

# Vascular Assessment: Ultrasound in the Sick Child

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# Overview

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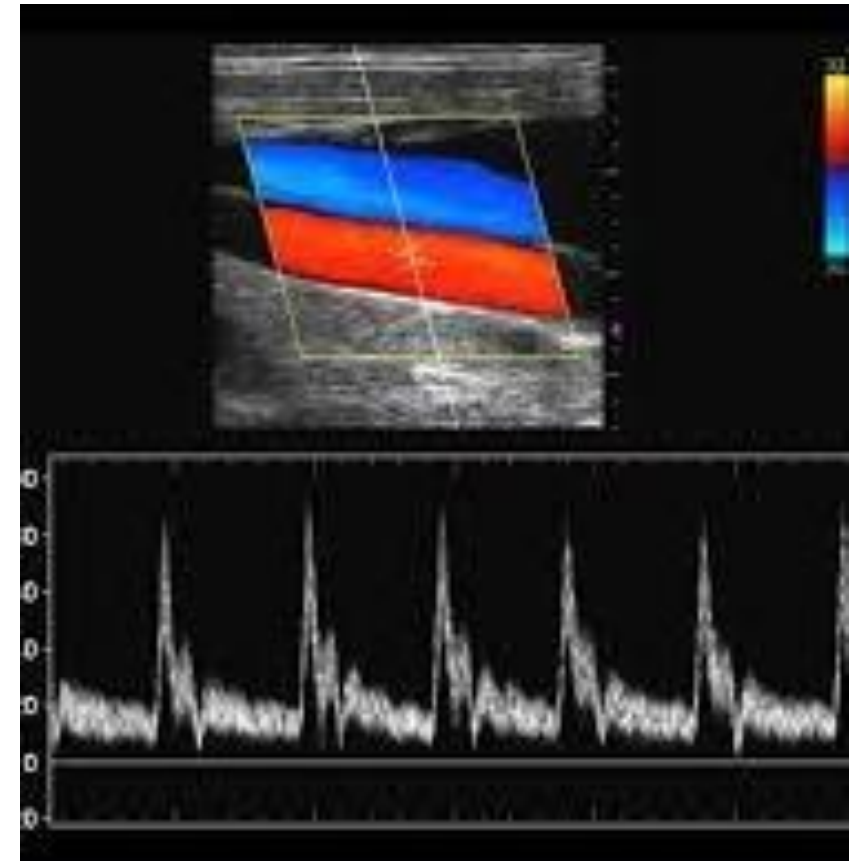
- Introduction
- Indications
- Challenges
- Technique
- Interesting cases
- Summary



# Vascular Ultrasound

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- Non-invasive
- Uses high frequency sound waves
- Allows dynamic evaluation of blood vessels / flow
  - Colour doppler
  - Spectral doppler
  - B mode



# Indications – acute setting

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- Thrombus
- Post operative (transplant) imaging
- Trauma
- Vascular malformations
- Peripheral vascular diseases
- Intervention



# Challenges

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- Small size structures
- Limited acoustic window
- Delicate anatomy
- Patient movement





# Technique

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- History / clinical indication
- Previous imaging
- Know the anatomy
- Keep child calm(!)





## Flow characteristics

- Is there flow?
- Which direction?
- Velocity?
- Waveform?

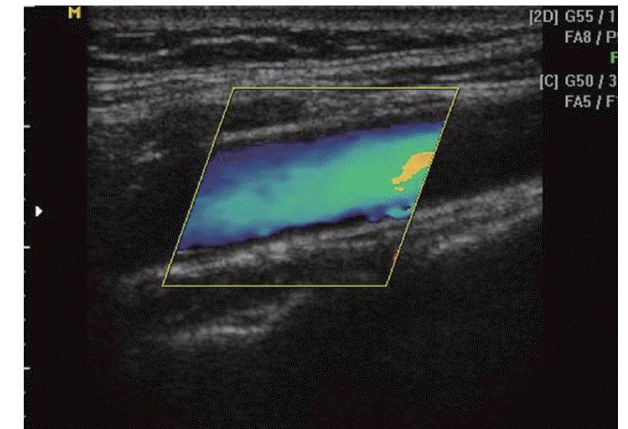
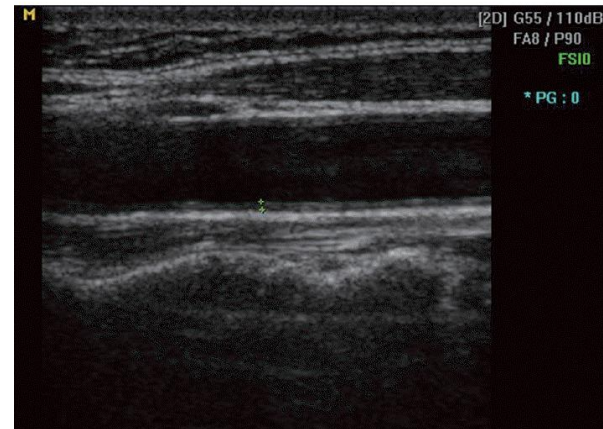
## Probe

- High-frequency linear
- Hockey stick for neonates

## Machine settings

- Gain
- Depth
- Velocity scale
- Focal zone

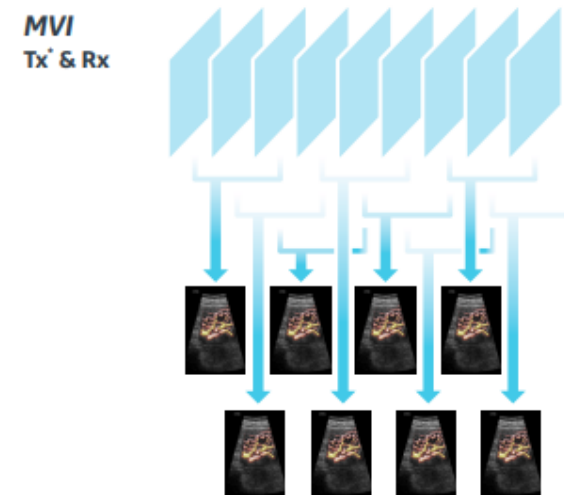
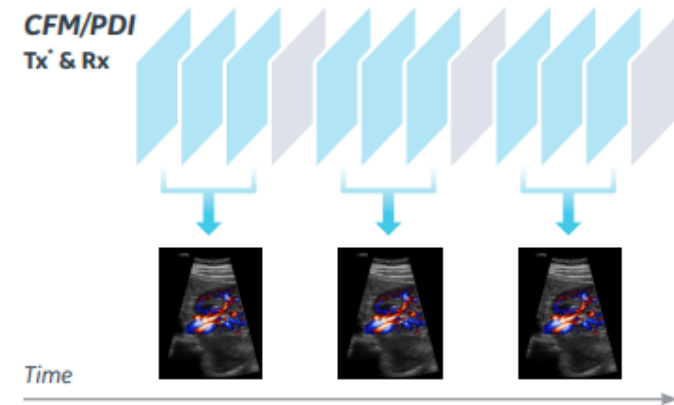
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- Scanning technique
    - Acoustic windows / different angles
    - 'heel-toe' probe to improve angle
    - Angle ultrasound beam
    - Harmonic imaging
  - Continuous assessment of image quality
  - Practice





# Other Ultrasound Flow Technologies (GE)

- Power doppler
- Micro vascular imaging
- Radiantflow
- B-flow
- Contrast



# Power Doppler

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- Independent of velocity and direction
- Allows detection of lower velocities



# B-flow

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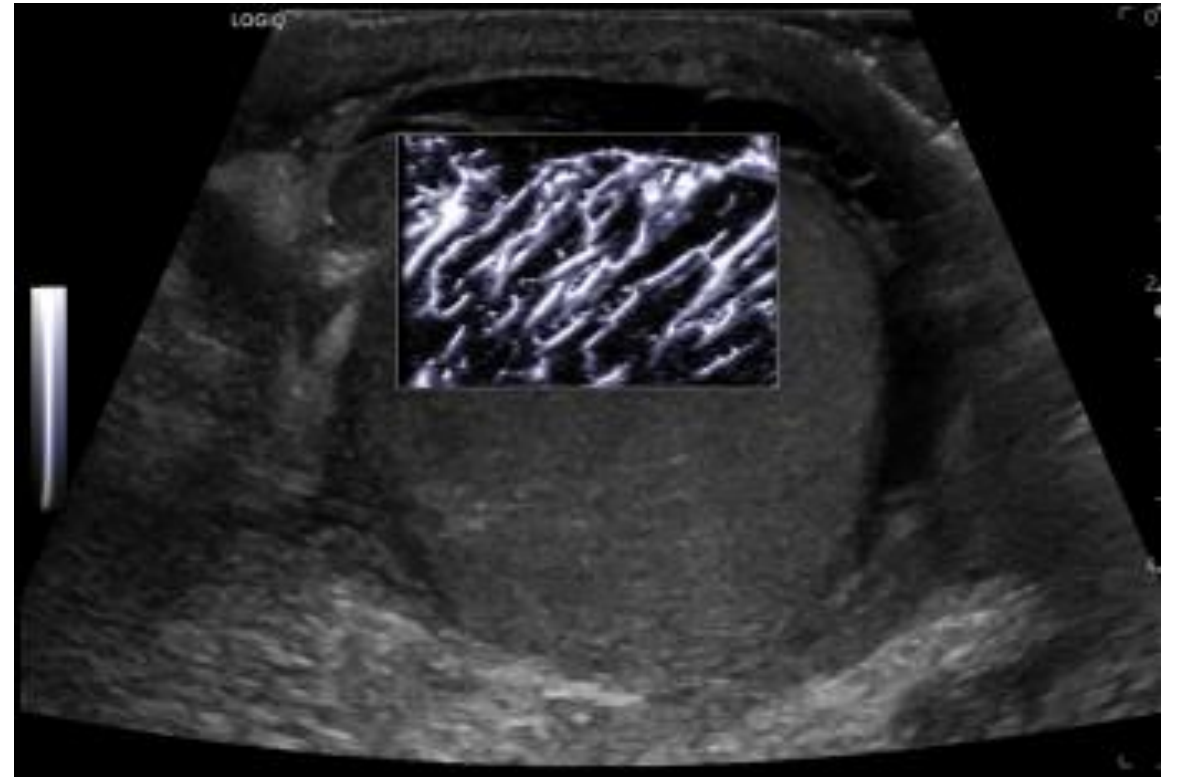
- Provides a subtracted image of flow in tissue



# Micro vascular imaging

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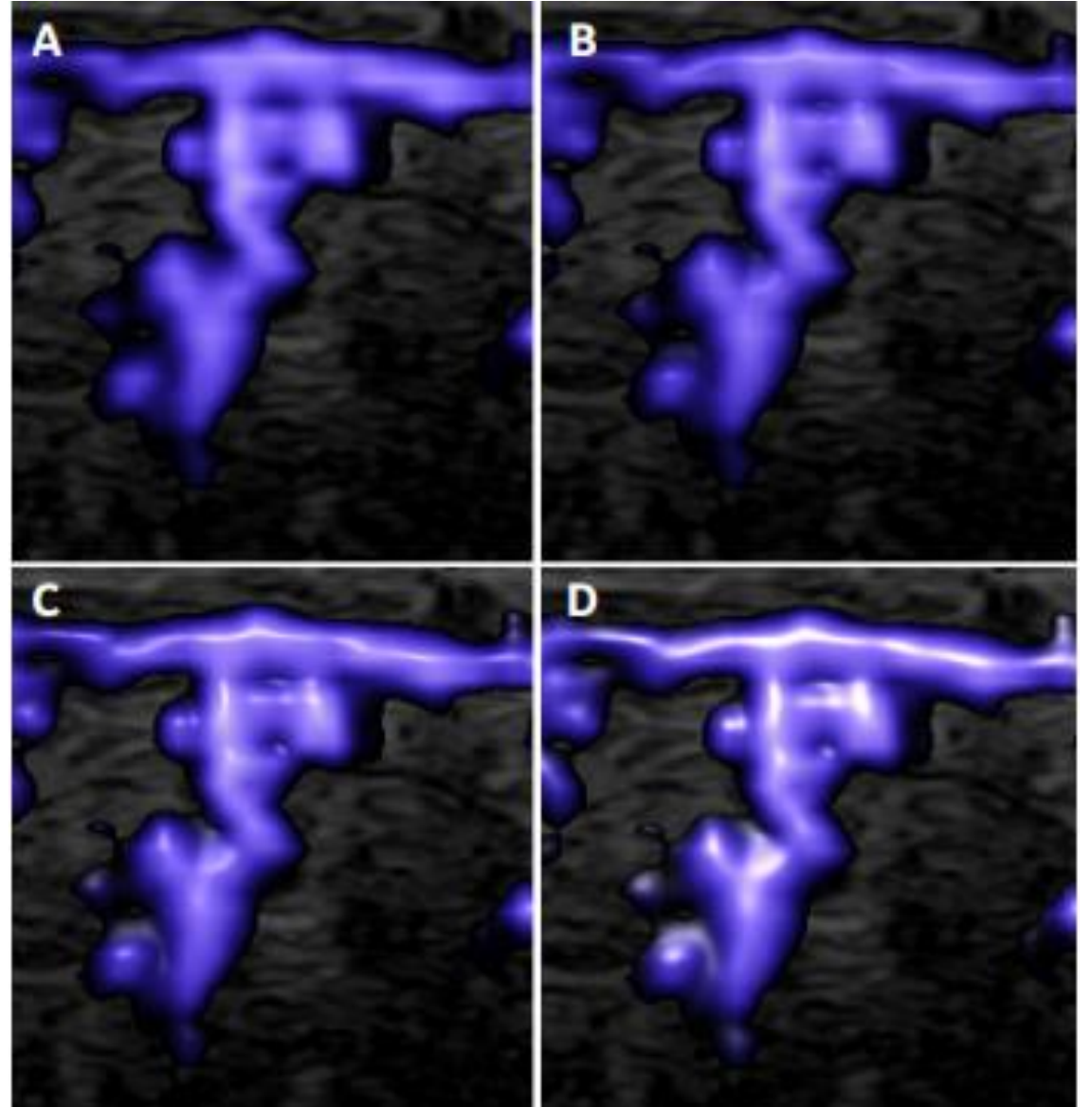
- Visualises blood flow in tissues at a finer scale



# Radiantflow

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- Advanced visualisation which provides a 3D-like appearance

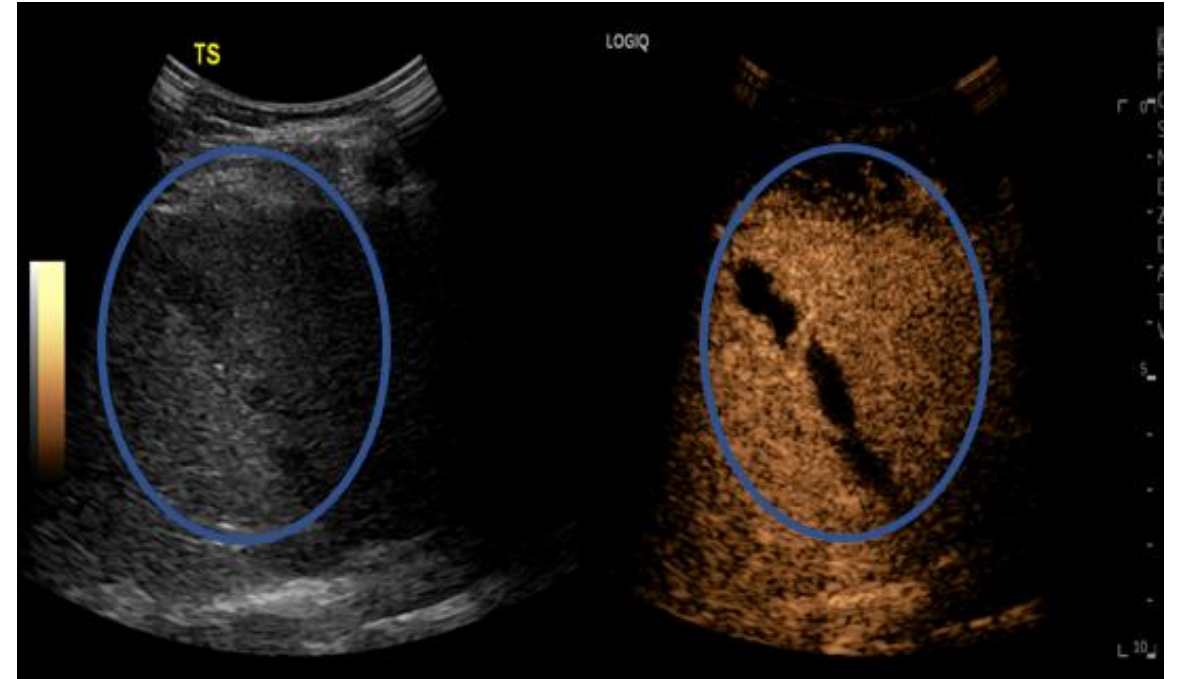




# Contrast

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- Uses microbubbles
- Injected IV
- Real-time, dynamic visualisation of flow
- Useful for
  - Post-trauma complications
  - Characterising liver lesions



# Clinical Cases

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Thrombus

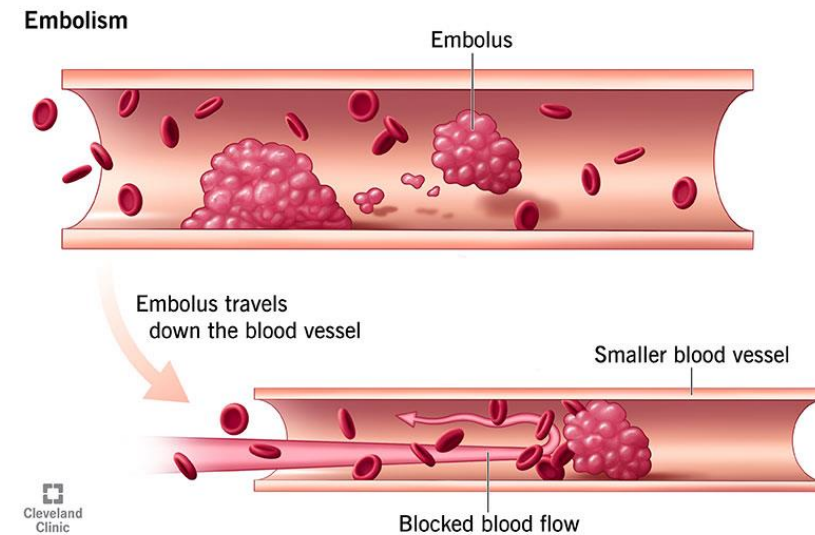
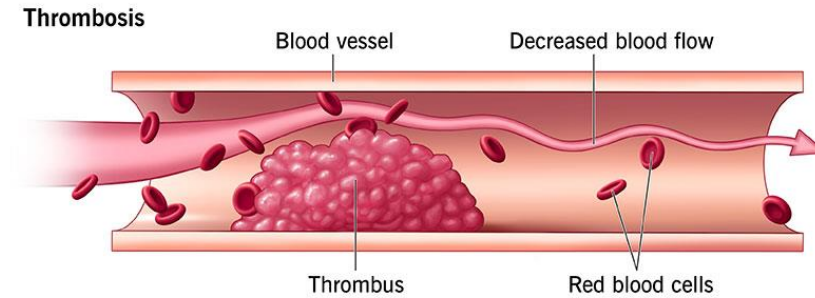
Stenosis

