The Lower Extremity Venous Ultrasound Exam

Clinical Approach to Vascular Ultrasound
June 4-5, 2021
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Technical Director, MGH Fireman Vascular Center

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Objectives

- Achieve proper patient and technologist positioning
- Identify deep and superficial veins of the lower extremity
- Analyze Doppler waveform characteristics of venous flow
- Distinguish acute vs. chronic thrombosis
- Recognize incidental findings

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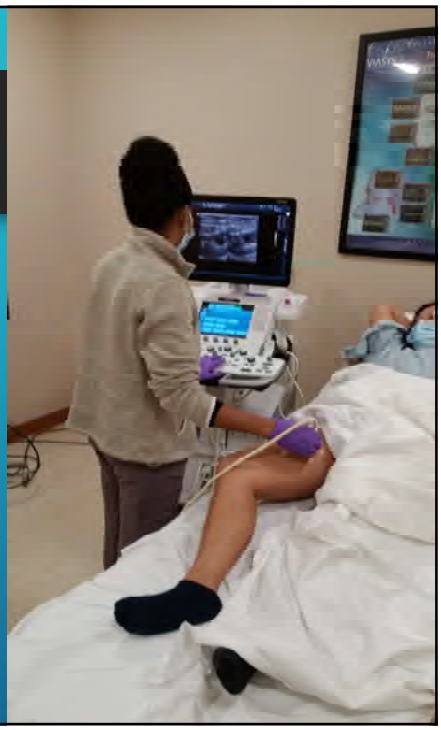
Patient Positioning

- Supine
- Exam table in reversed Trendelenburg 20-30 degrees (head elevated / feet down)
- Leg slightly externally rotated “Frog-leg style”

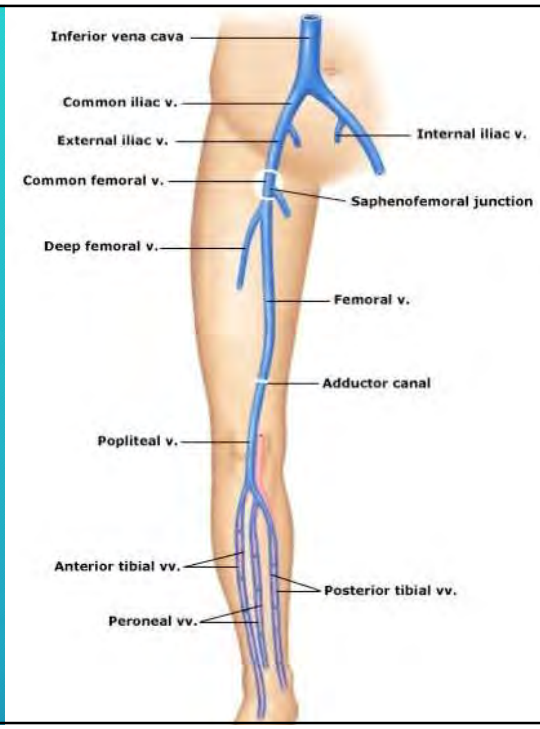


Technologist Positioning

- Imaging machine close to exam table
- Imaging machine monitor at eye-level
- Key-pad at comfortable height
- Limit abduction of scanning arm

Technologist Positioning

- Usually begin with a Linear 9mHz transducer
- Indicator on transducer always pointed to patient's right (even when scanning the left leg)



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Deep venous anatomy from proximal to distal

- Common Femoral Vein
- Great Saphenous Vein at the Saphenofemoral Junction
- Femoral Vein – Deep Femoral Vein Bifurcation
- Femoral Vein
- Popliteal vein
- Gastrocnemius Vein
- Tibial-Peroneal Trunks
- Posterior Tibial and Peroneal Veins
- Soleal Vein

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The Ultrasound Exam – What to look for…

- Orientation of vessels
- Size of the vein compared to adjacent artery
- Compression of the vein
- Spontaneous flow
- Respiratory variation (Phasicity)
- Augmentation

