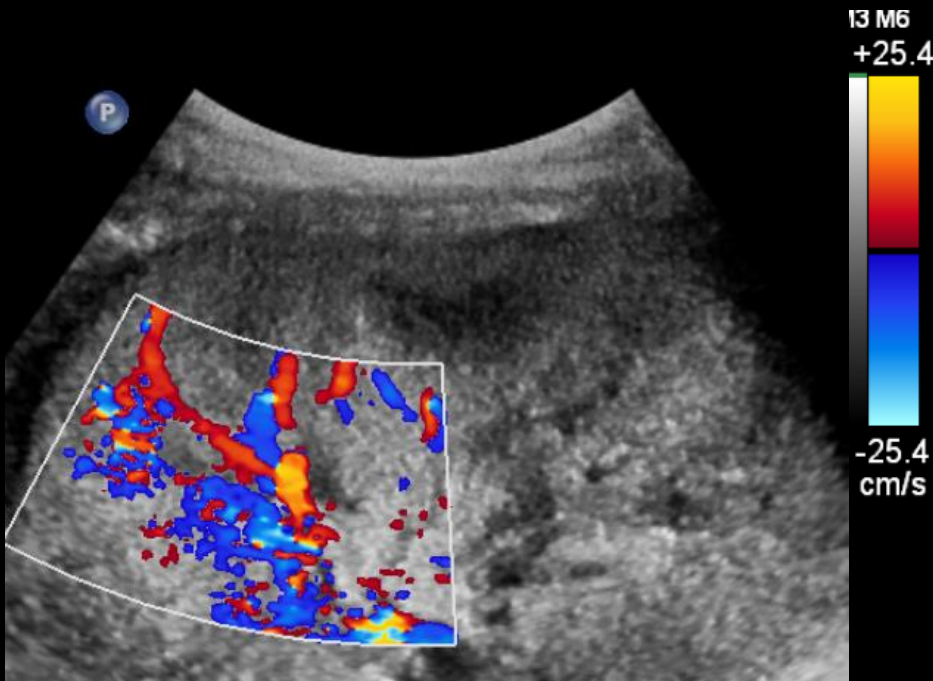
Pitfall #1: Failure to identify correct waveforms