Aneurysms

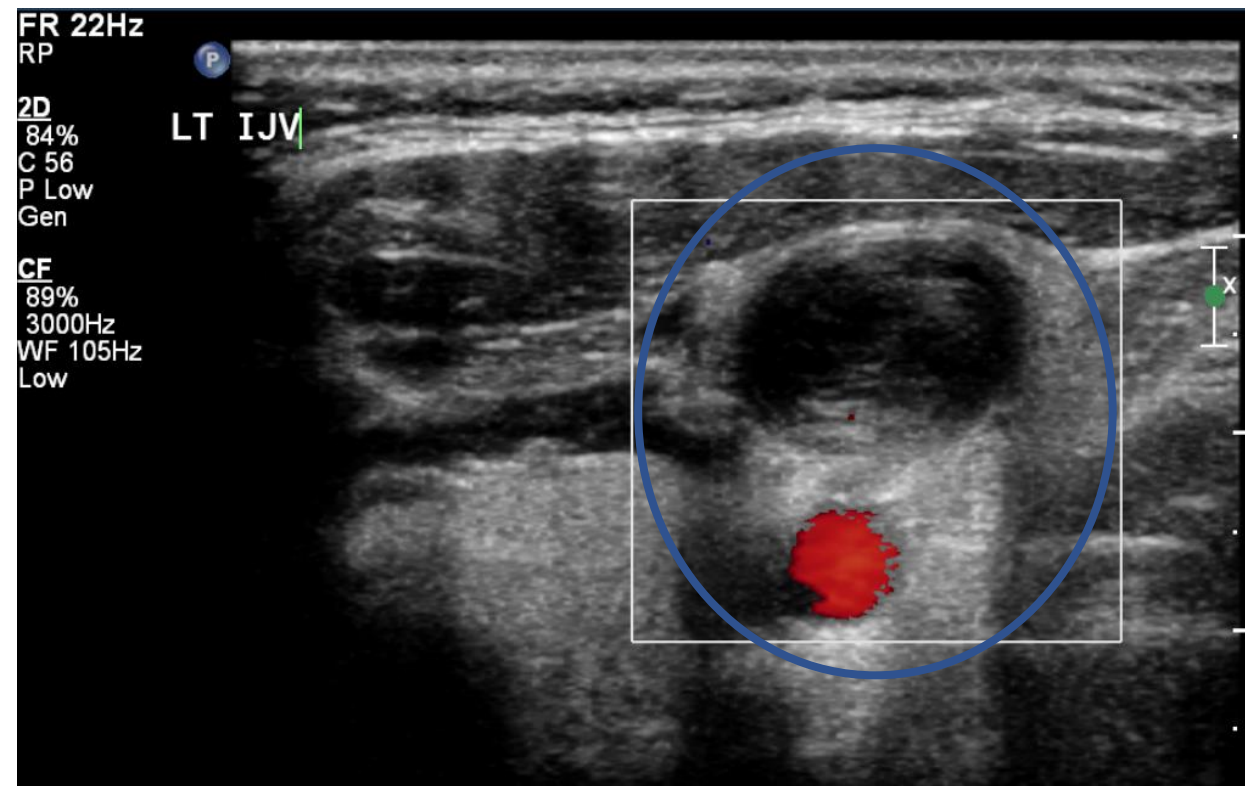
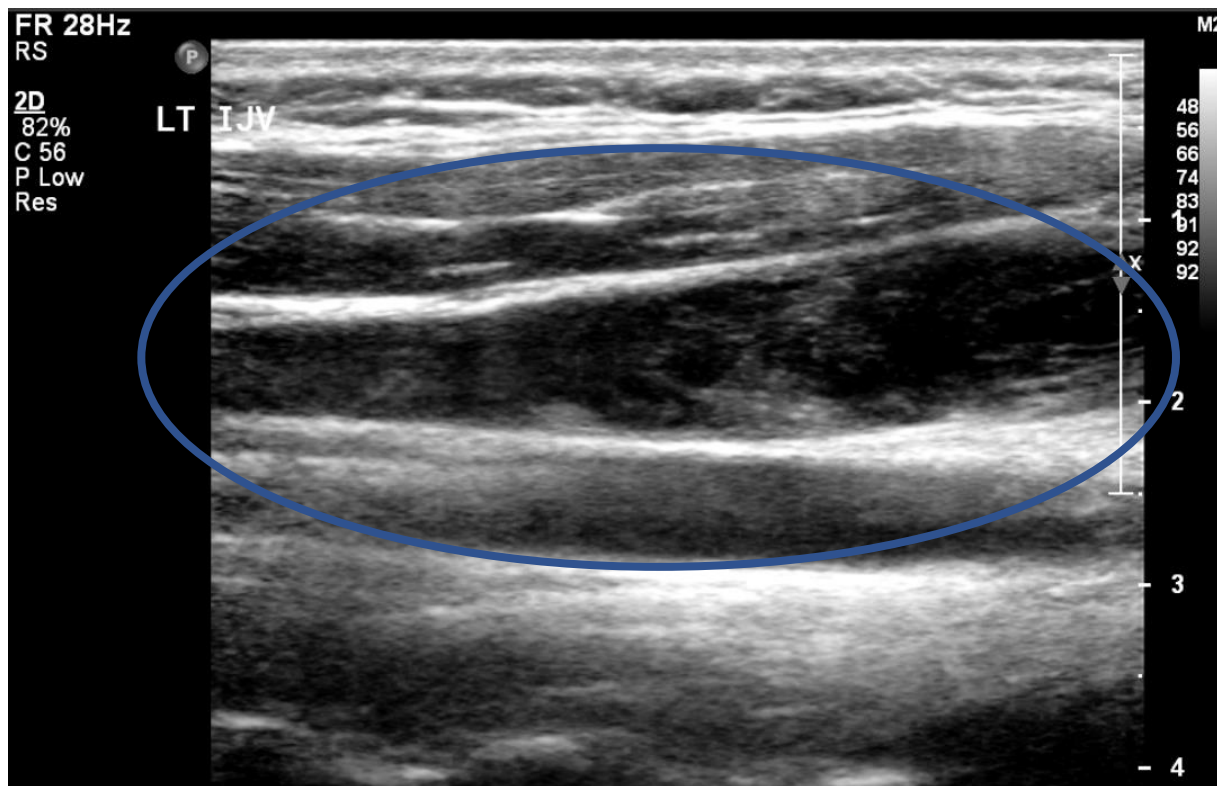
AV anomalies

# Thrombus

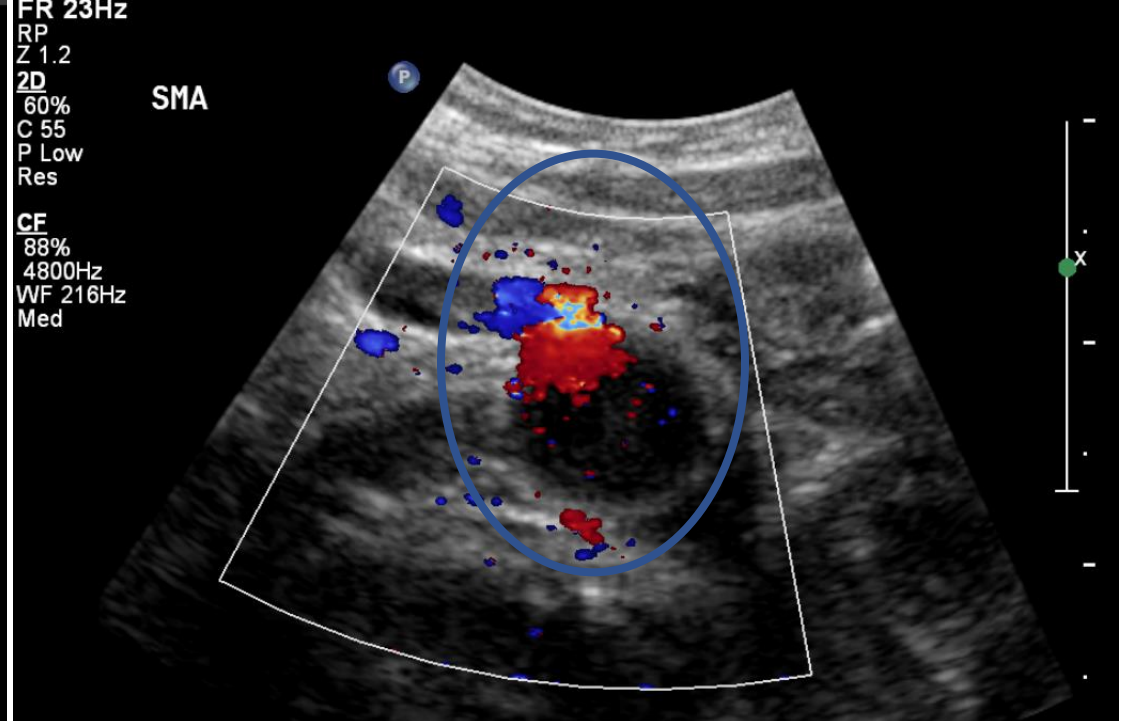
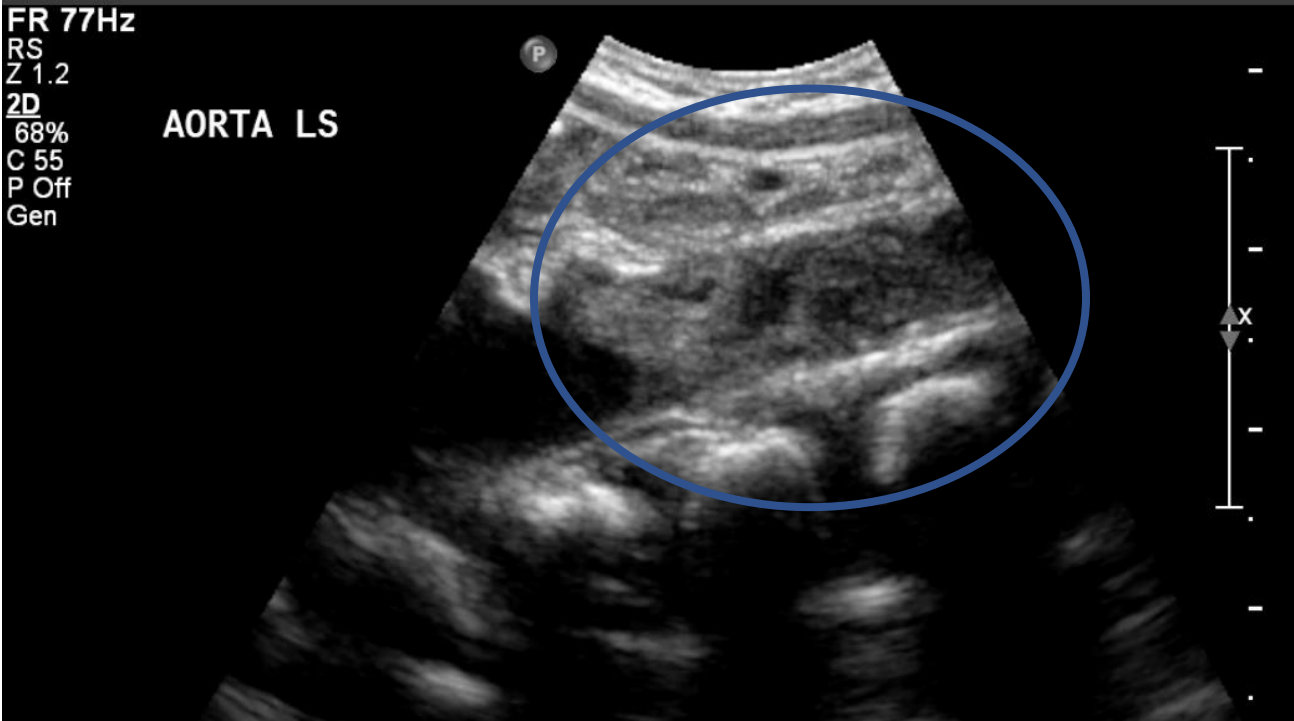
- B –mode
  - Acute – hypoechoic
  - Chronic – hyperechoic
- Compression
- Colour
- Evaluate
  - Extent
  - Occlusive / non-occlusive
  - Adherent / free floating



# IJV Thrombus

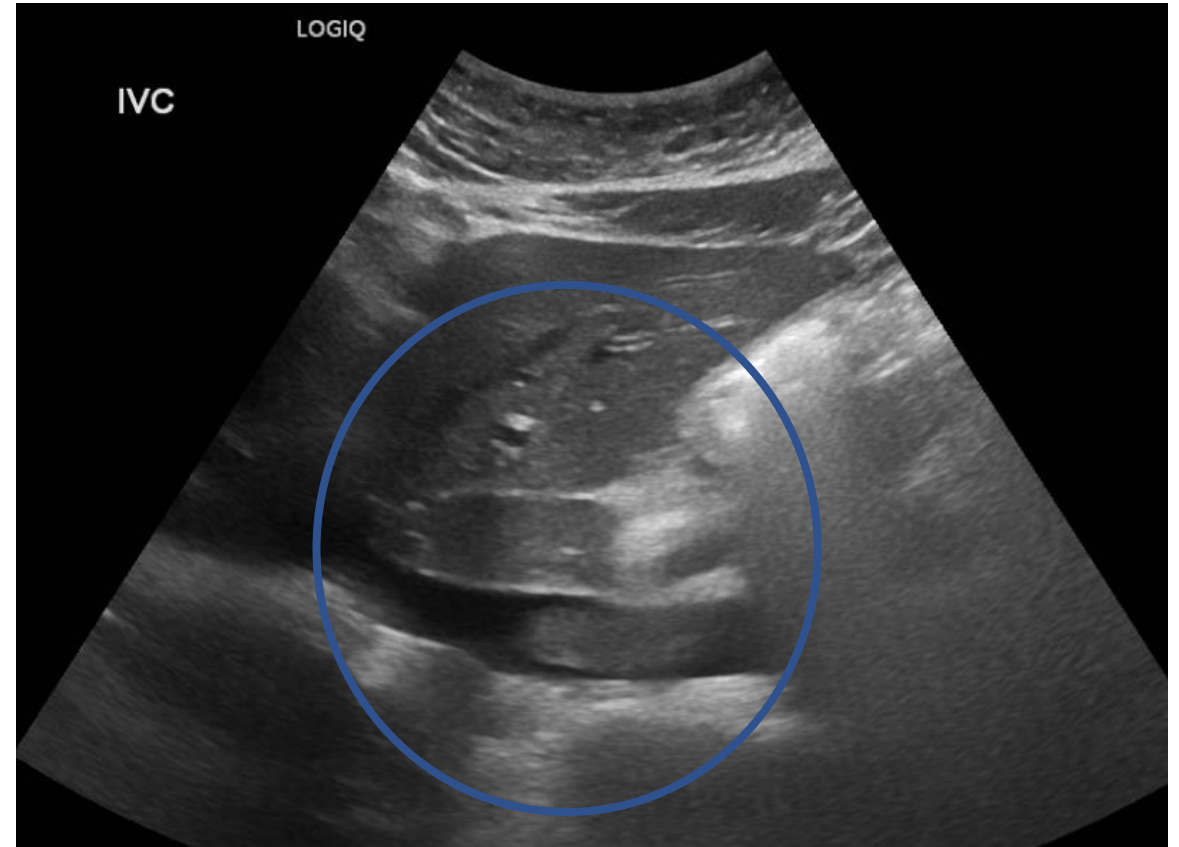
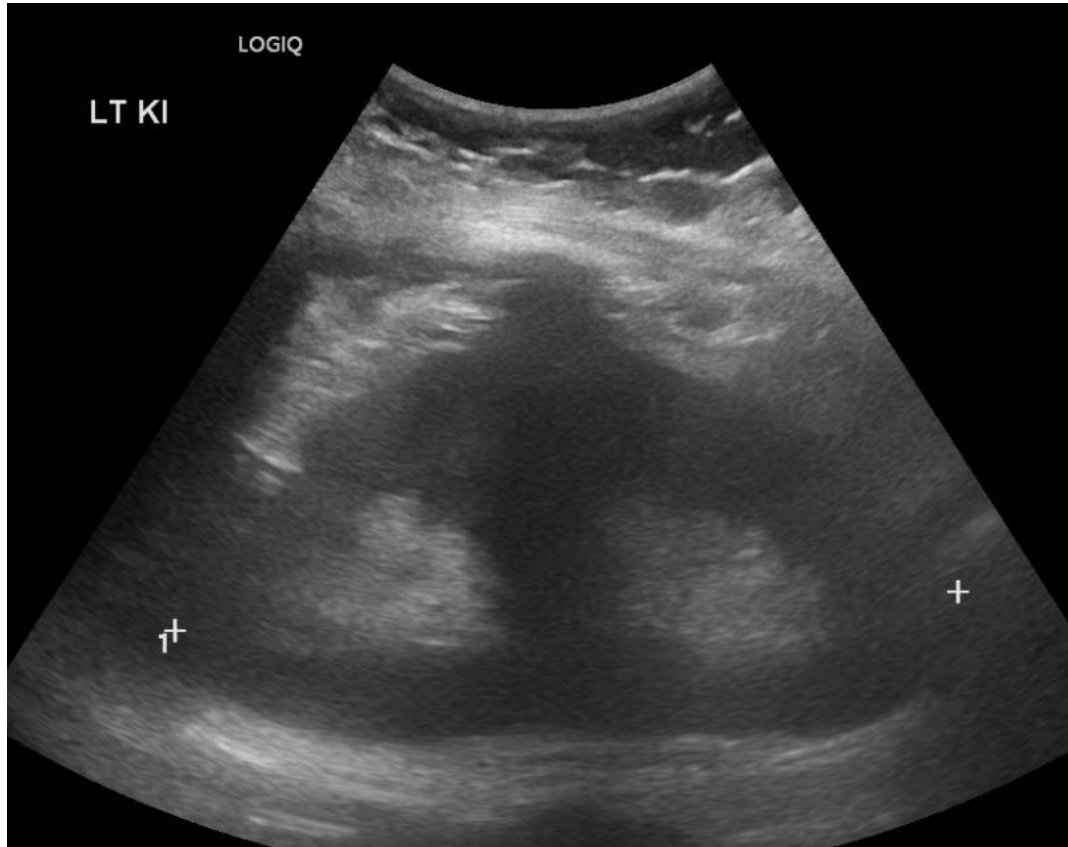


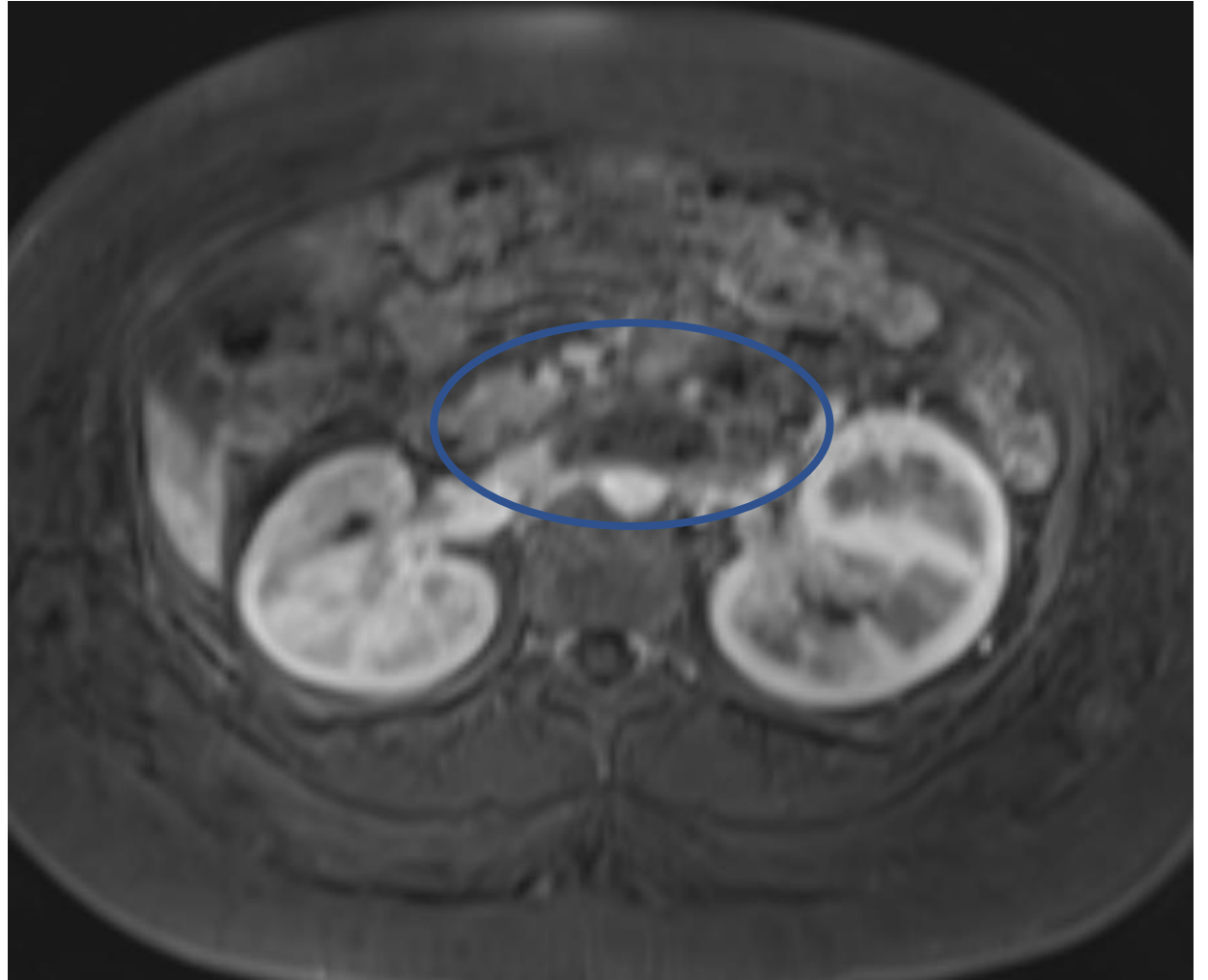
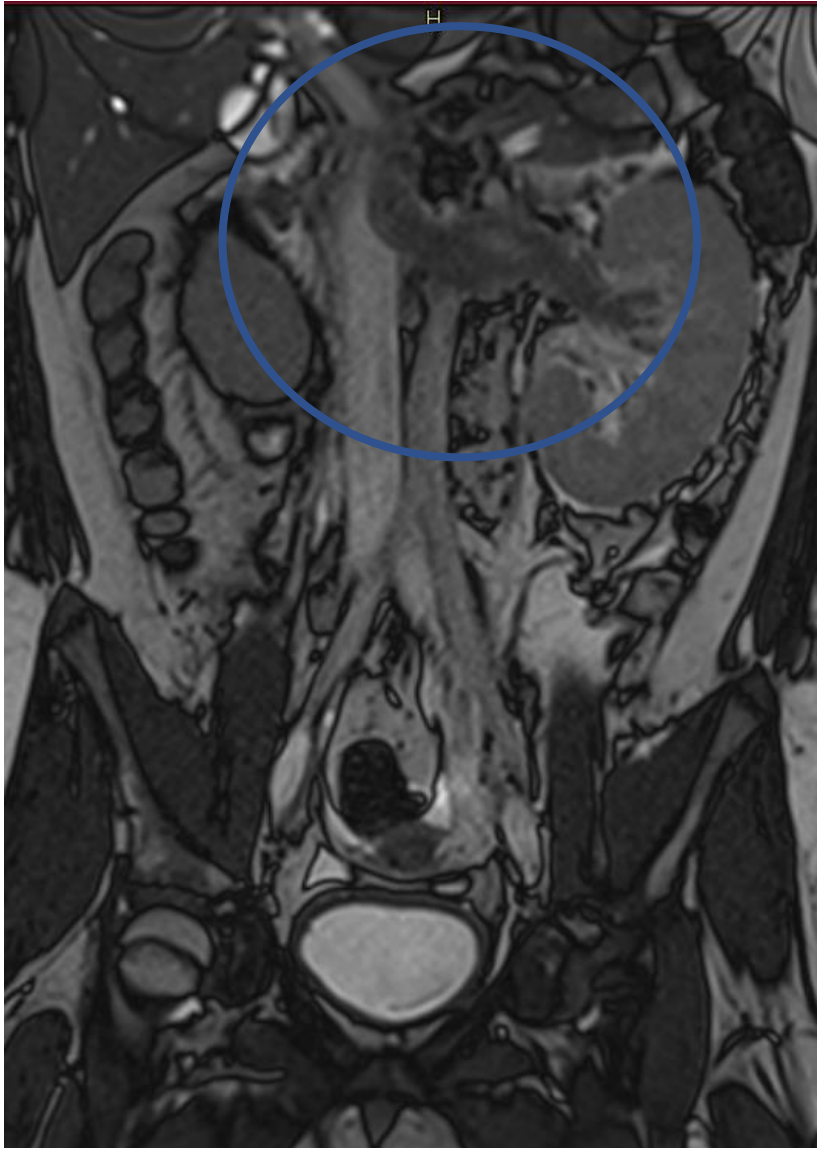
# Aortic Thrombus