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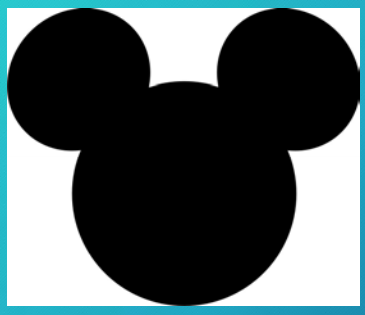
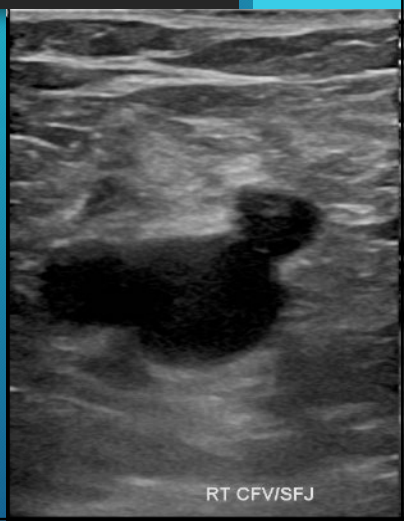
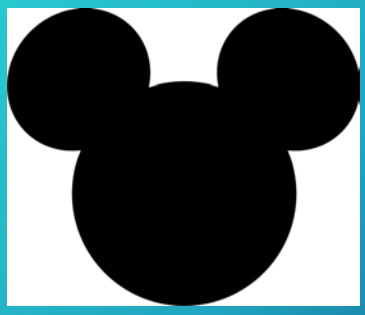
The Ultrasound Exam