Pitfall #2: Incorrect Doppler scale

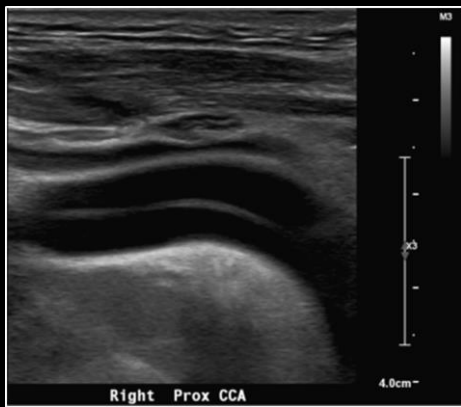
First set of images

Repeat images same day

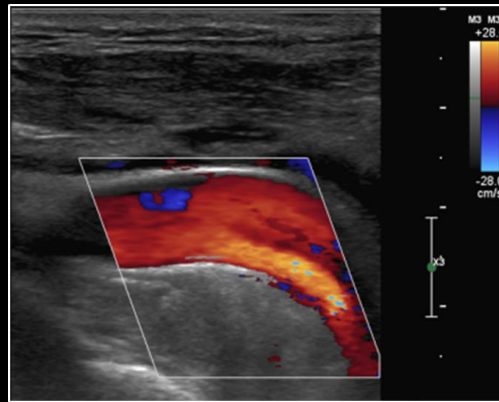


Pearl #1: Systematic approach

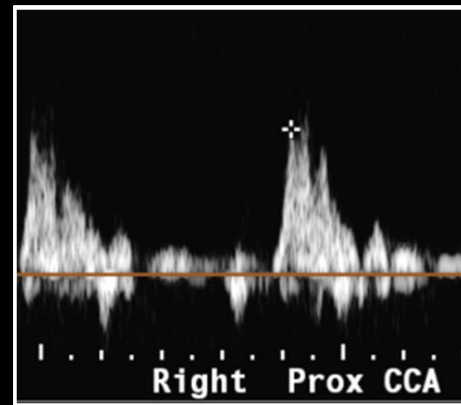
✓ grayscale



✓ color



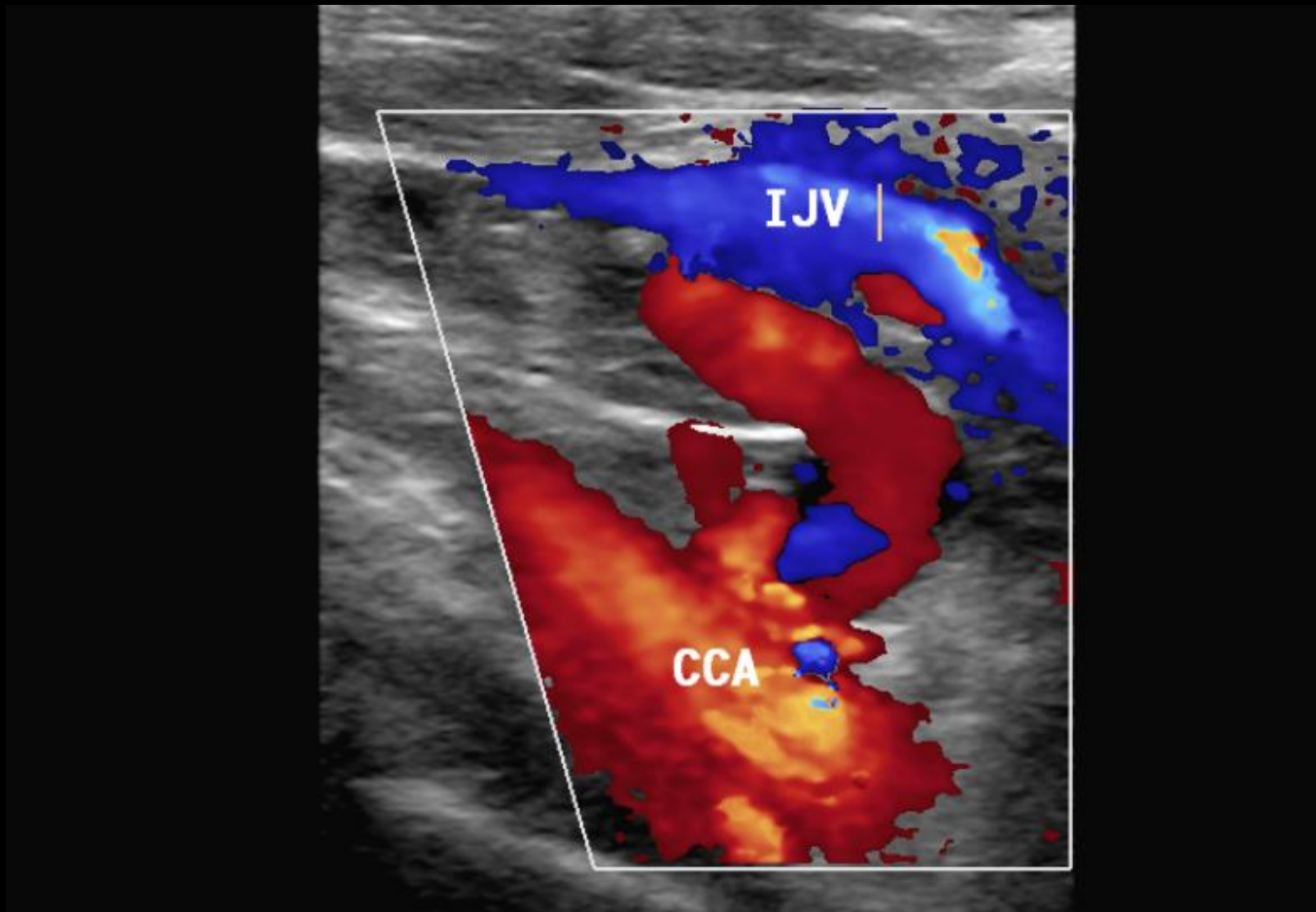
✓ spectral



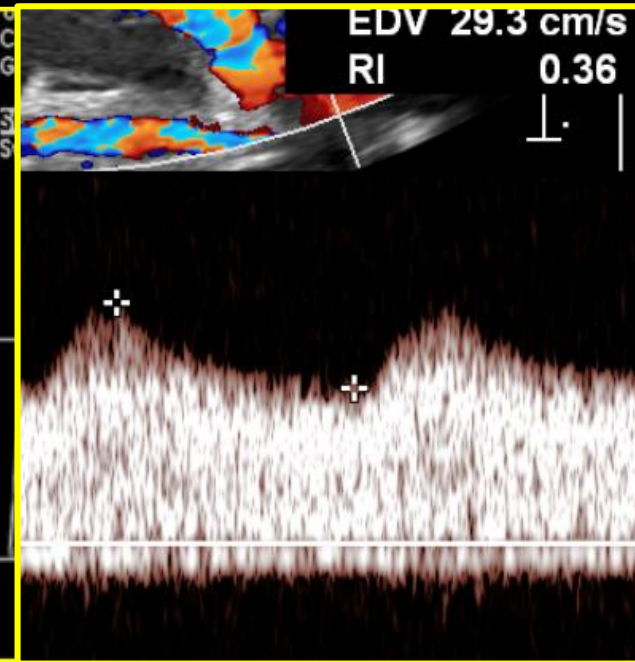