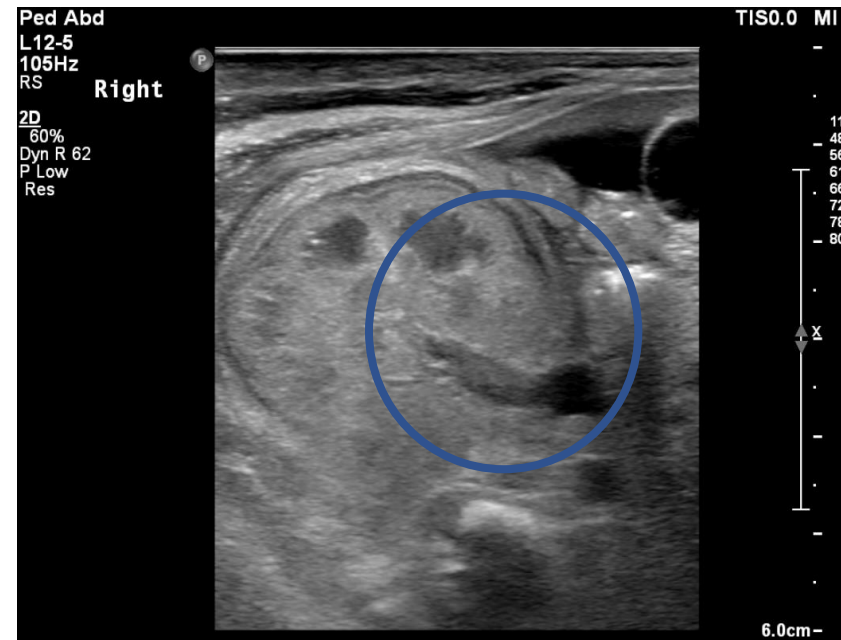
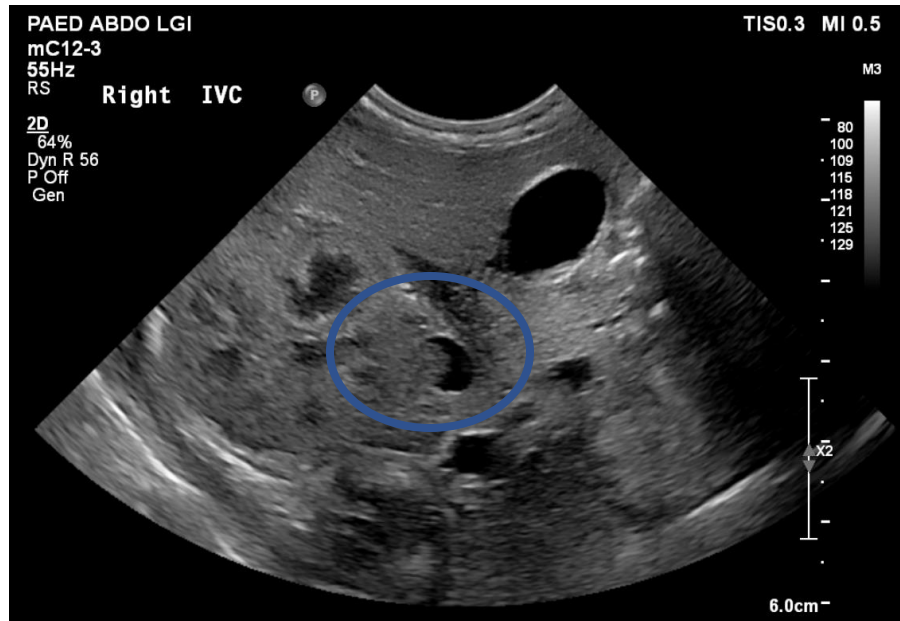
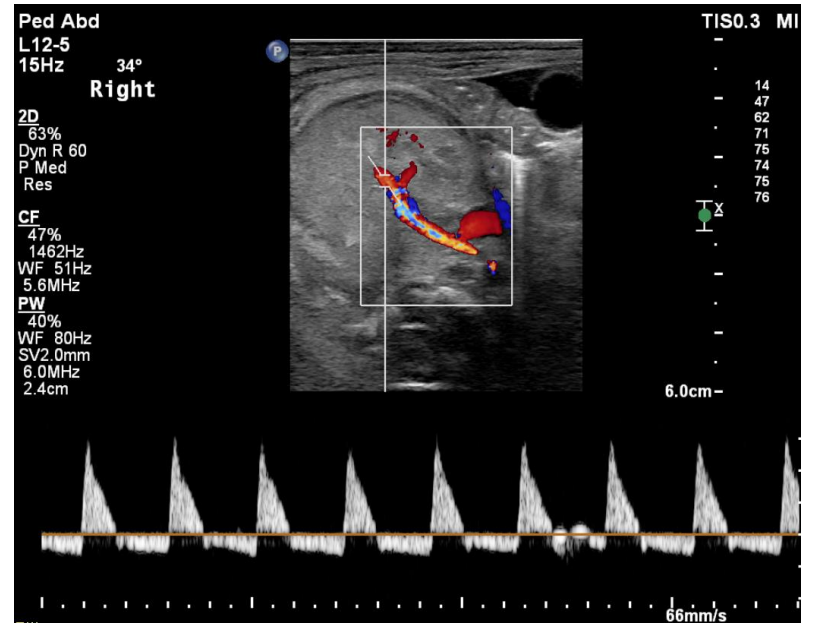
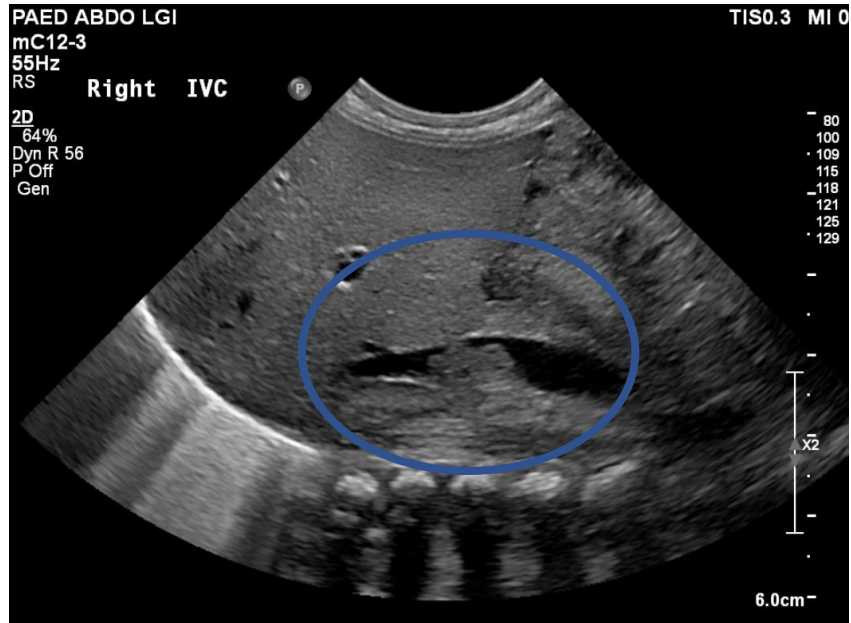




# Renal vein Thrombus

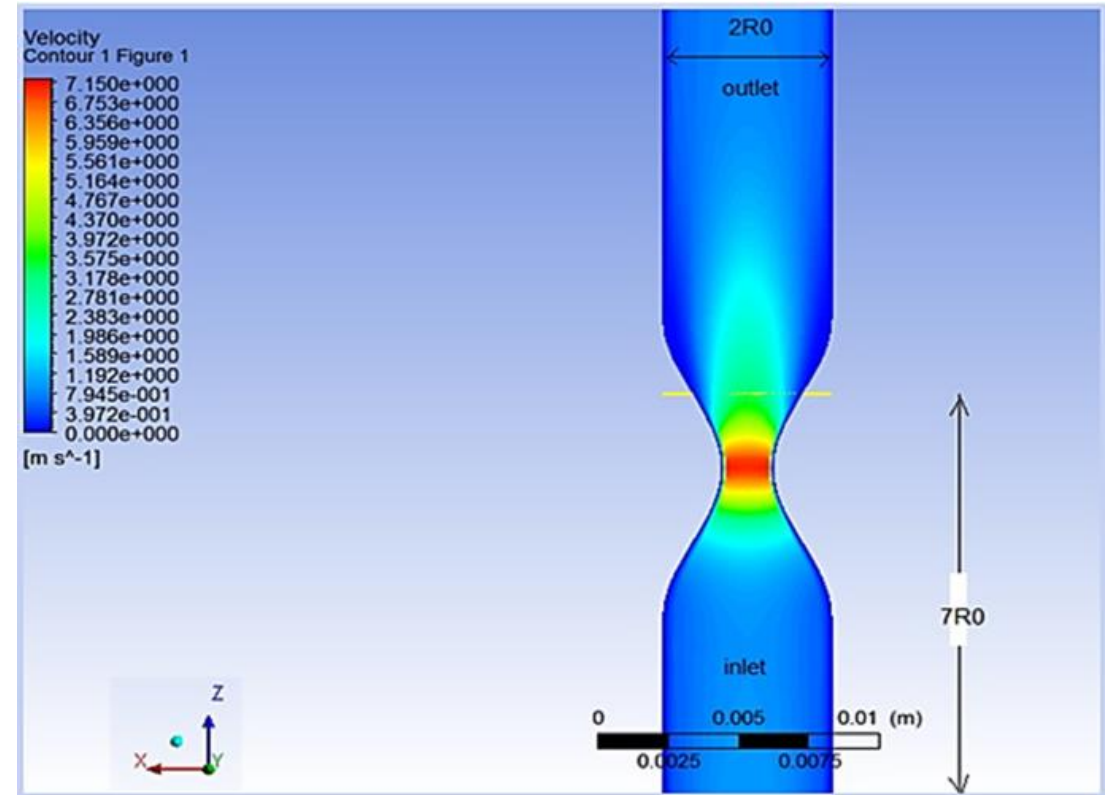






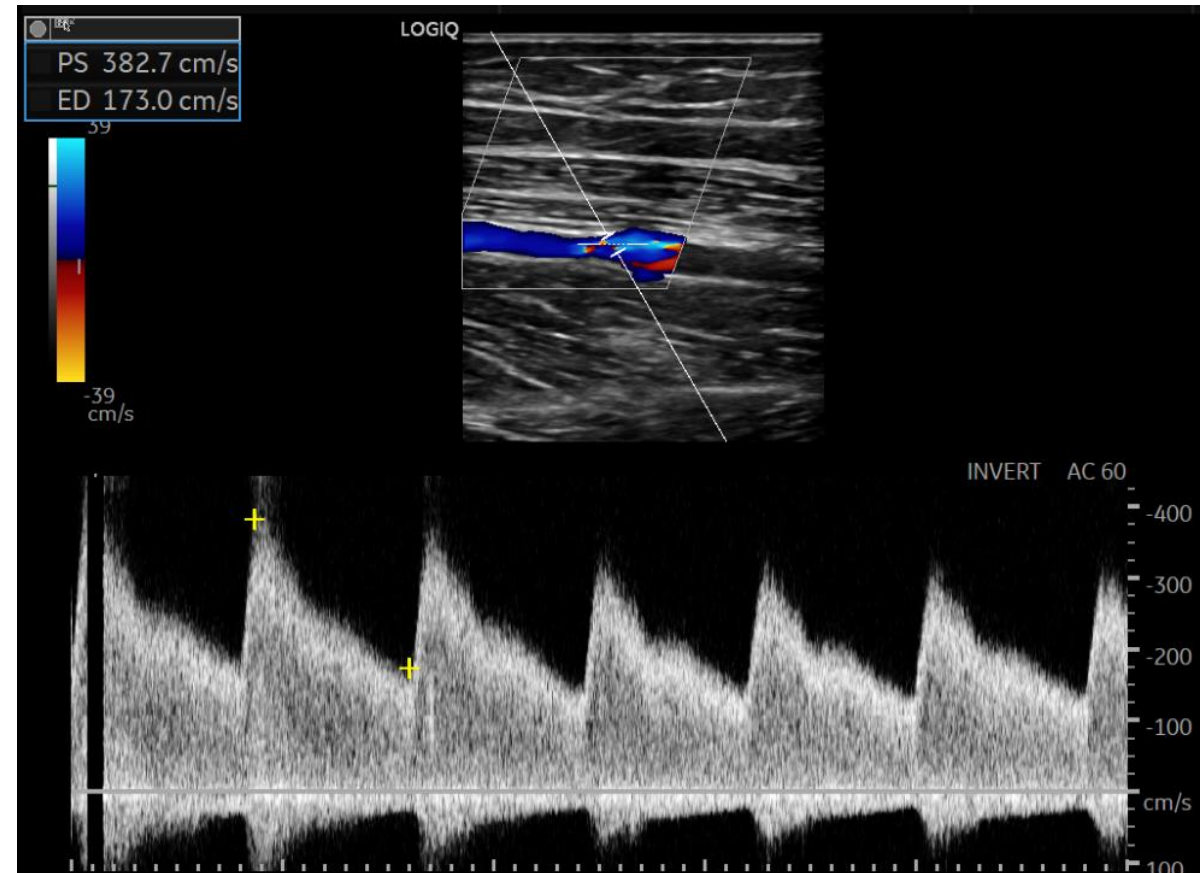
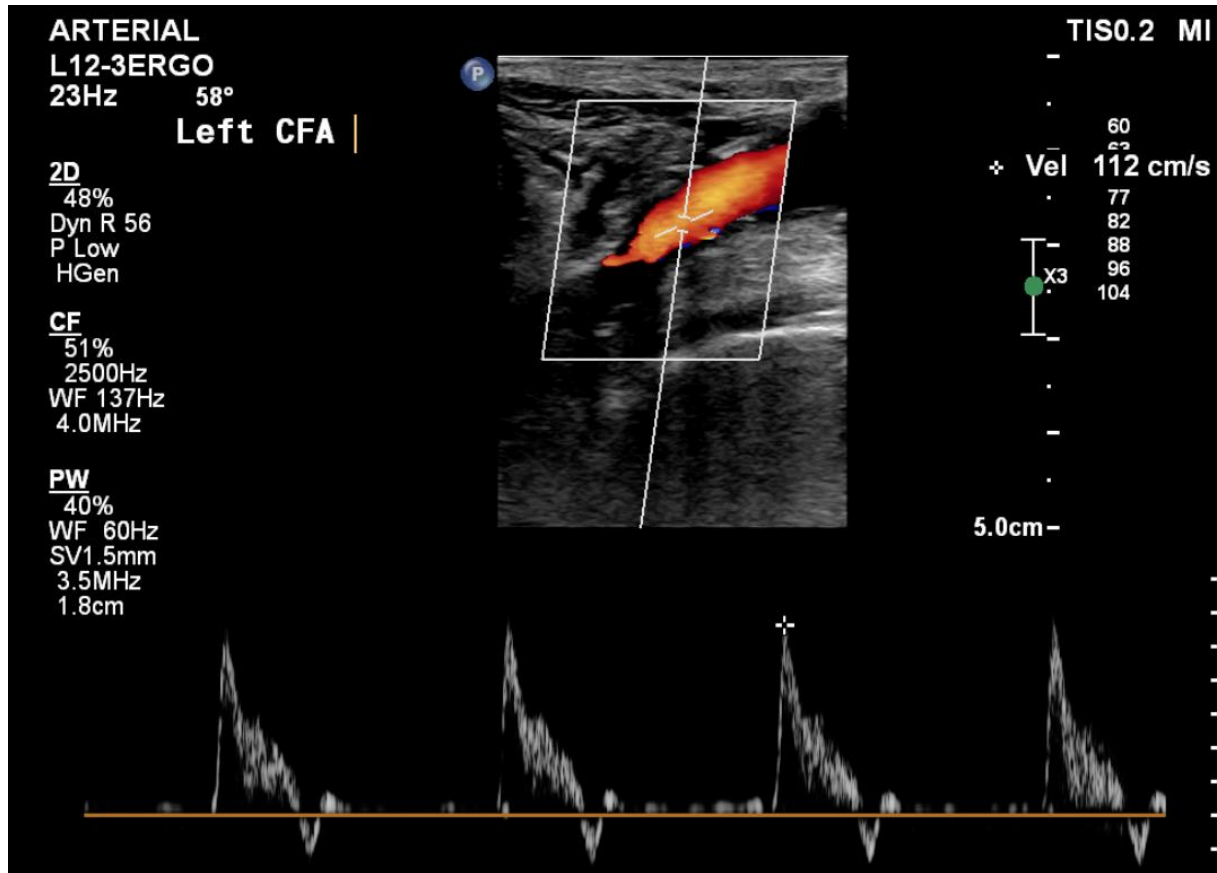
# Stenosis

- Narrowing / irregularity
  - Rarely see atherosclerosis / calcification
  - Post stenotic dilatation
- Velocity
  - Increased at stenosis
  - Turbulent flow immediate pre/post stenosis
- Spectral doppler
  - Artery – phasic, parvus tardus
  - Loss of laminar flow