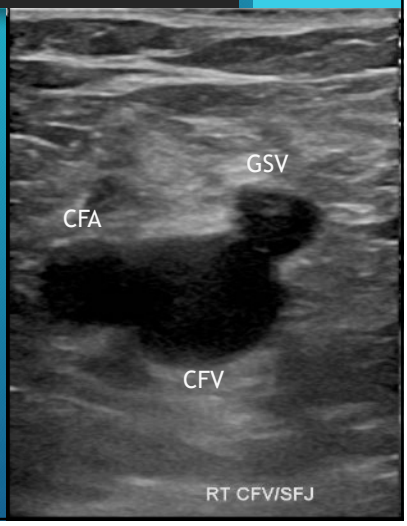
Saphenofemoral Junction



The Ultrasound Exam

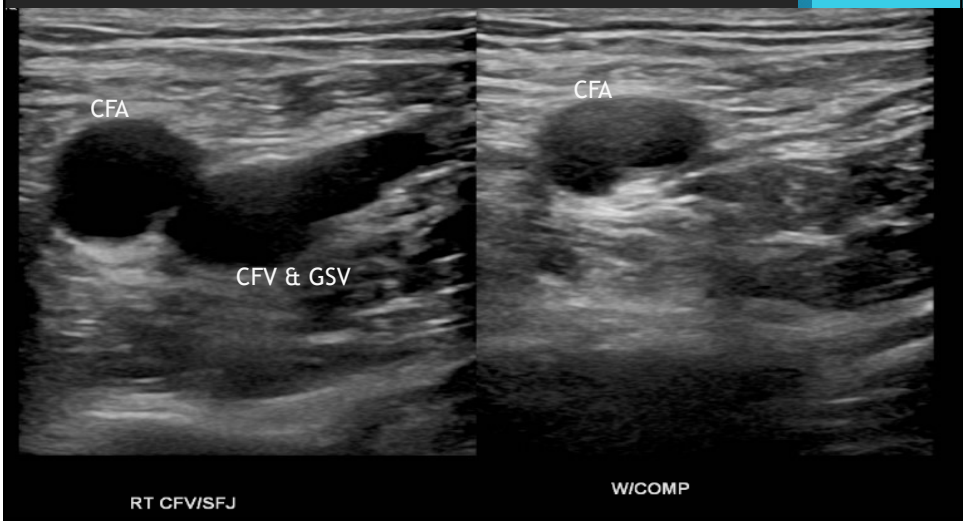


Saphenofemoral Junction

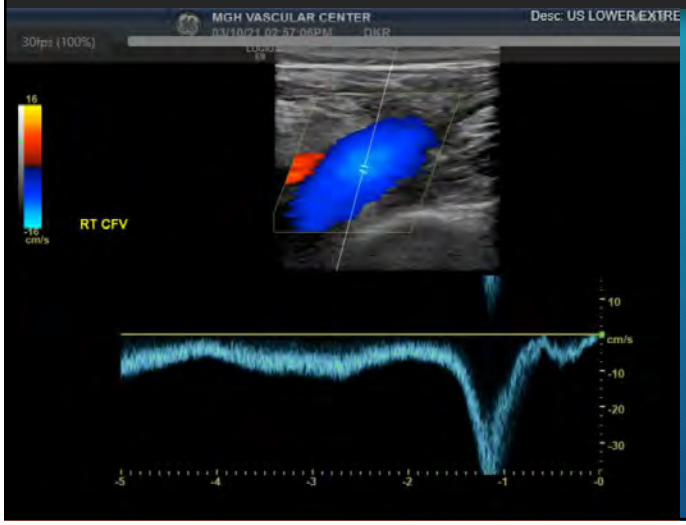


Saphenofemoral junction – Size & Compression

Saphenofemoral junction – Size & Compression



Color Doppler & Spectral Analysis



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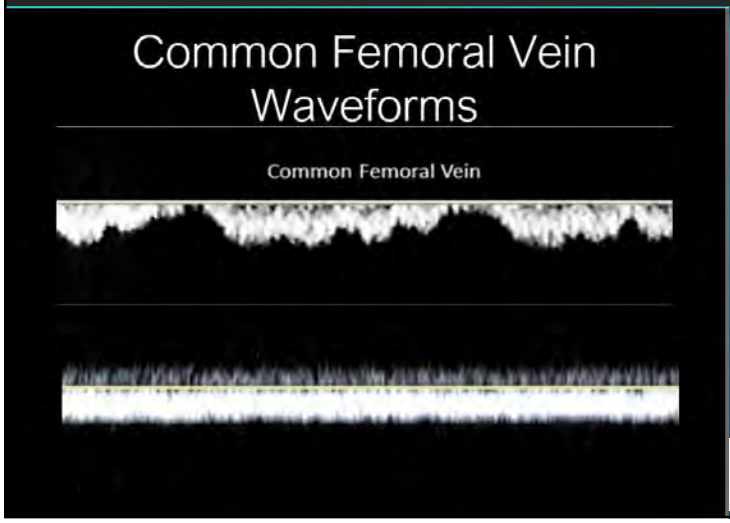
Saphenofemoral Junction – Doppler Analysis



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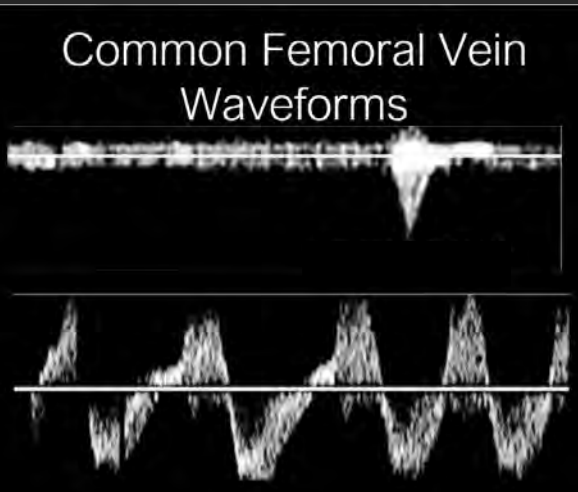
Saphenofemoral Junction – Doppler Analysis



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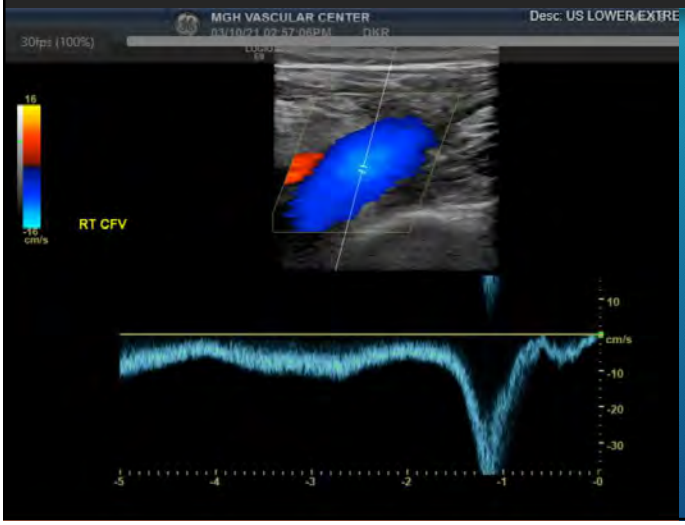
Color Doppler & Spectral Analysis