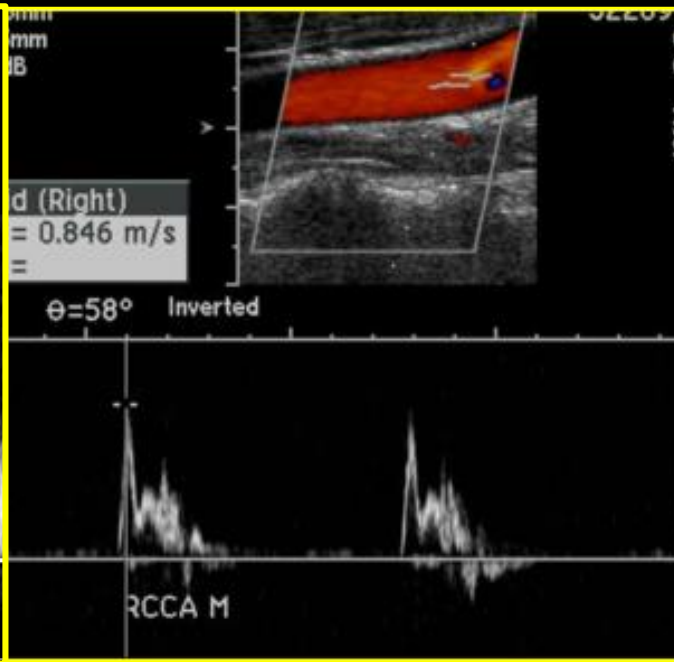
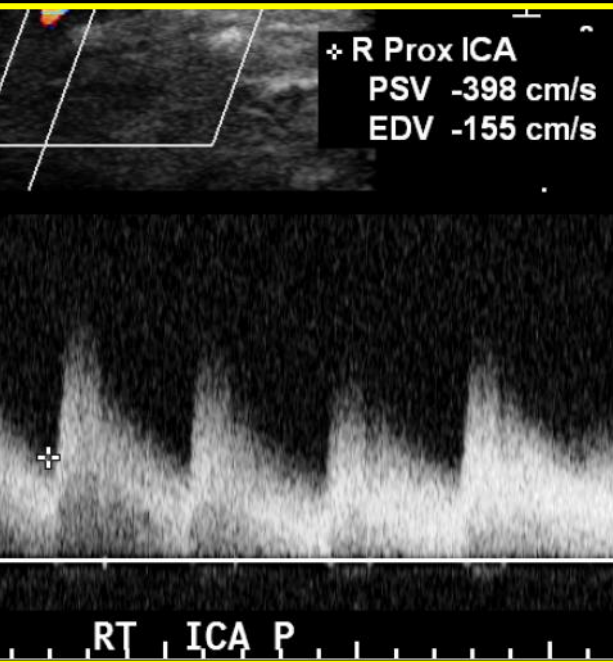
✓ velocities

Bulb	θ	52 °
PSV		-136 cm/s
EDV		-16.9 cm/s
Prox ICA	θ	40 °
PSV		-206 cm/s
EDV		-62.2 cm/s
Mid ICA	θ	34 °
PSV		-187 cm/s
EDV		-51.2 cm/s
Dist ICA	θ	34 °
PSV		-194 cm/s
EDV		-42.9 cm/s
Prox ECA	θ	52 °
PSV		-115 cm/s
EDV		-9.9 cm/s

Pearl #2: Always turn on color



Pearl #3: These 3 waveforms



Thank you!