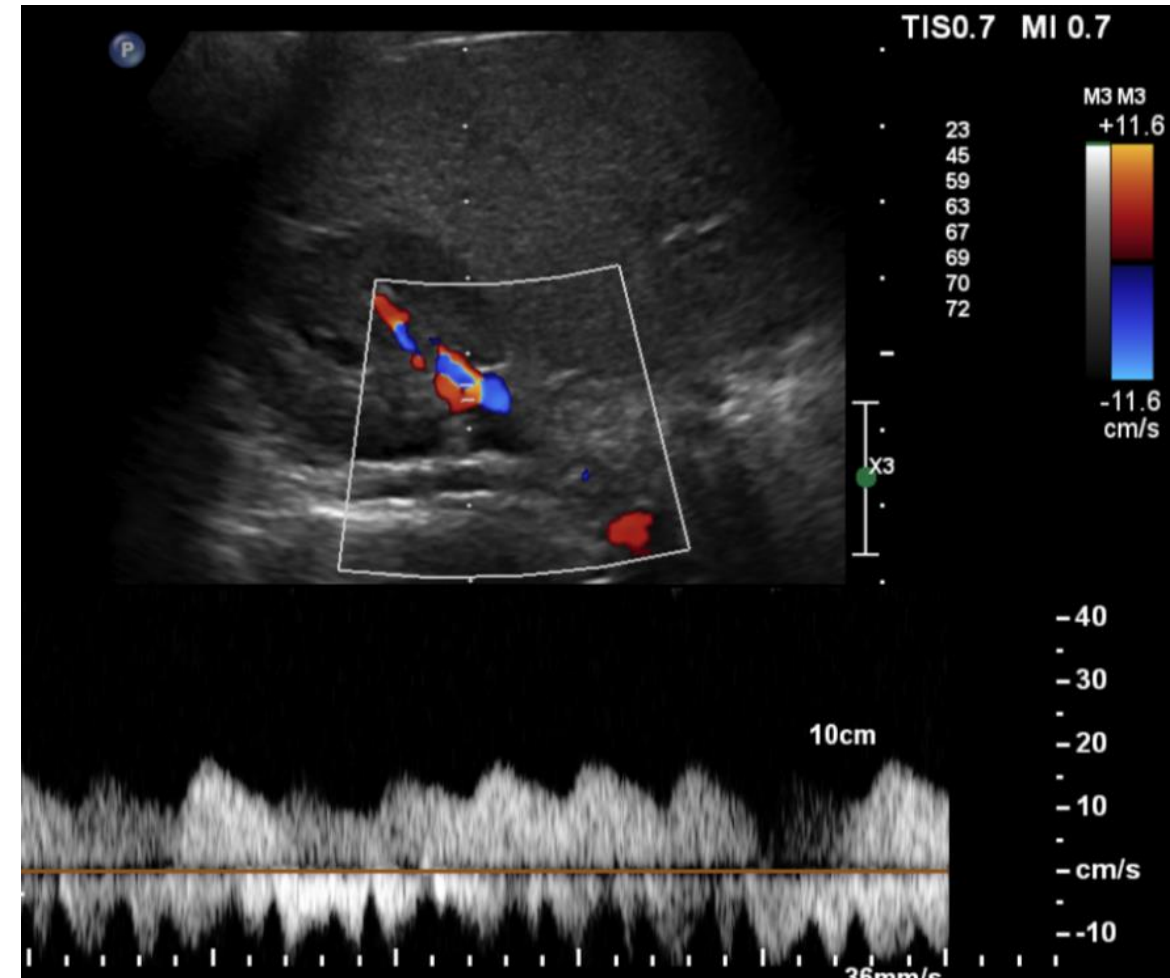
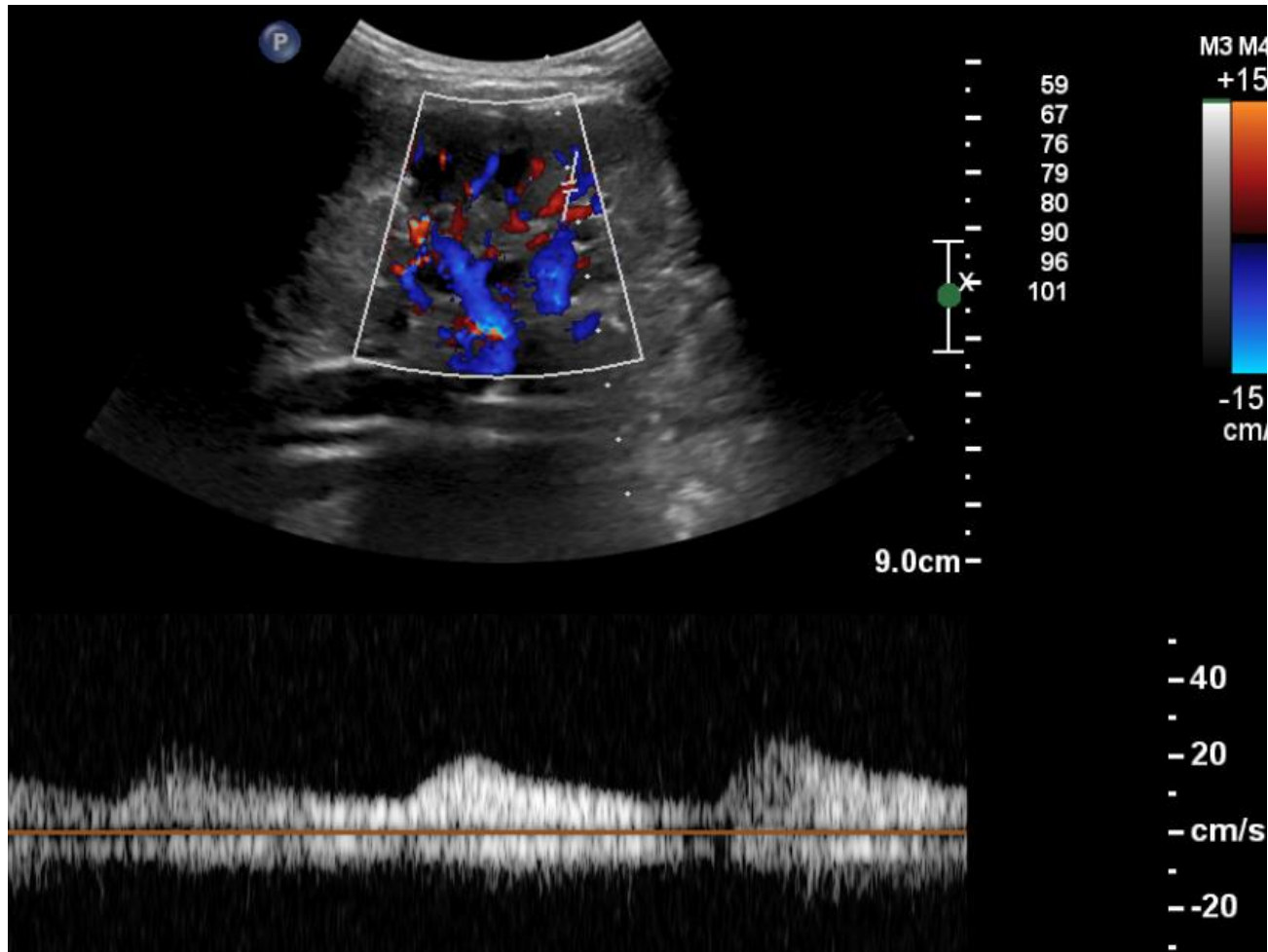


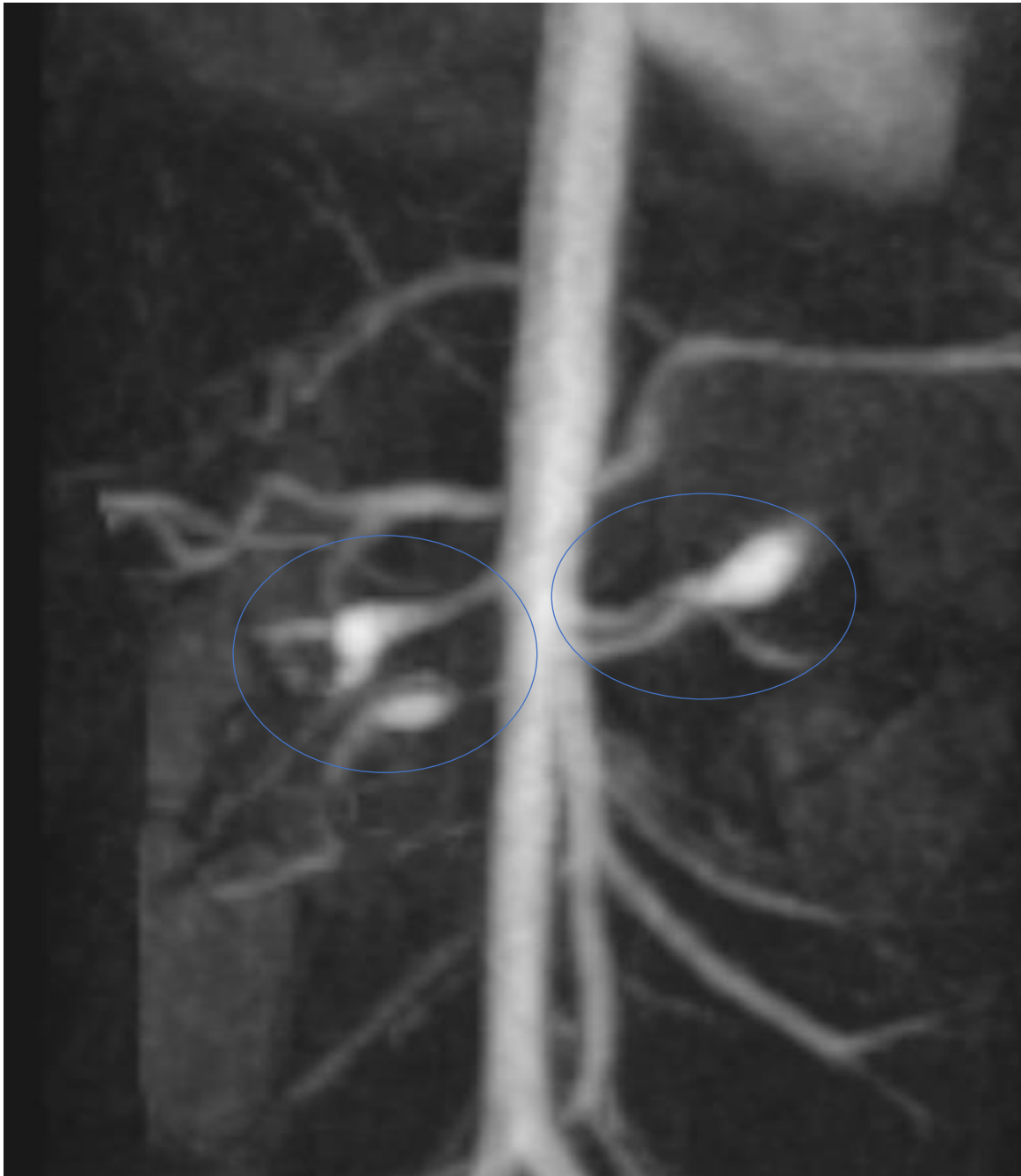
# SFA Stenosis



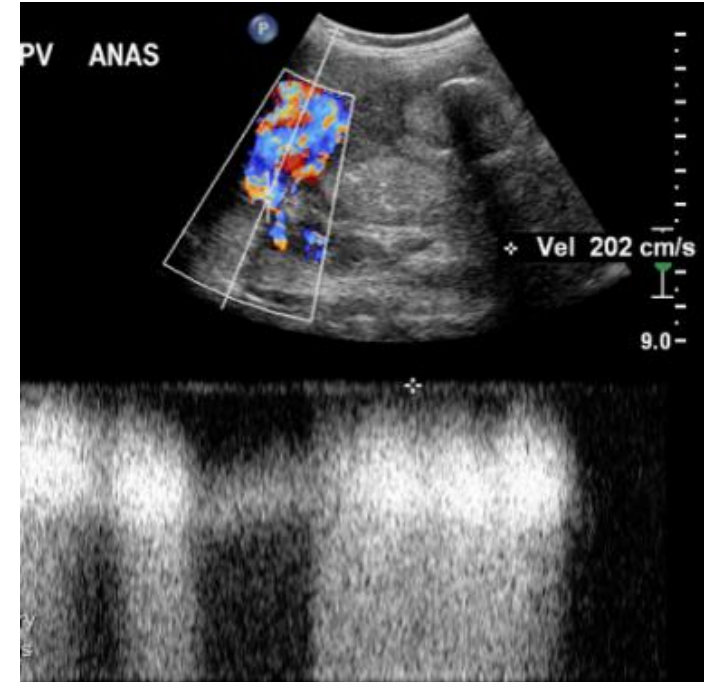
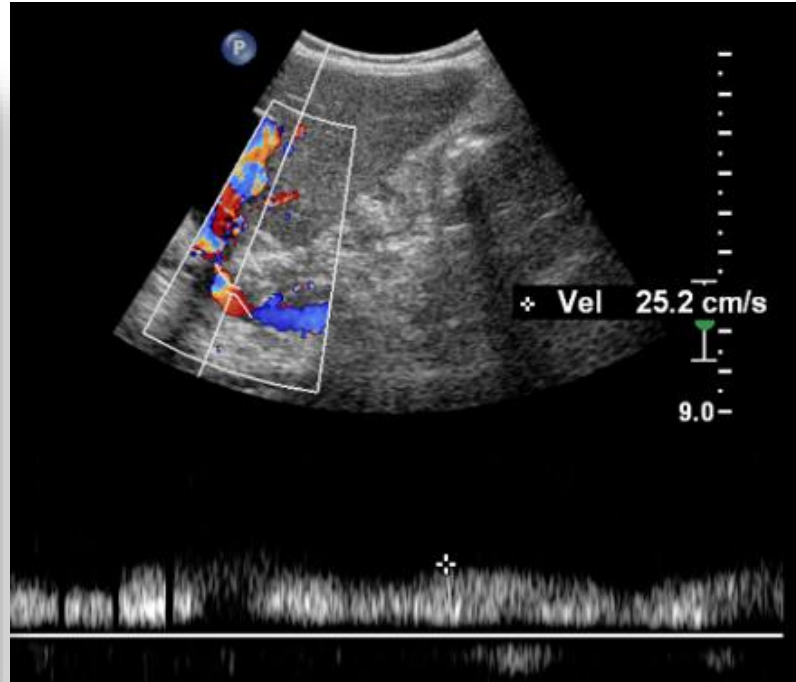
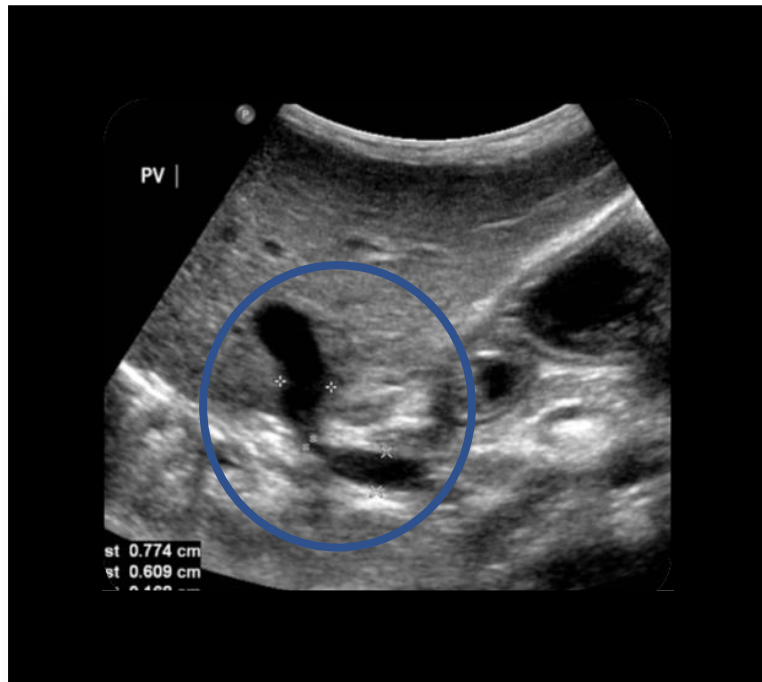


# Renal Artery Stenosis

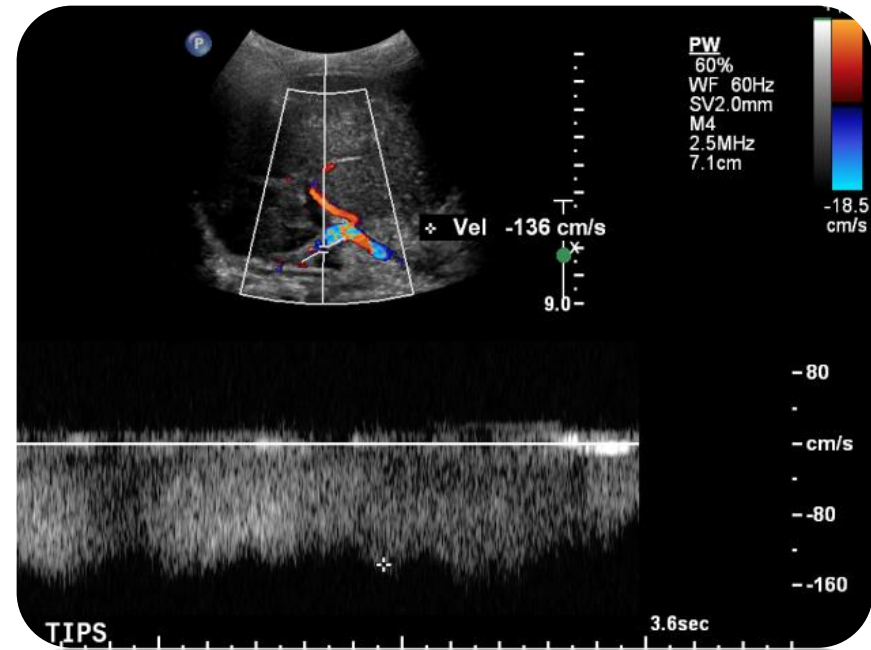
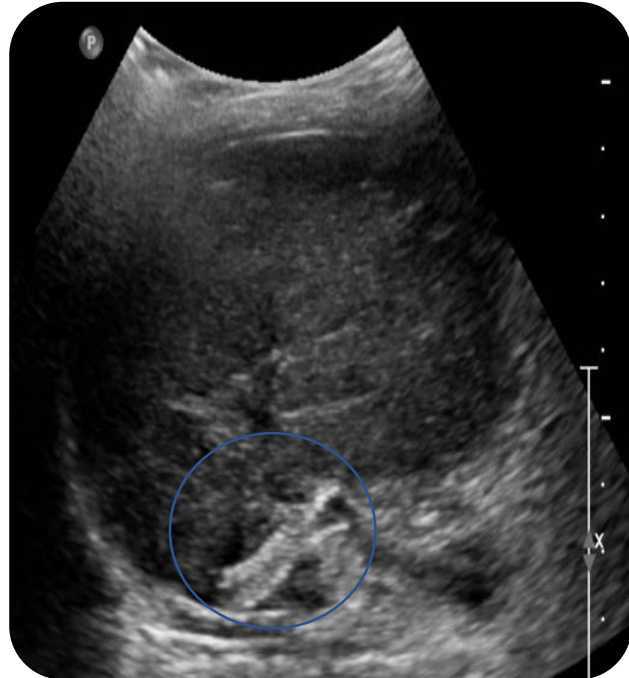
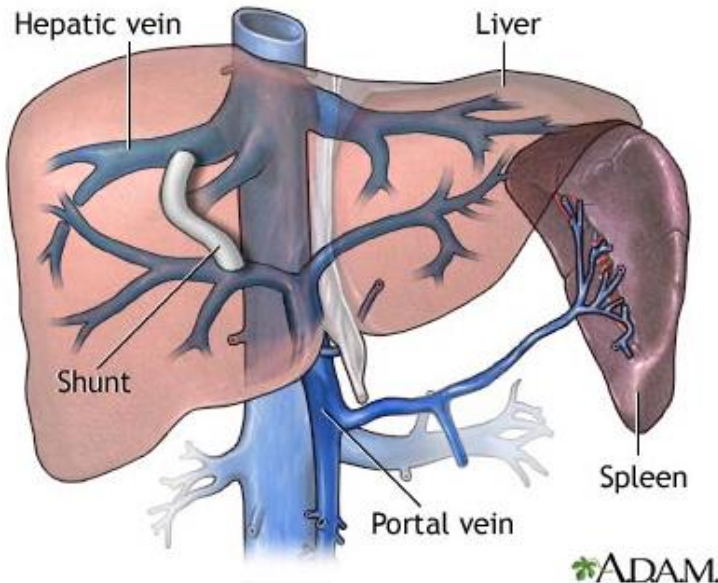