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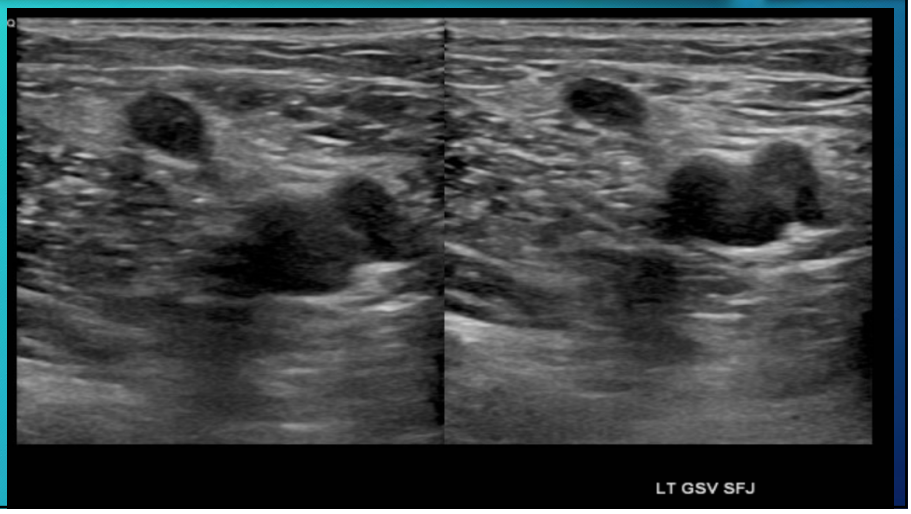
Saphenofemoral Junction – GSV thrombus extension into CFV



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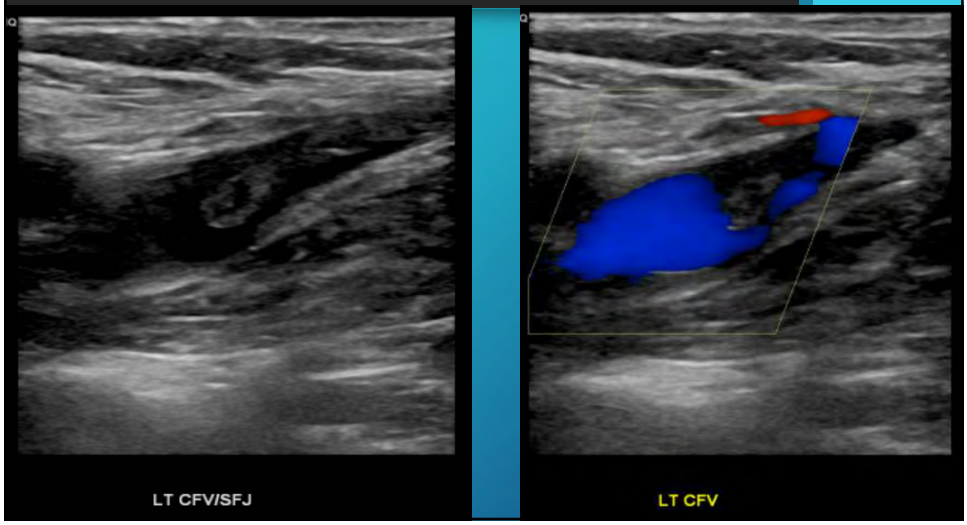
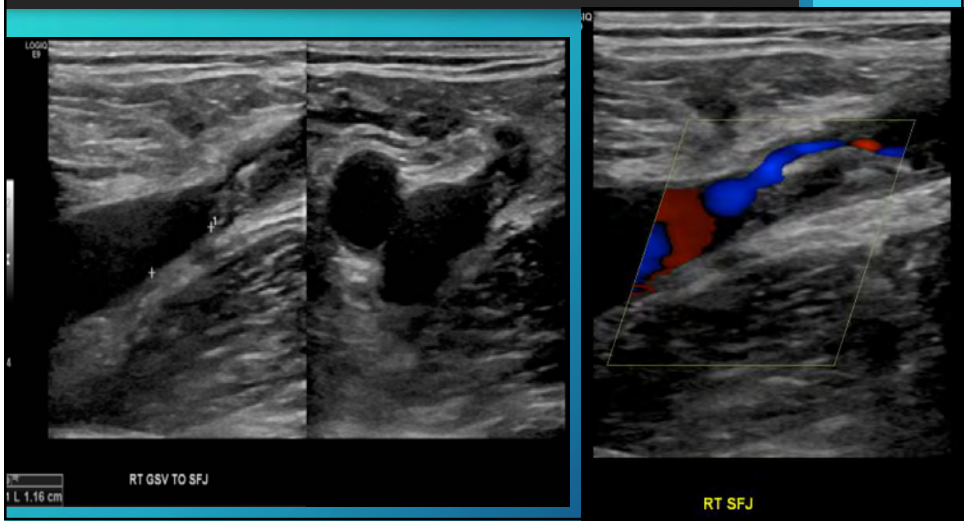
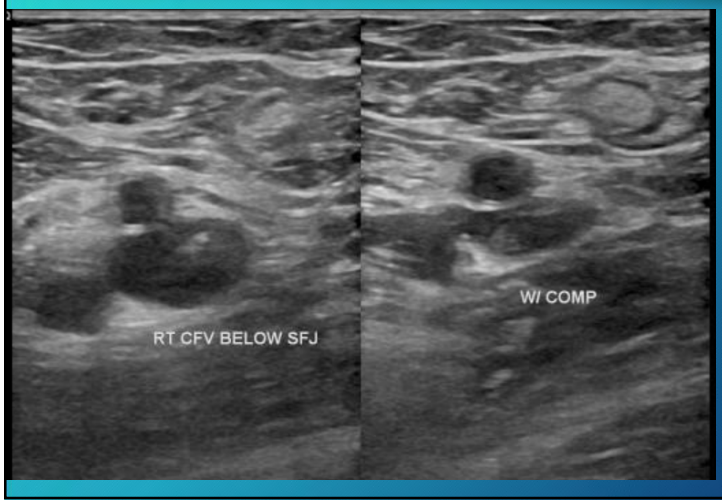


Saphenofemoral Junction – GSV thrombus



Common Femoral Vein - DVT



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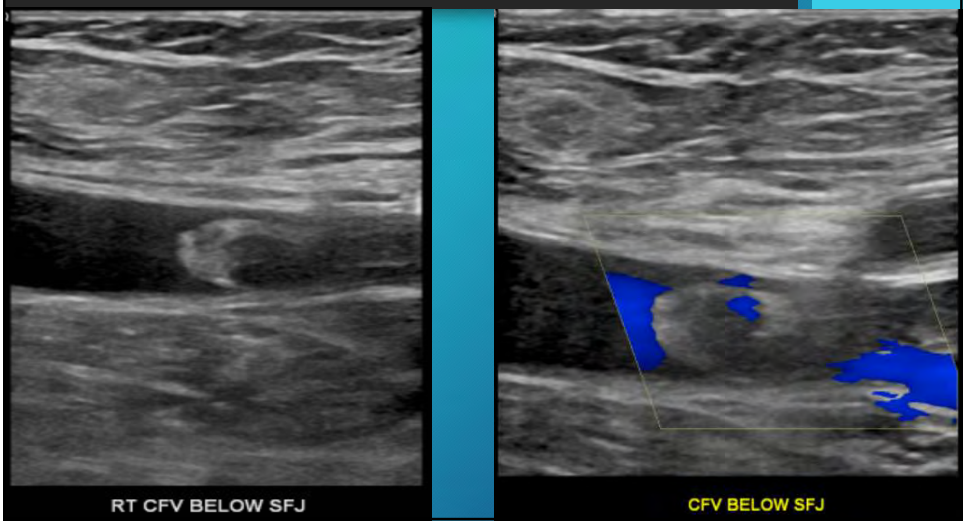

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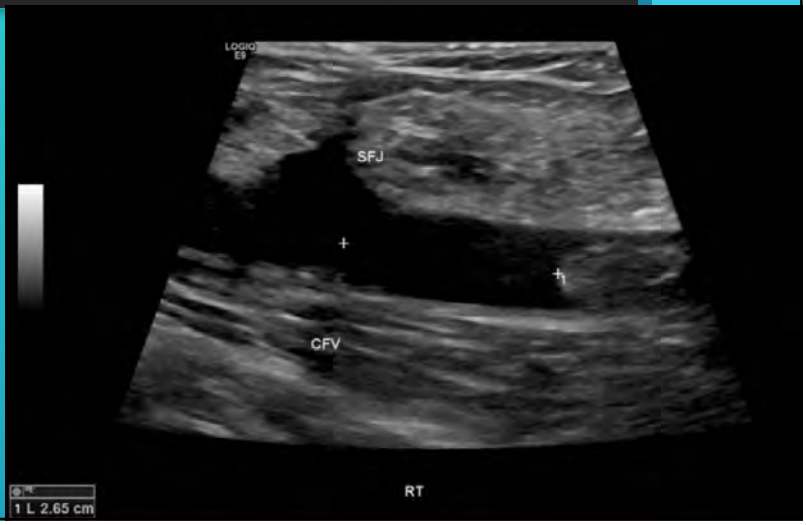