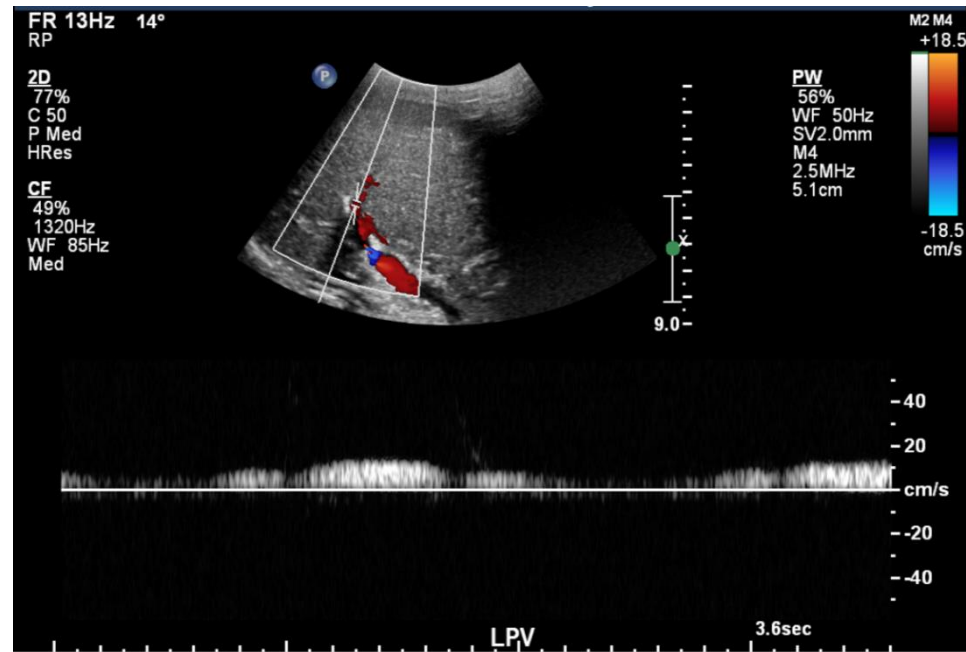
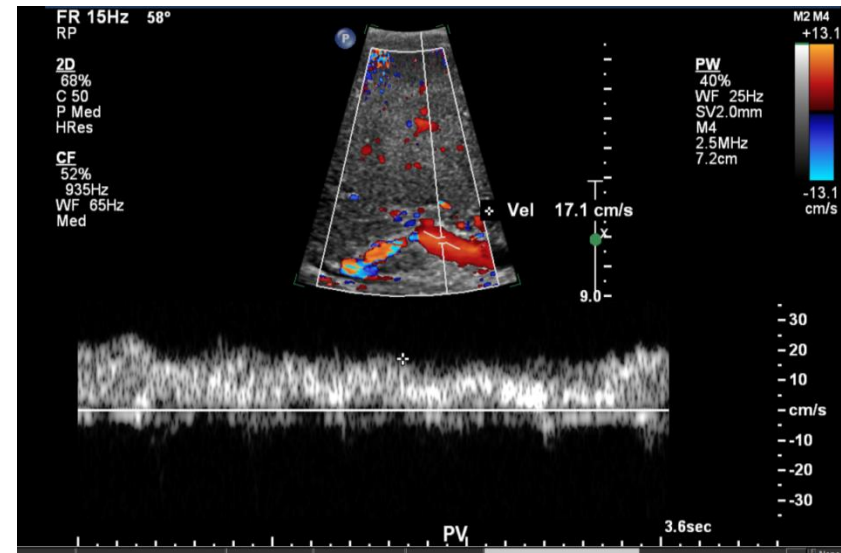
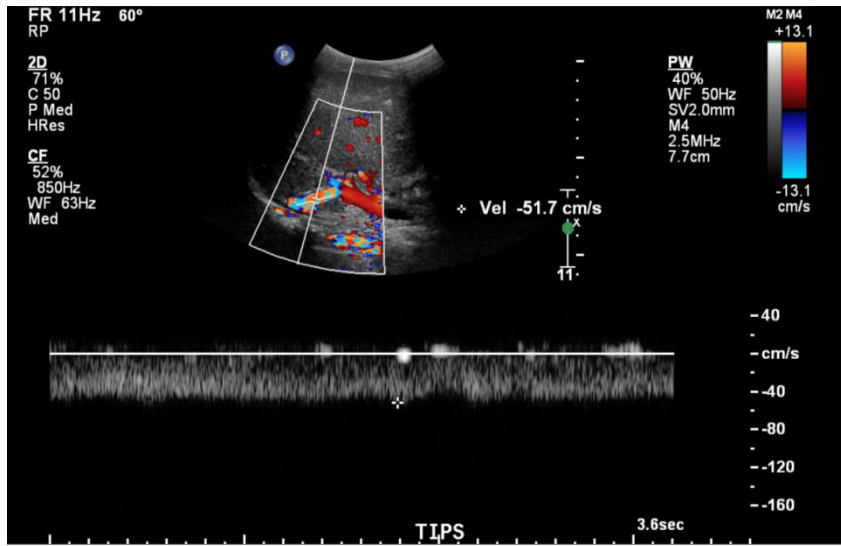
# Portal Vein Stenosis



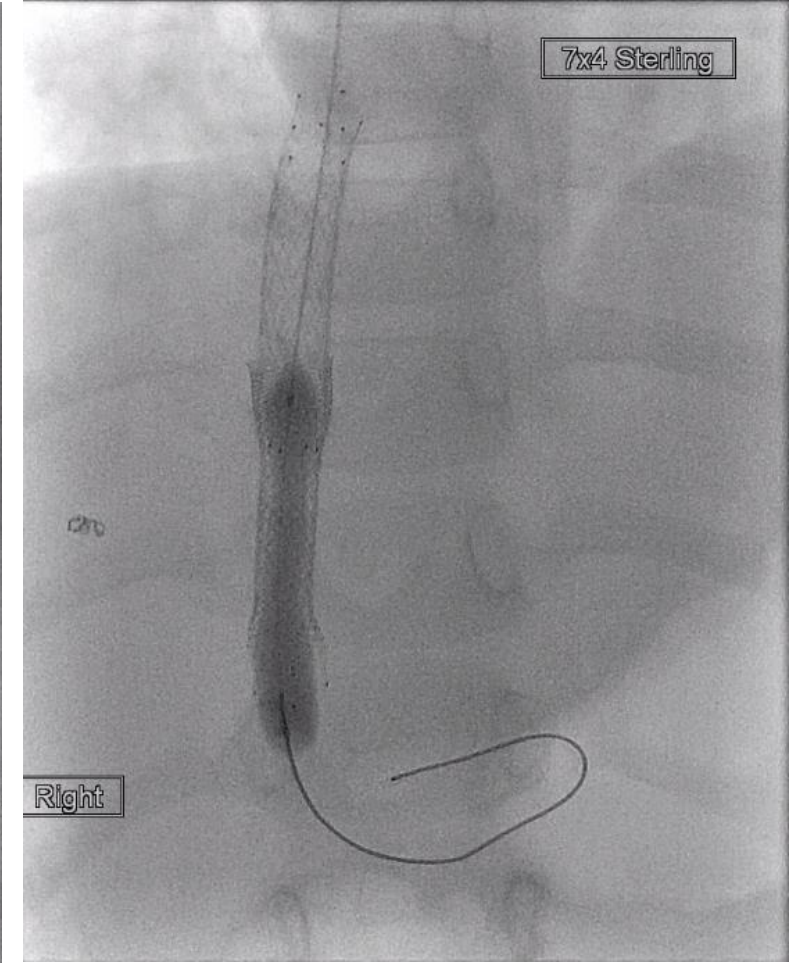
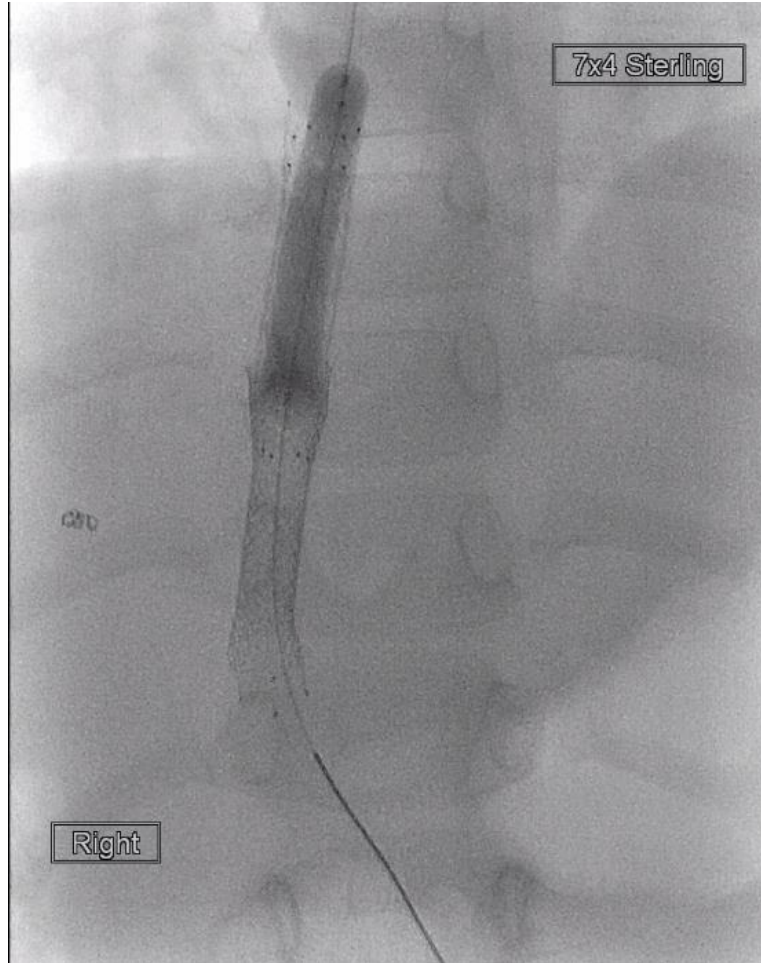
# TIPSS









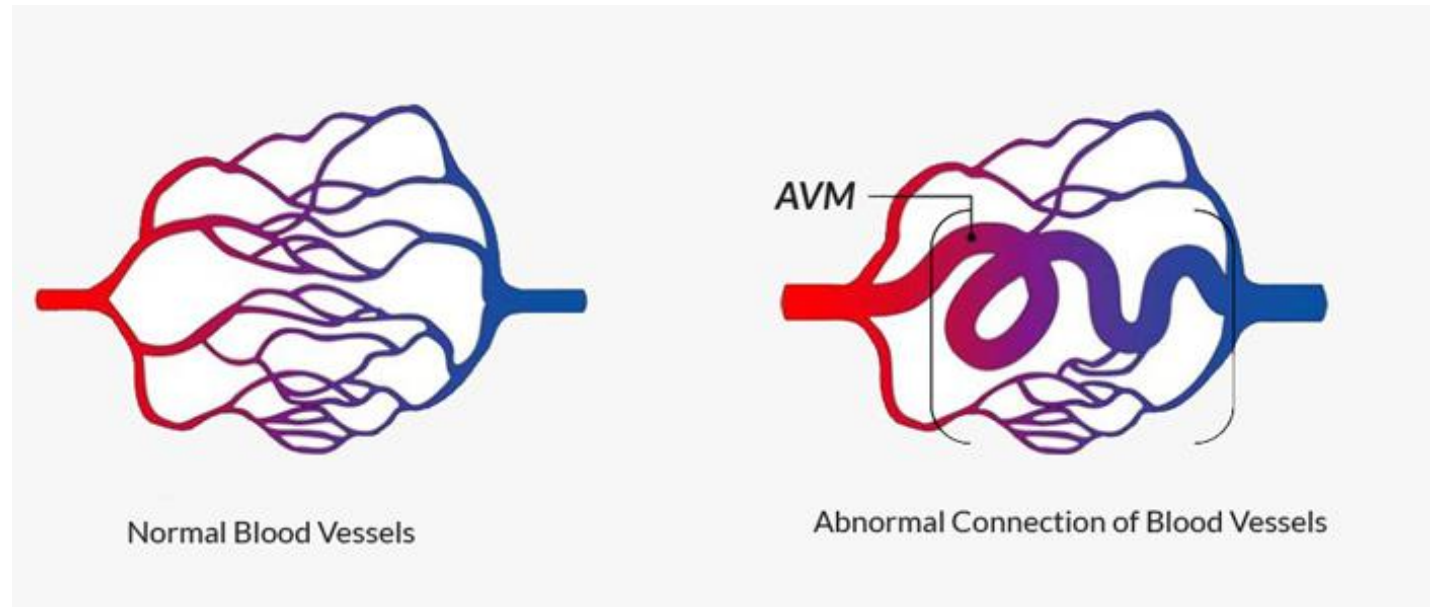




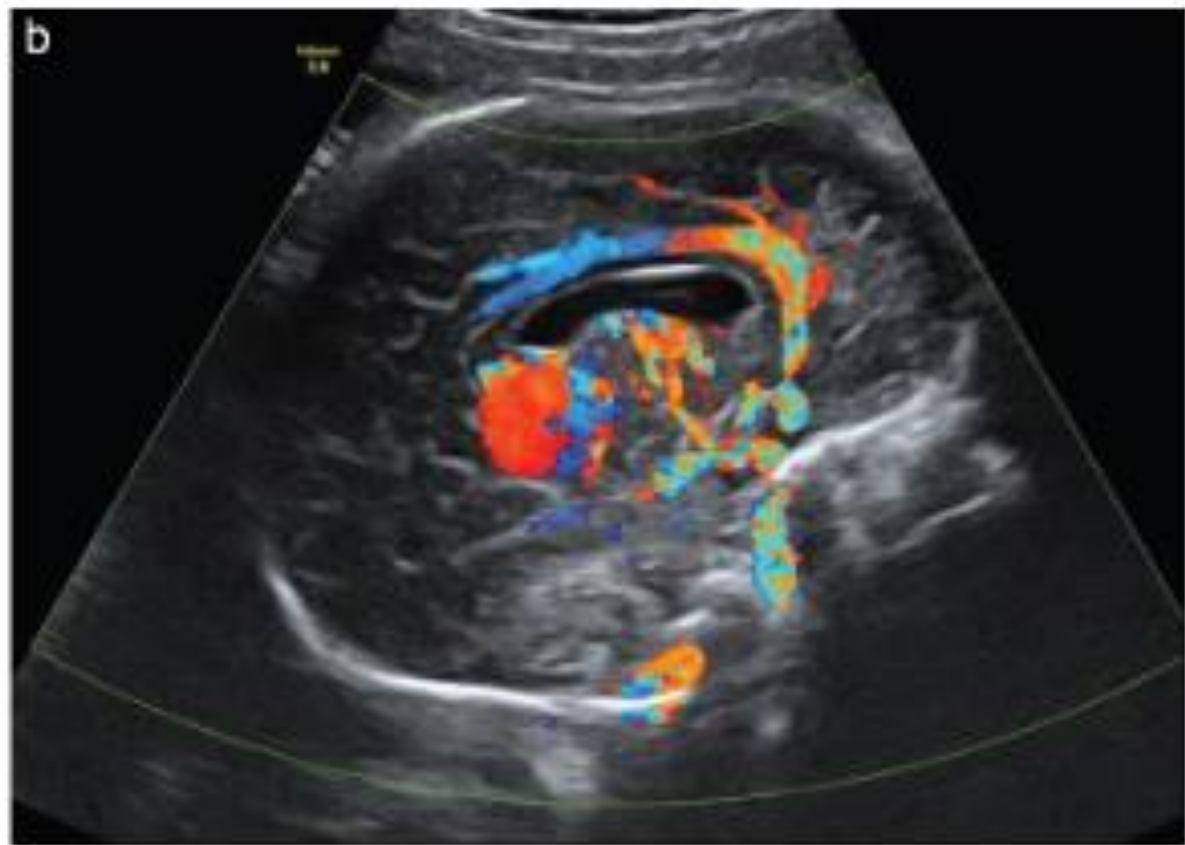
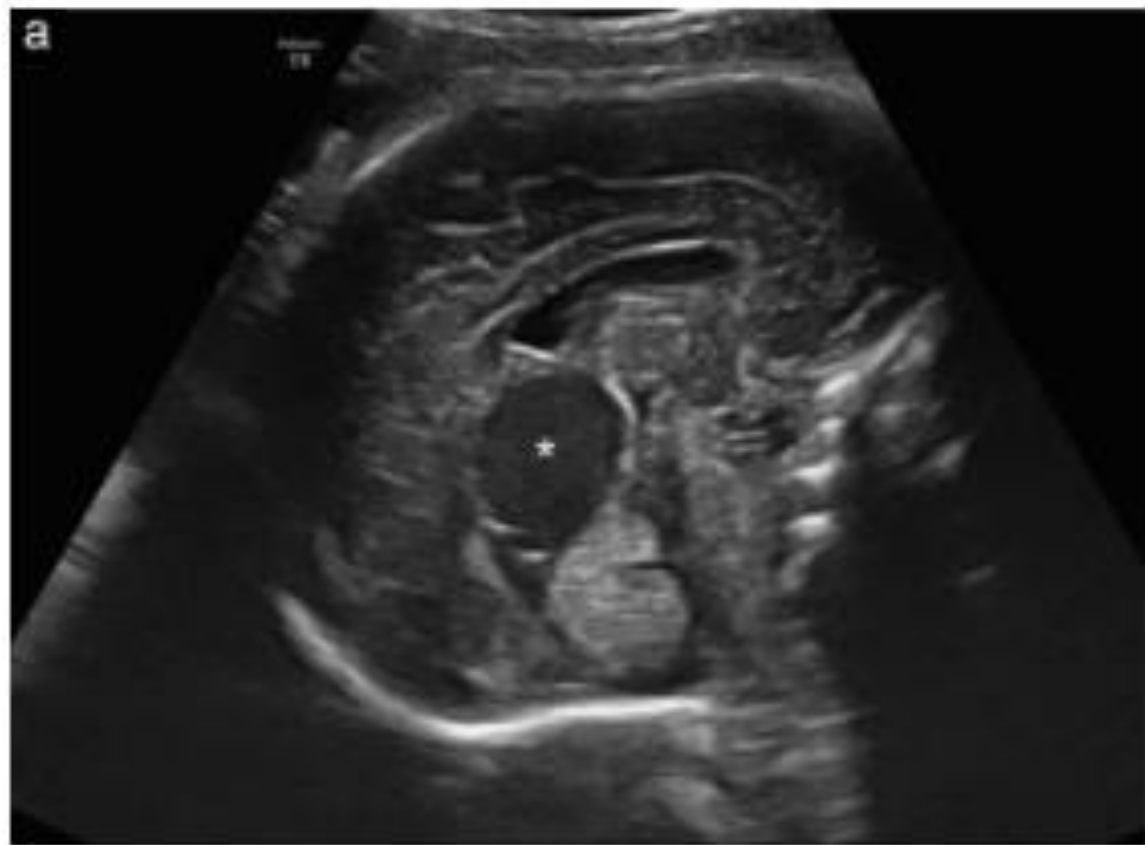
# A-V Anomalies

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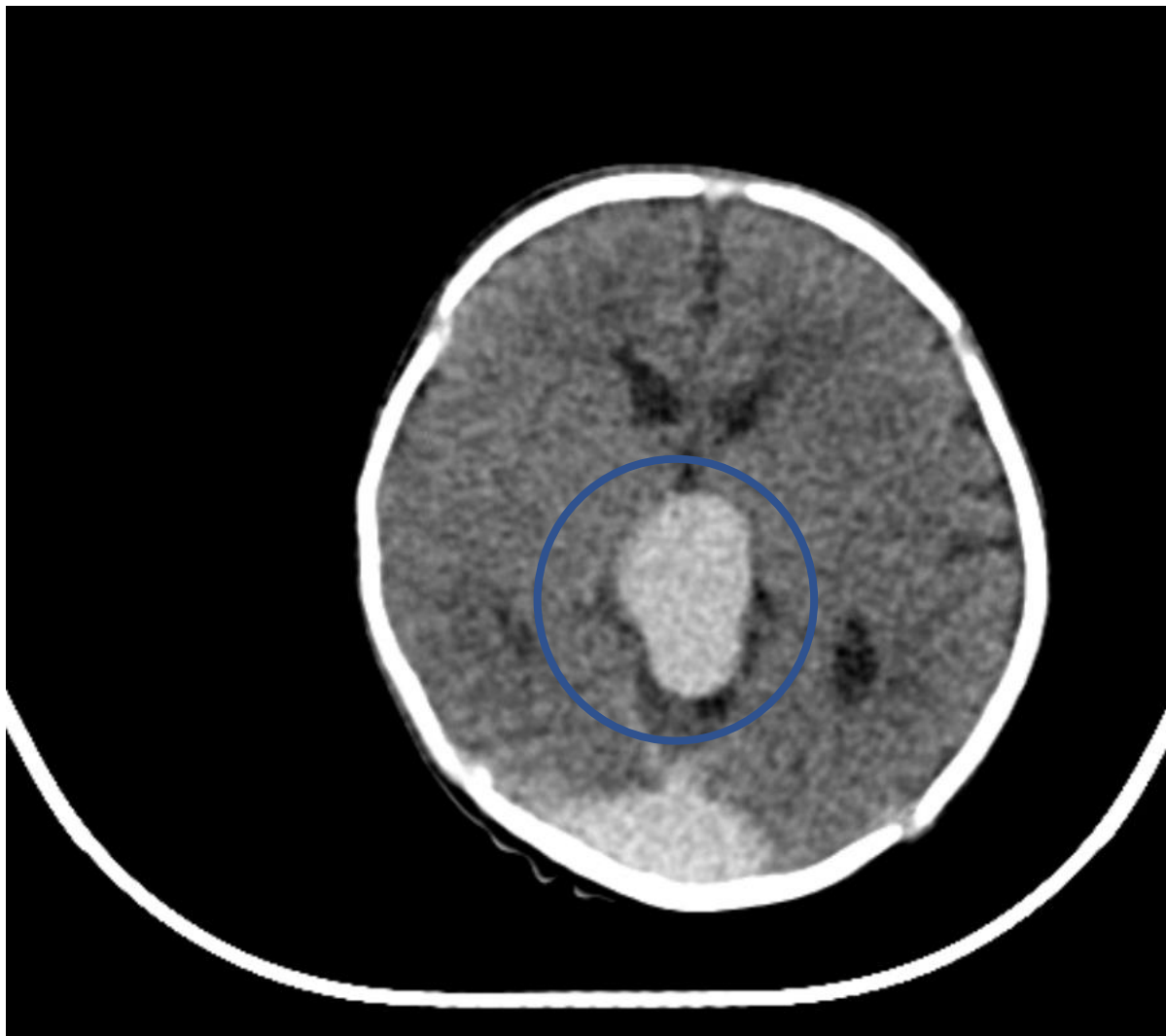
- Abnormal connection between artery / vein
- Shunting of blood
- High output cardiac failure
- Damage to vessels / tissues
- Causes
  - Congenital
  - Iatrogenic
  - Trauma





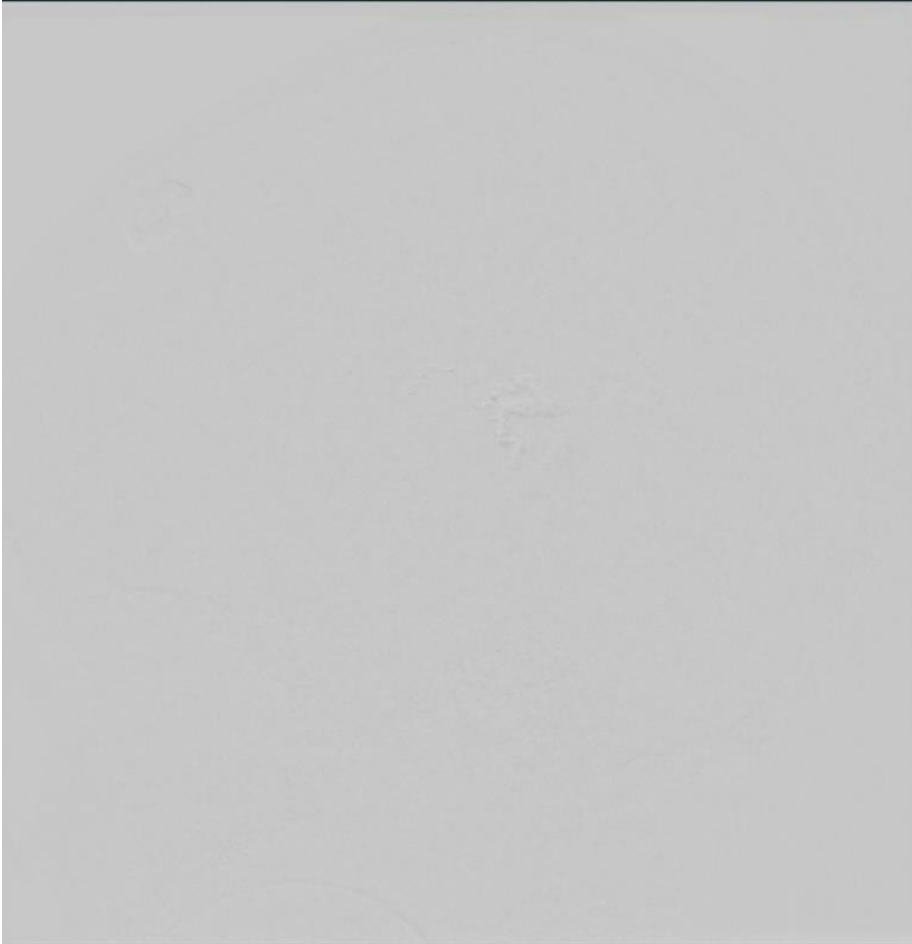


# Vein of Galen malformation

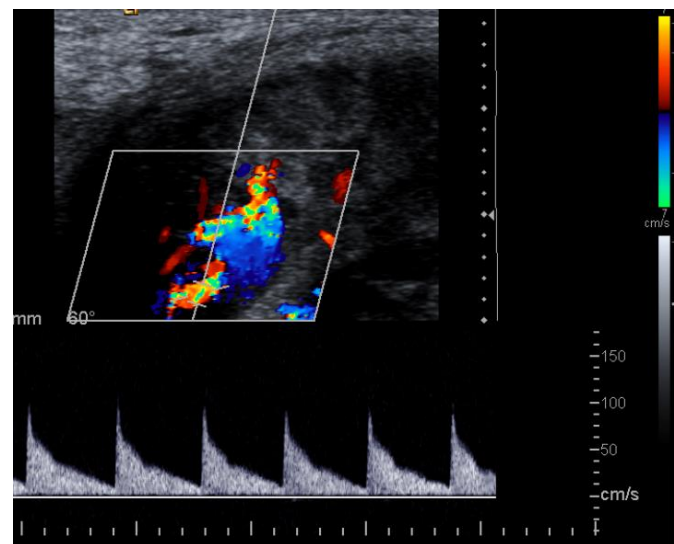
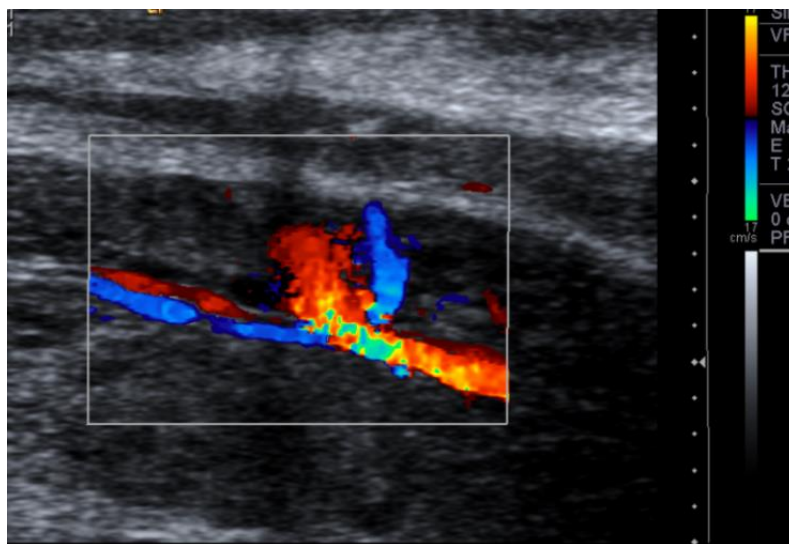
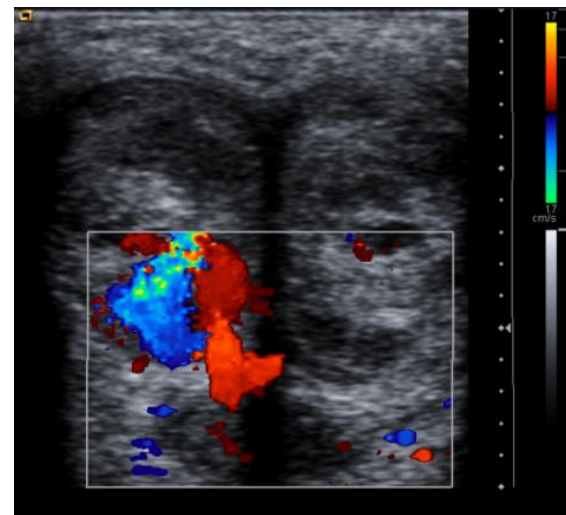
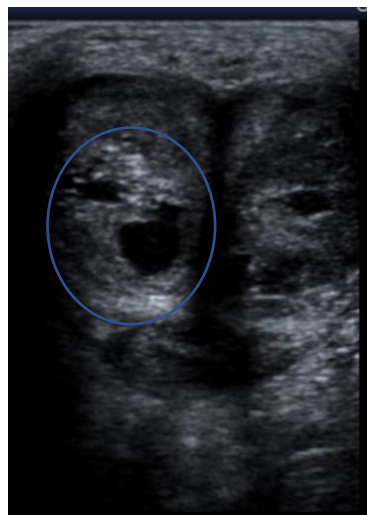


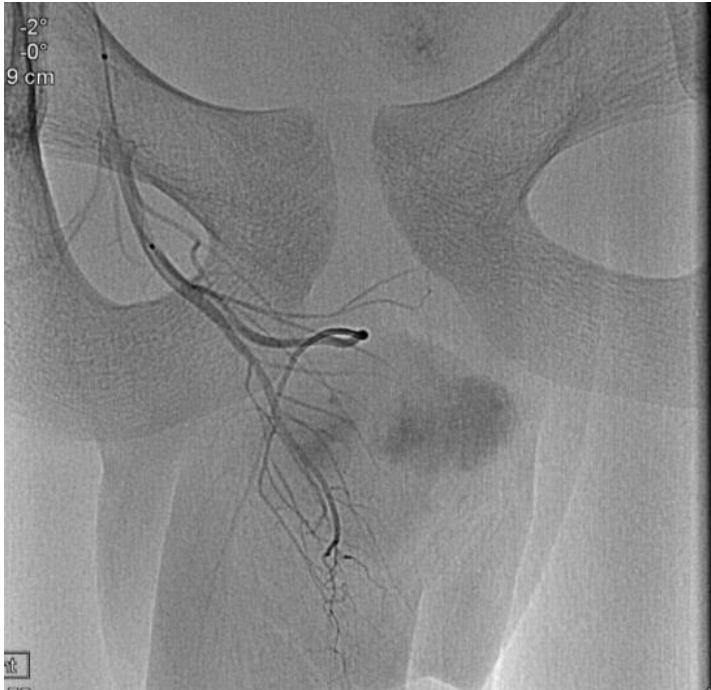
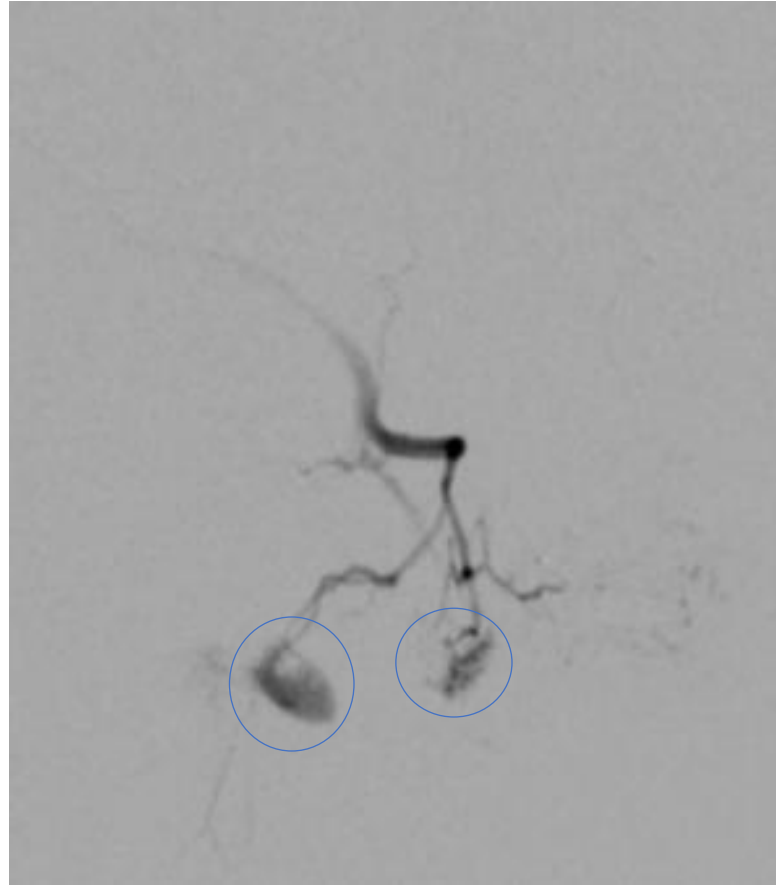
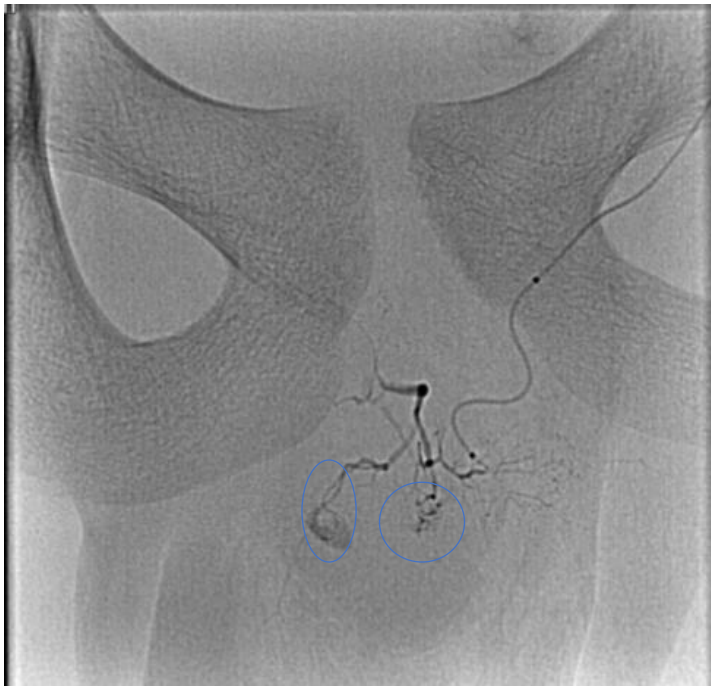


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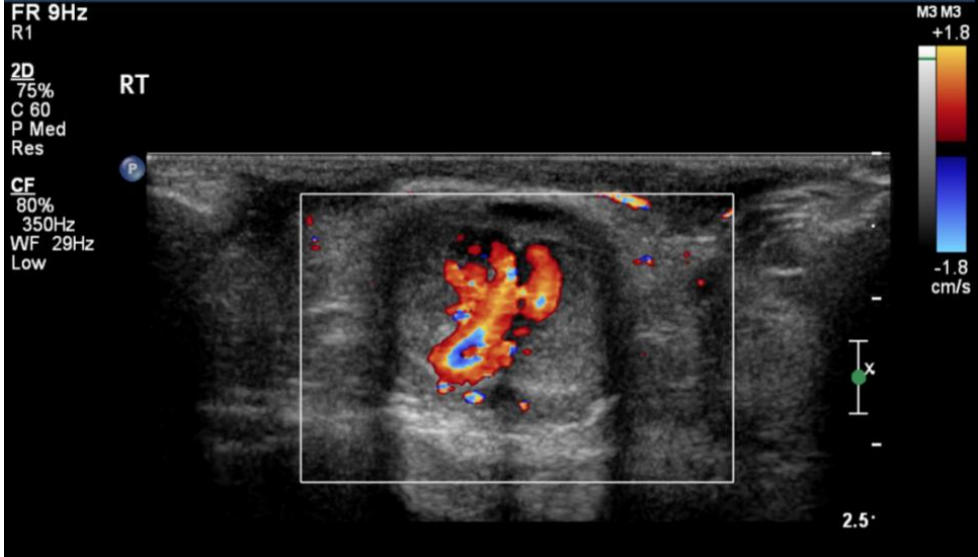
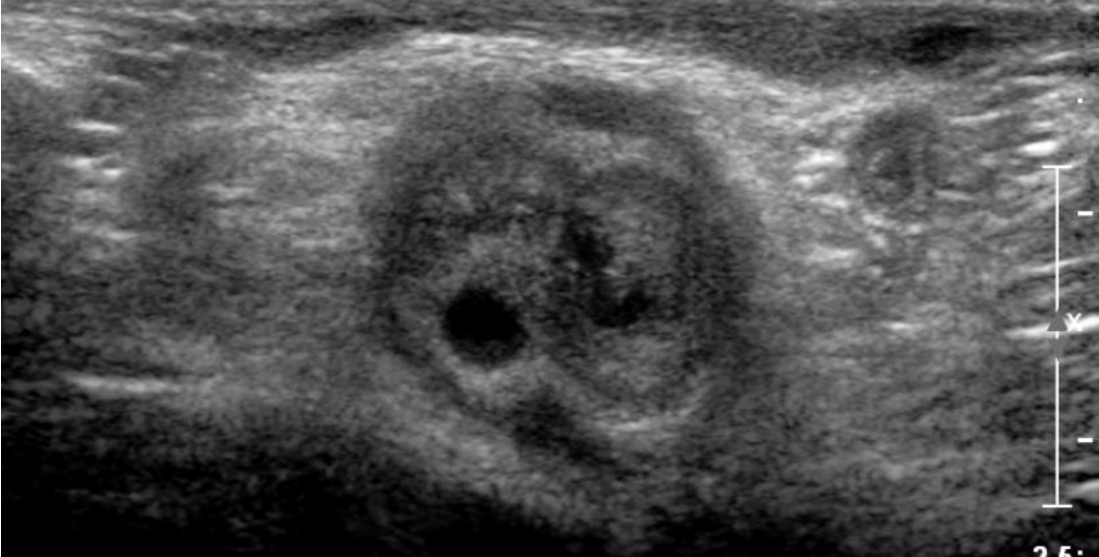
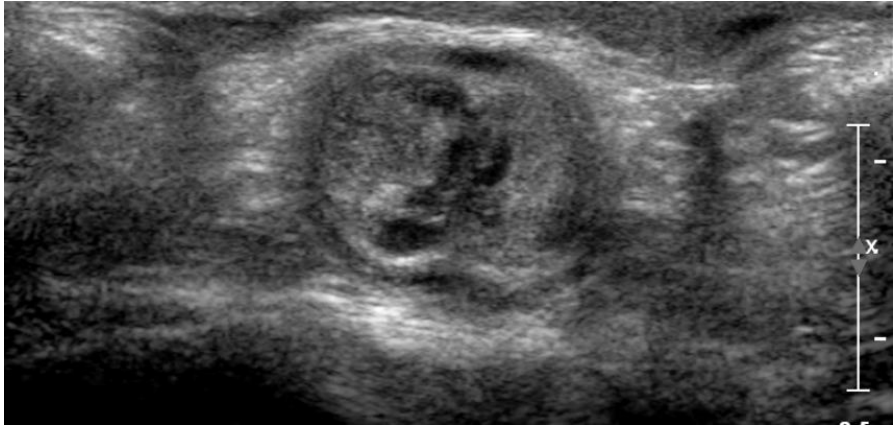
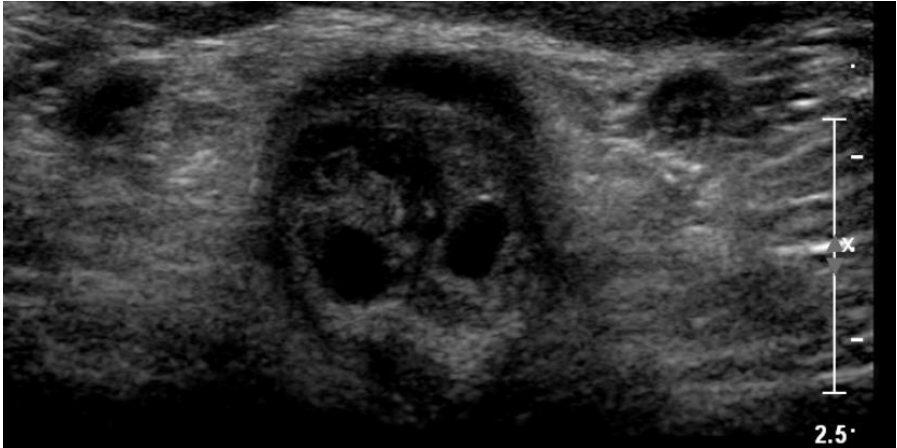


# Leap Frog

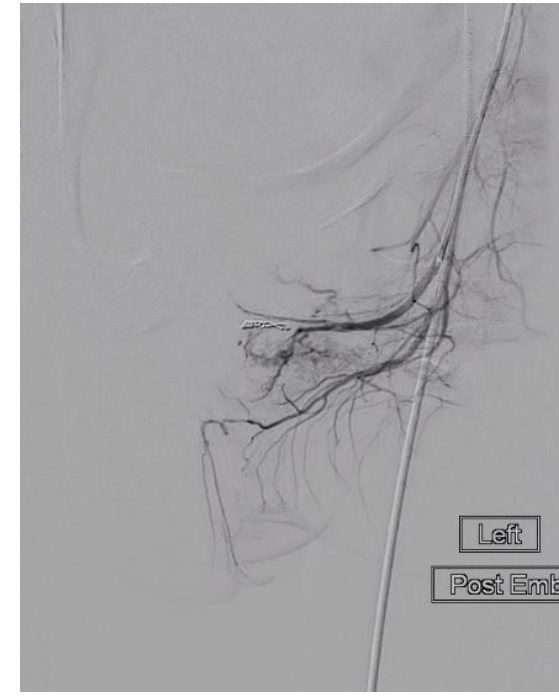
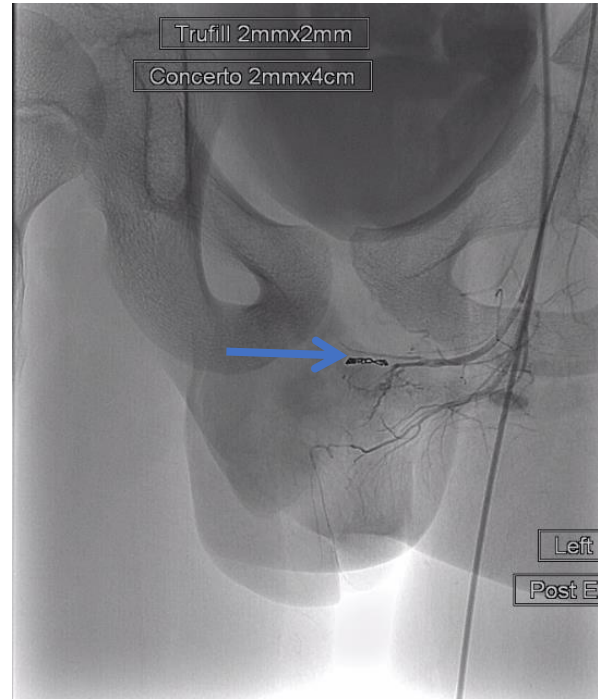
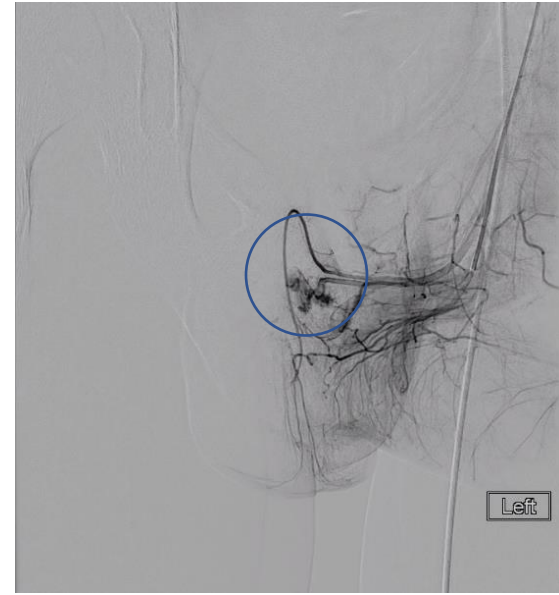




# Traumatic Priapism





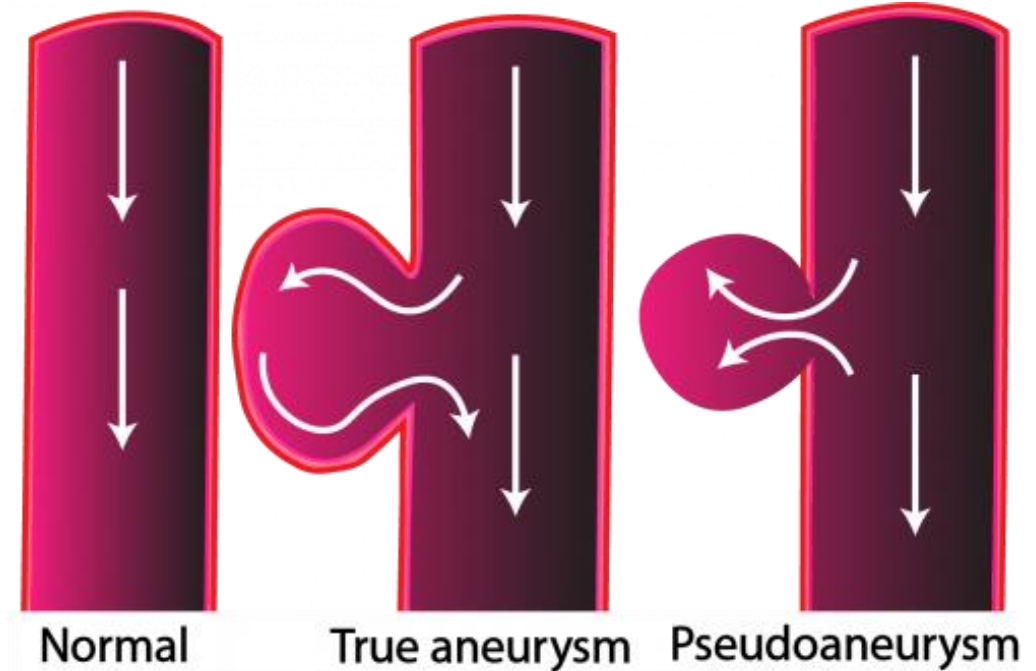


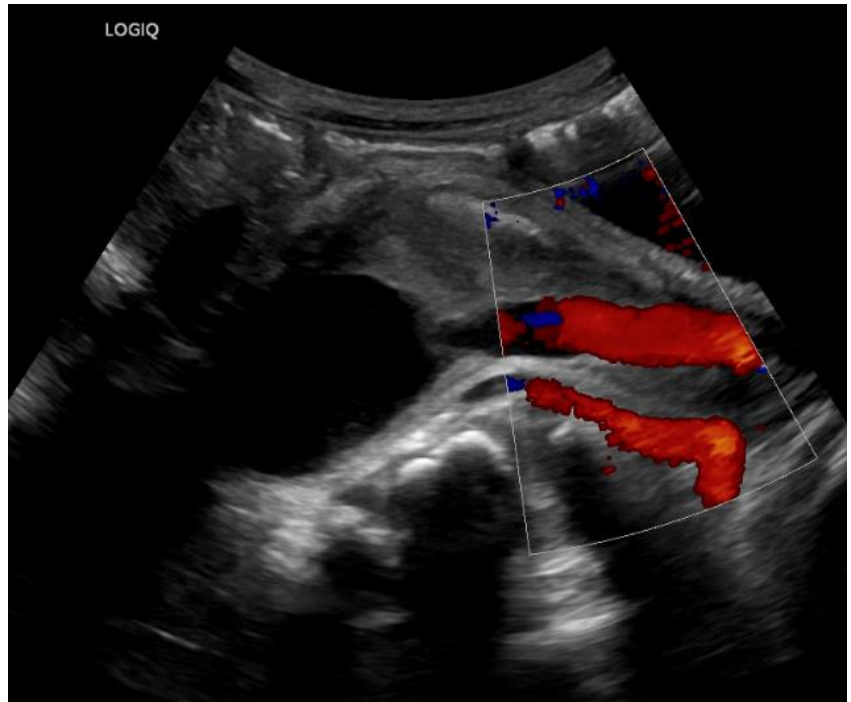


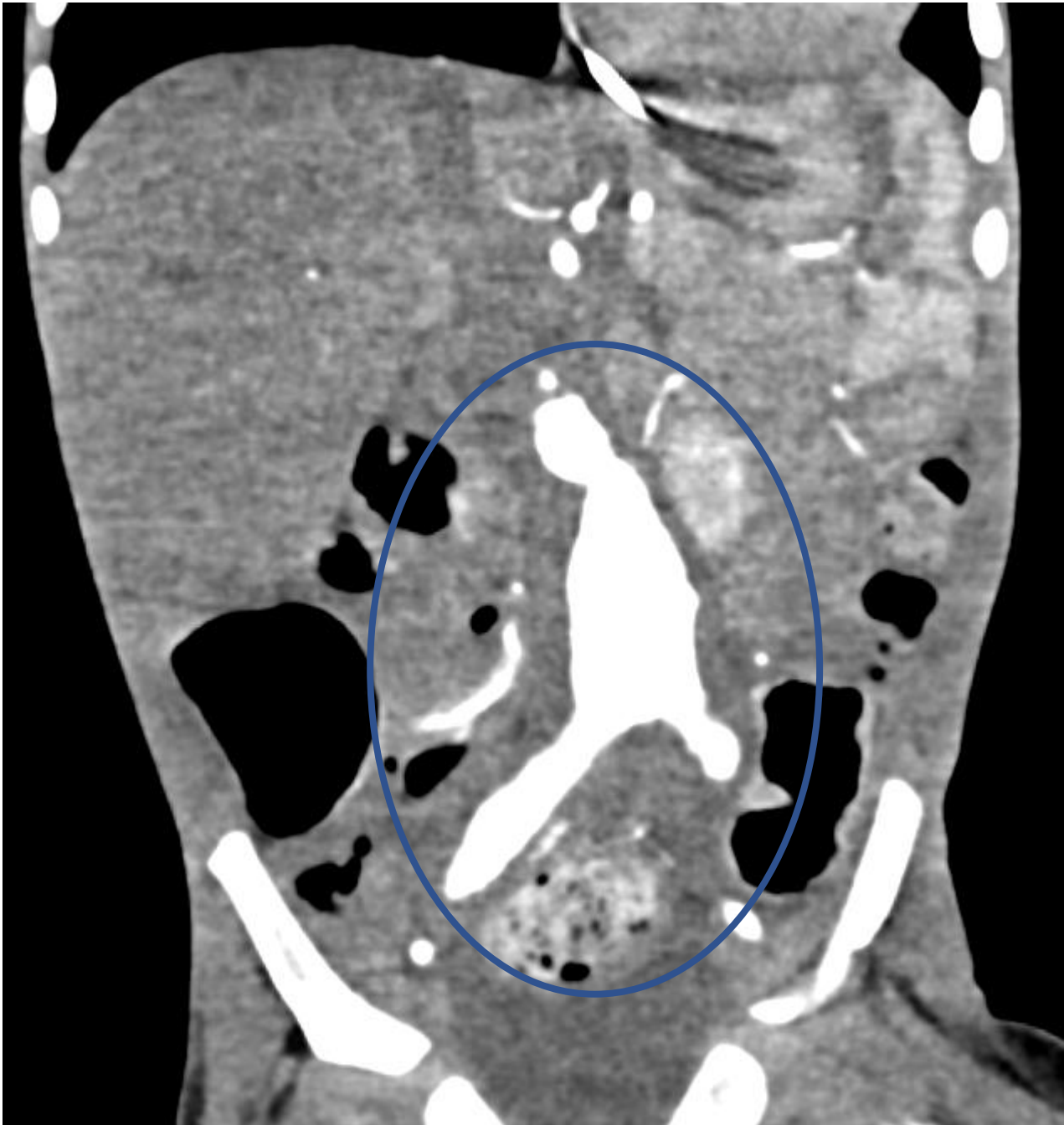
# Aneurysms

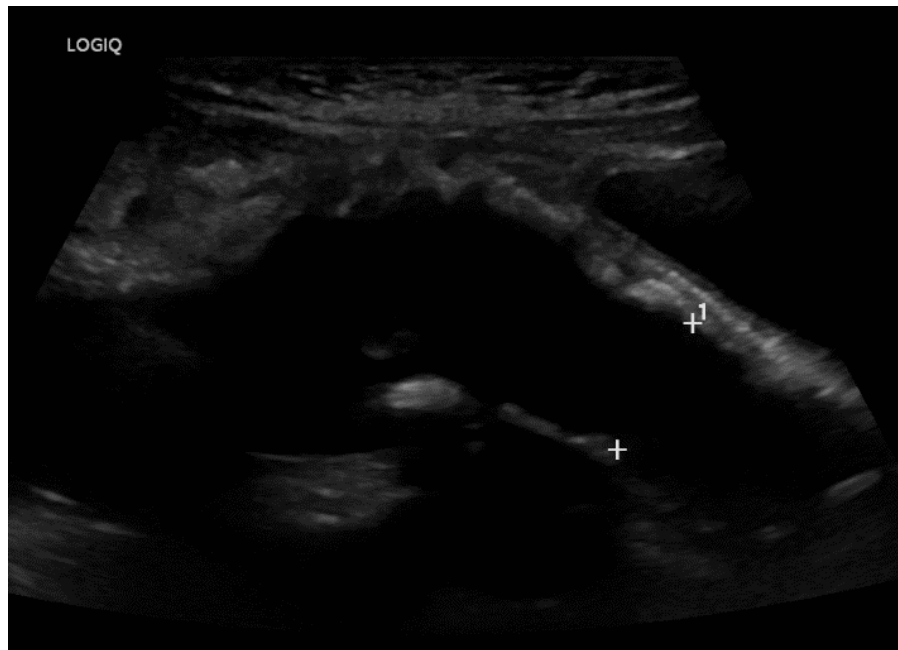
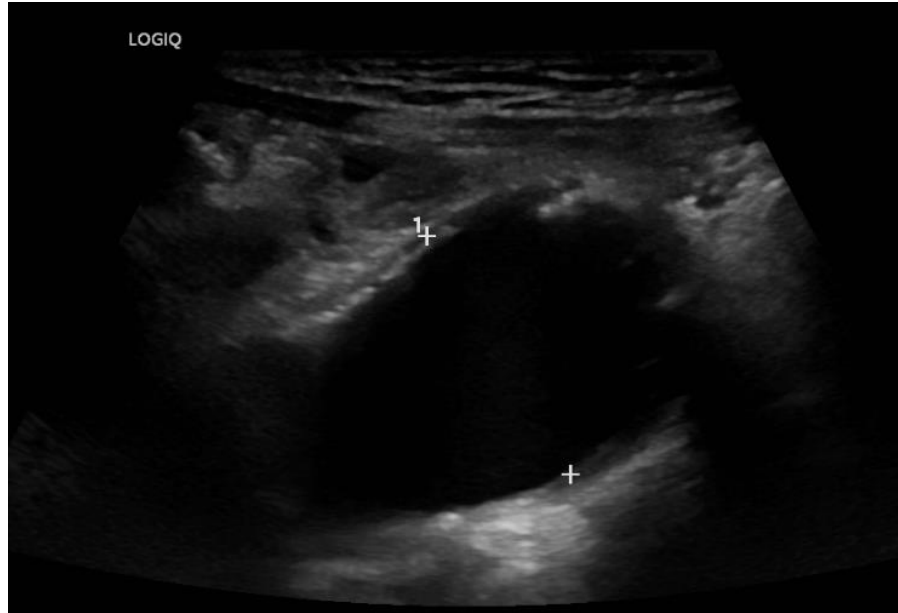
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- Bulge in vessel wall
- Caused by weakness
  - Trauma
  - Connective tissue disorder
  - Inflammation
  - Infection
- True vs false

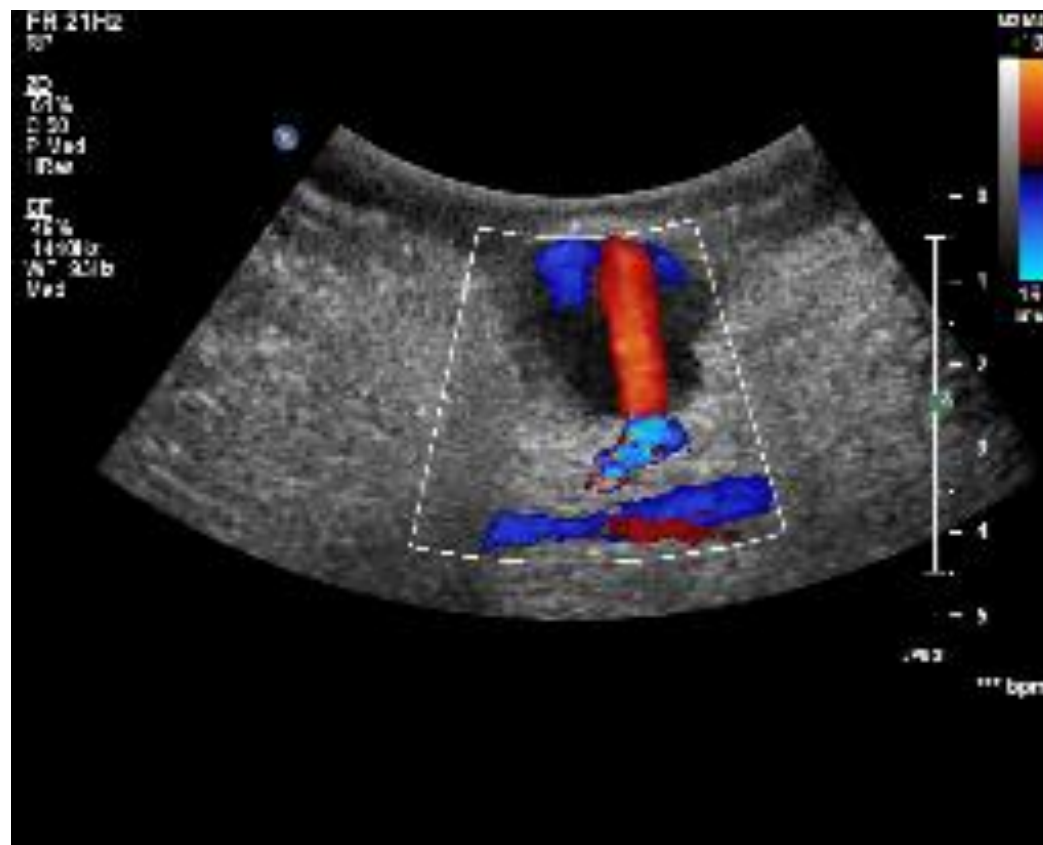
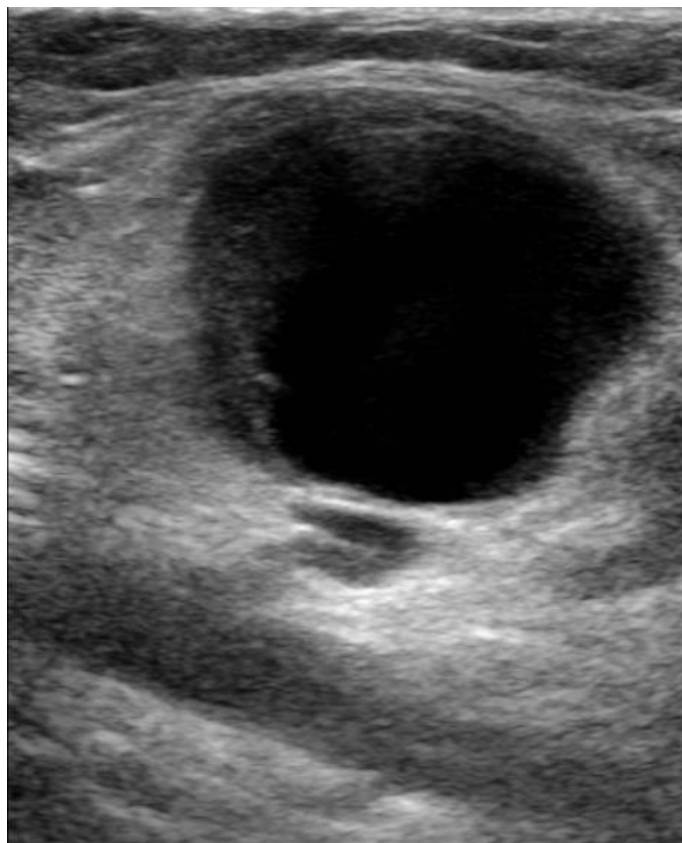




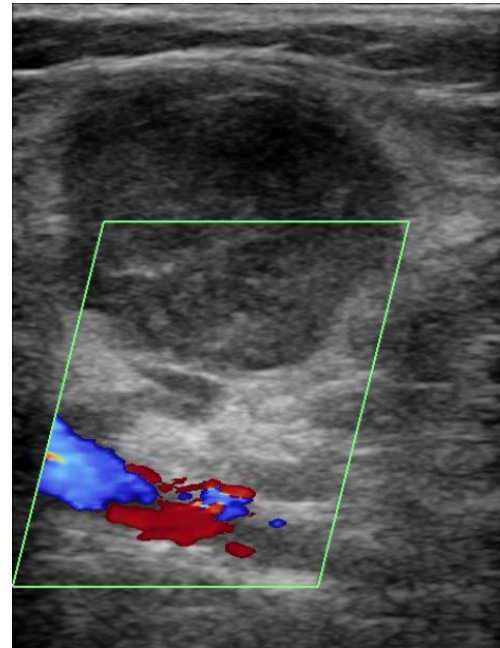
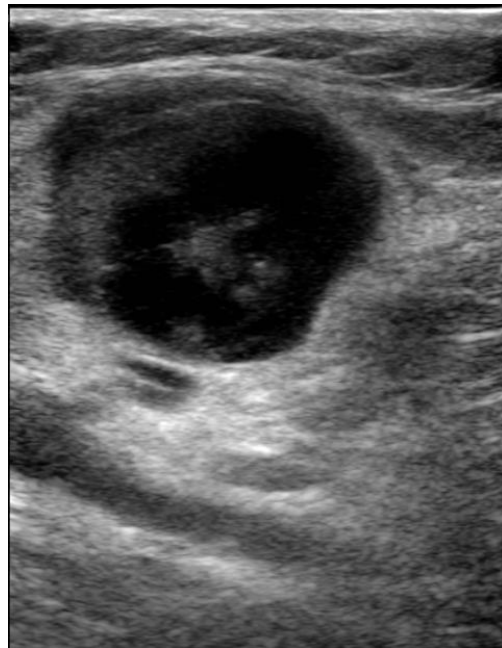
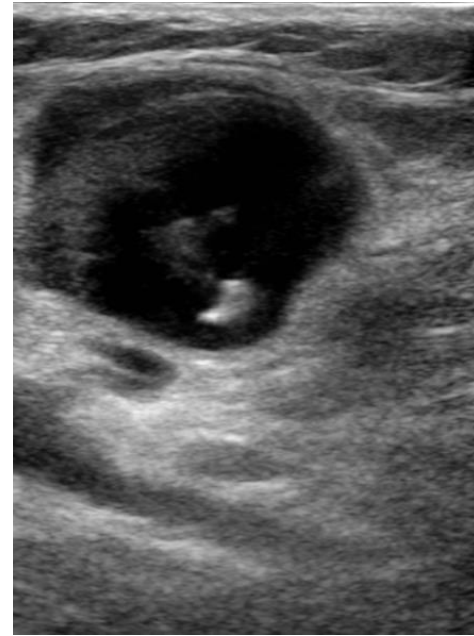
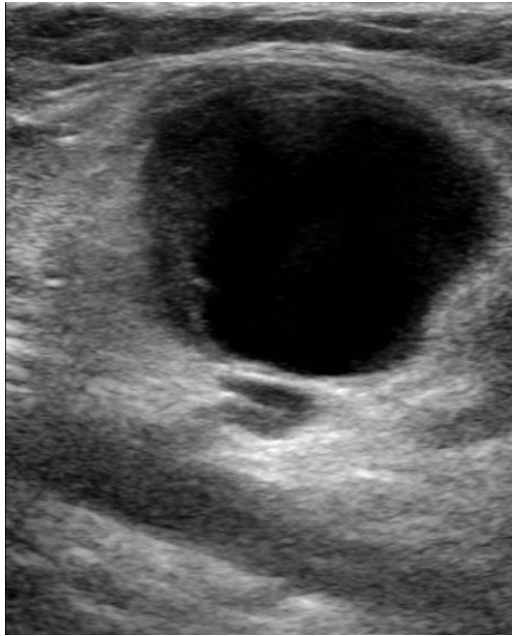




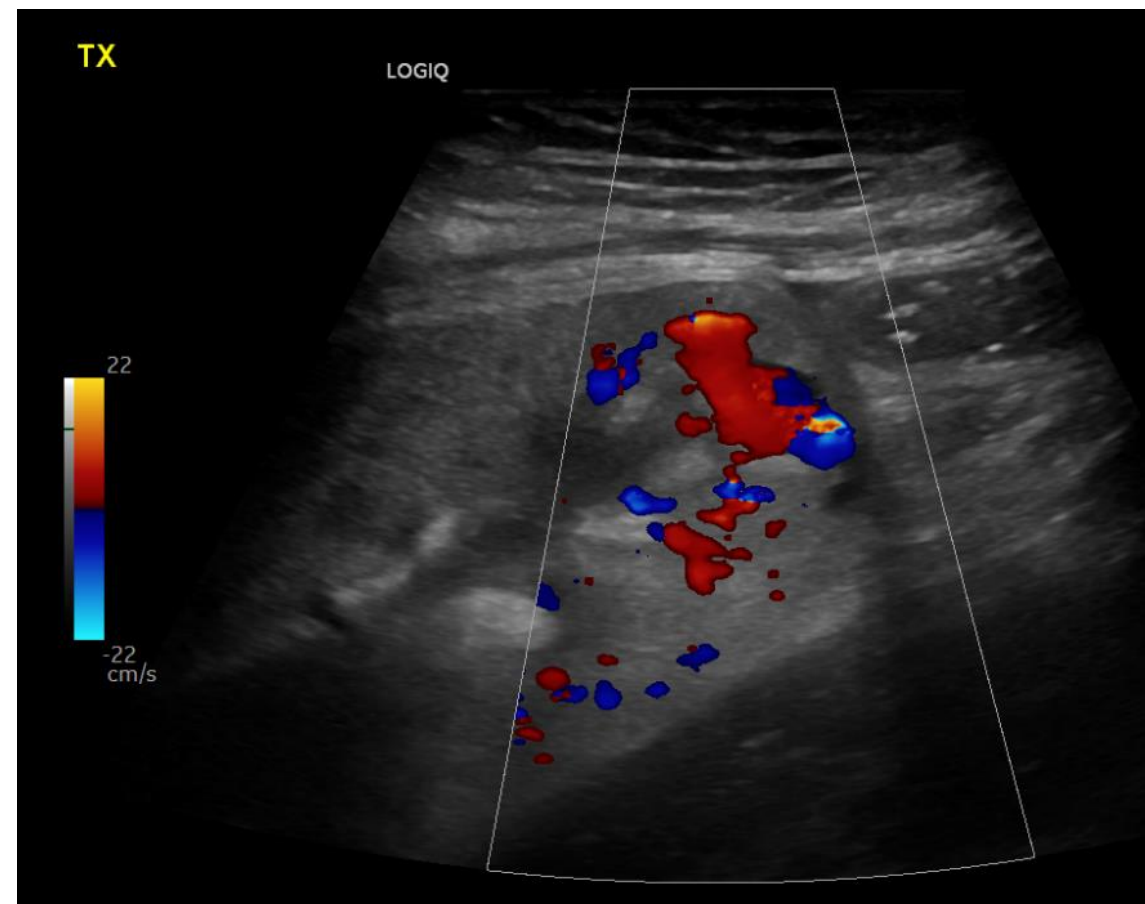
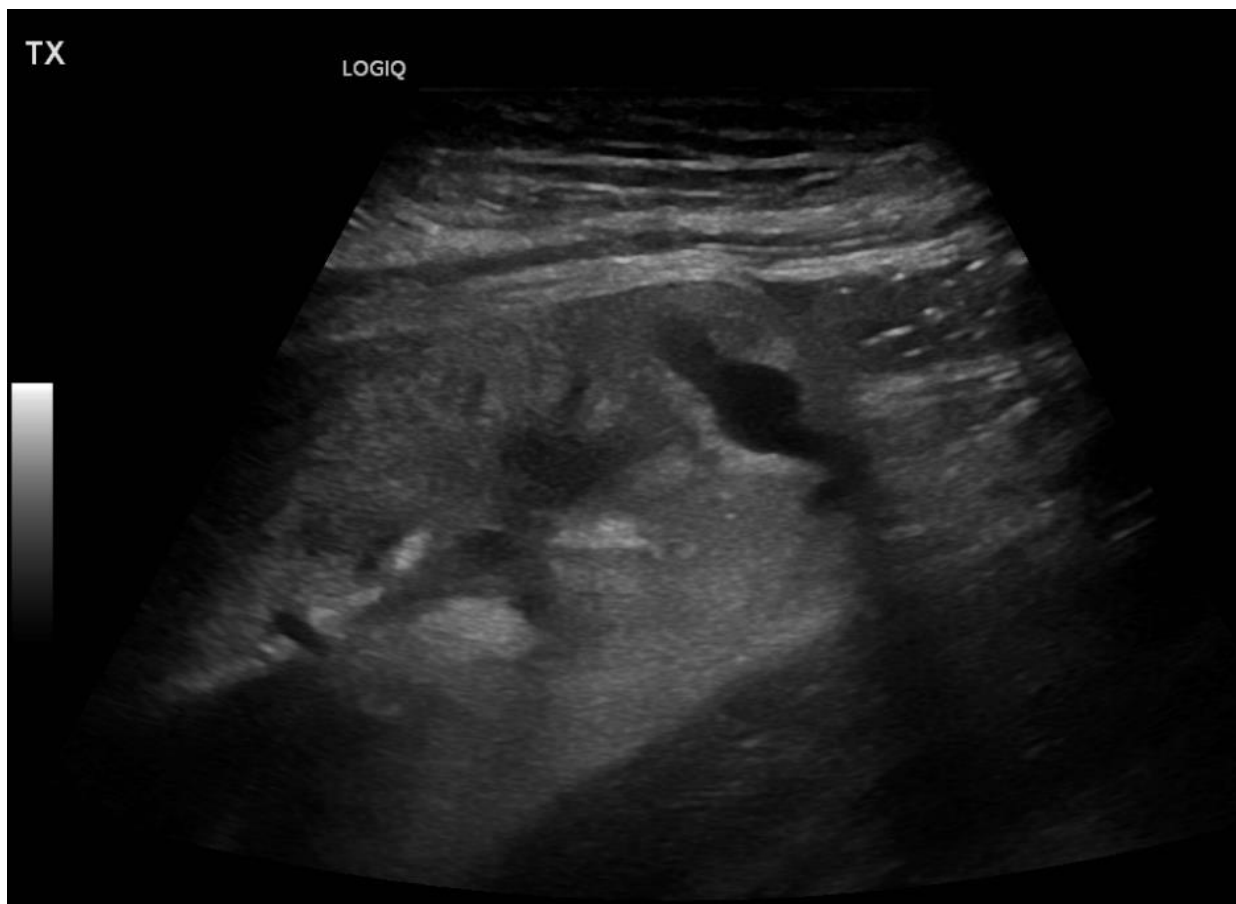
# Right groin lump post FA puncture

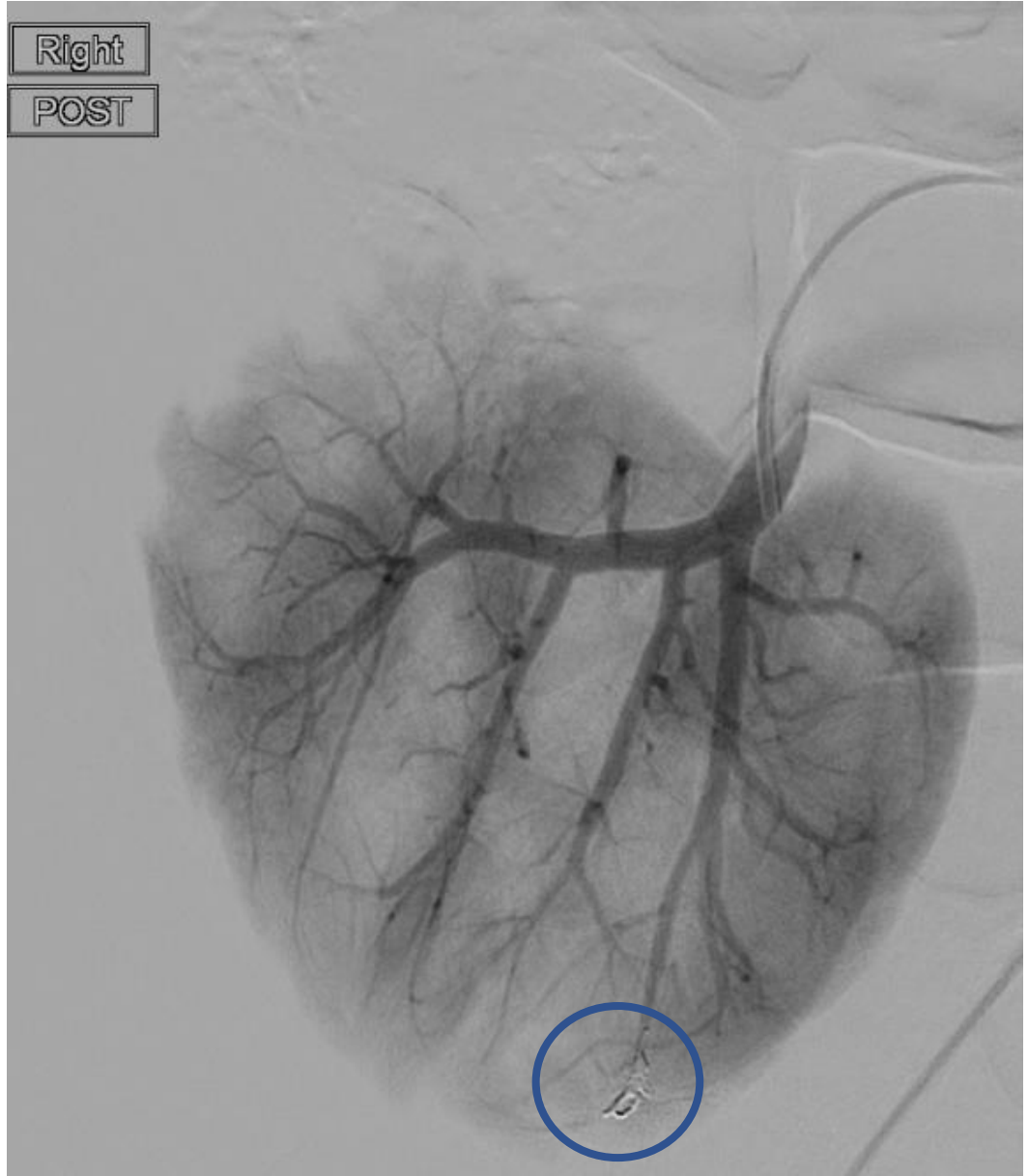




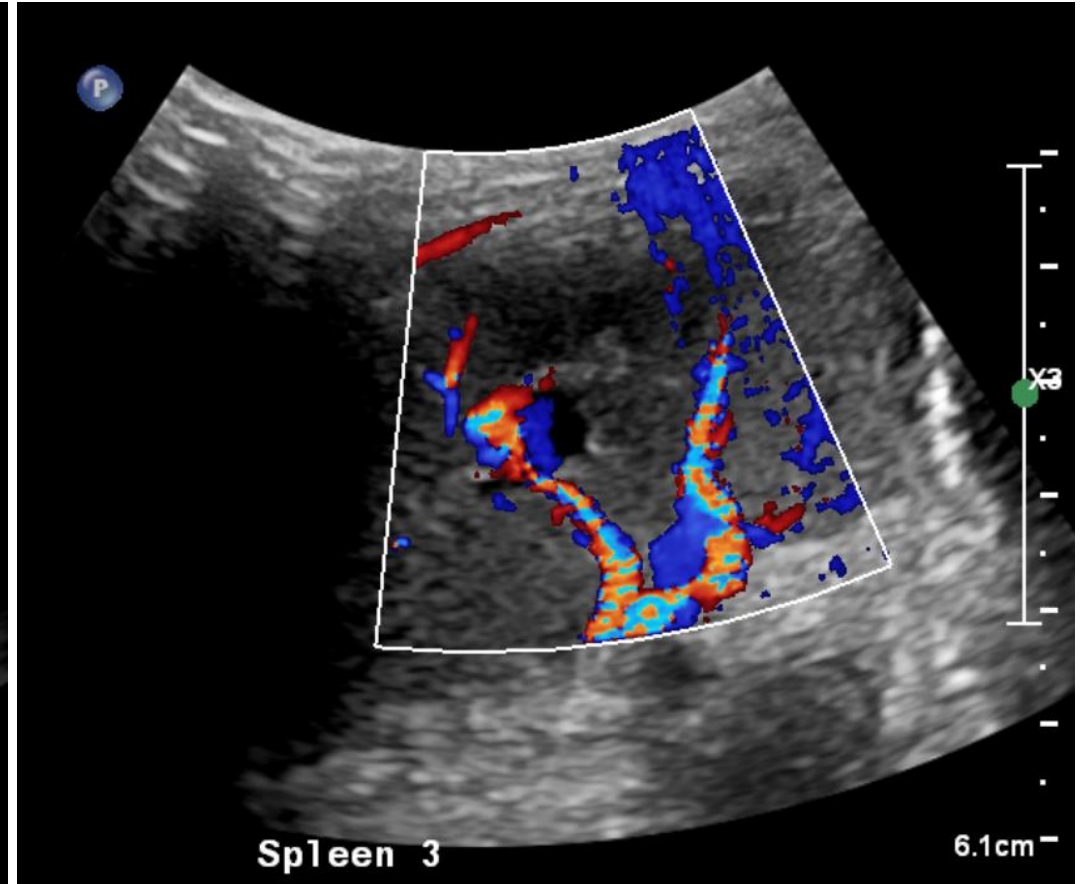
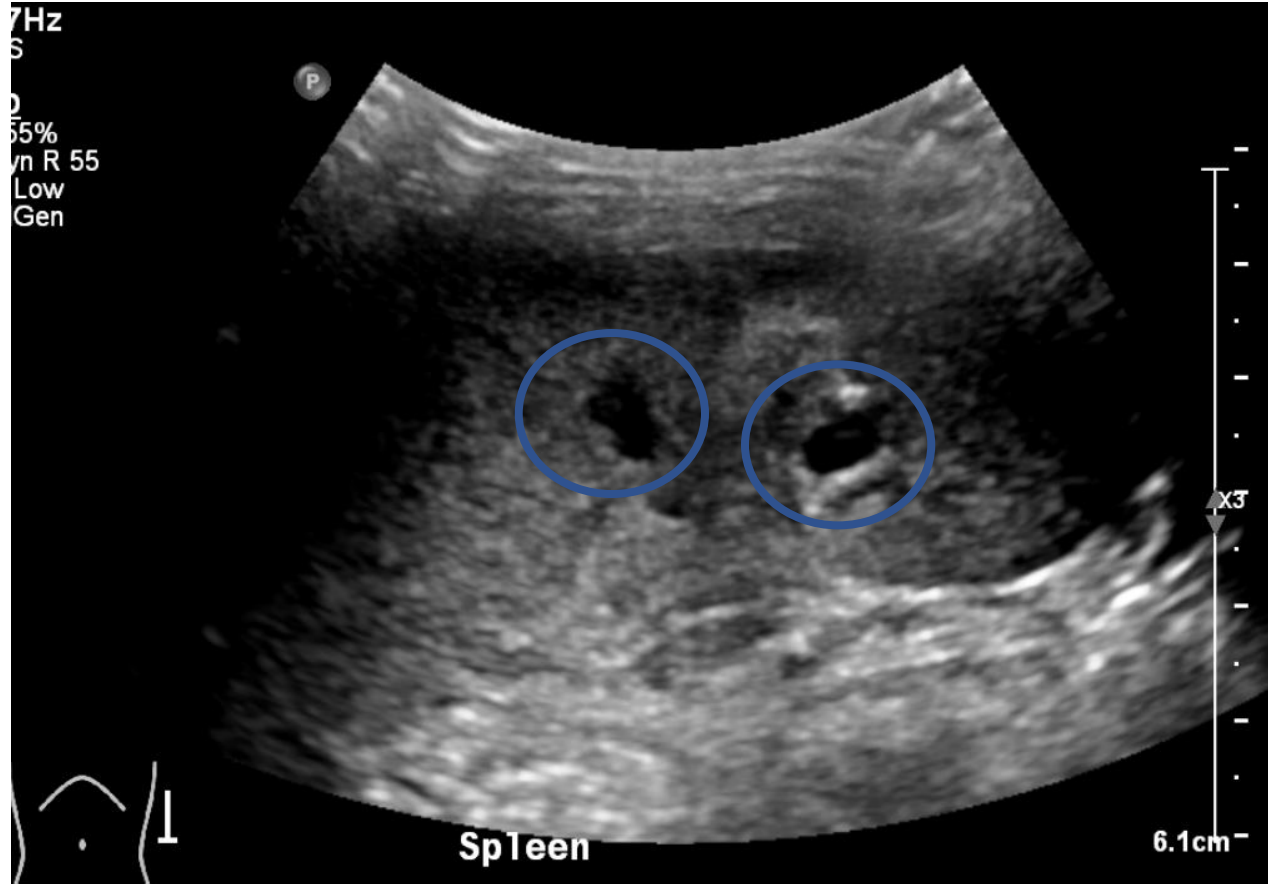


# PSA Post Renal Biopsy





# Splenic PSA Post Trauma





# Summary

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- Vascular ultrasound is challenging in children
- Small size and movement will preclude accurate assessment
  - Spectral doppler may not be possible
- Ensure 'cystic' areas are interrogated with colour doppler
- Clinical history is important