Saphenofemoral junction - Pseudoaneurysm

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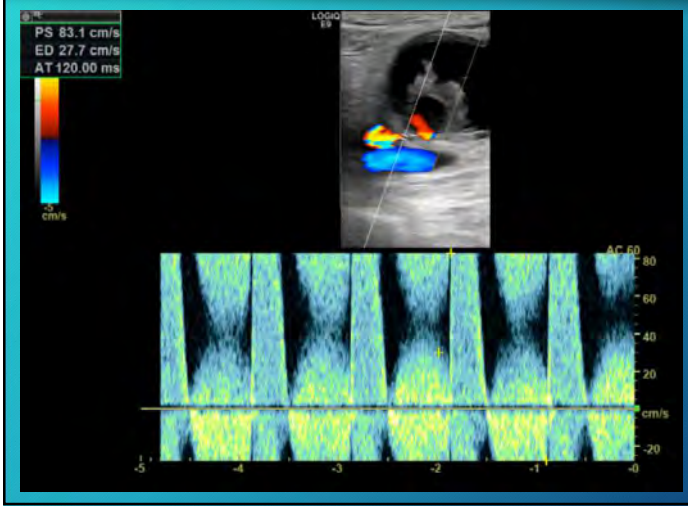
Sapenofemoral junction - Pseudoaneurysm



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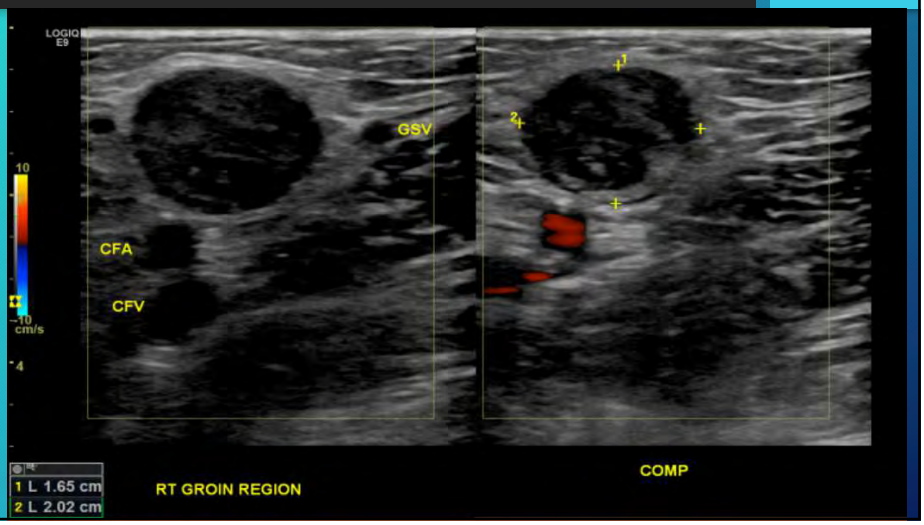
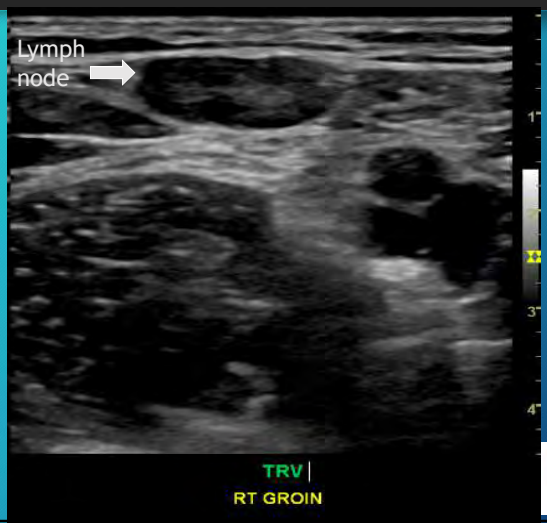
Saphenofemoral Junction – Mass



Saphenofemoral Junction – Lymph nodes



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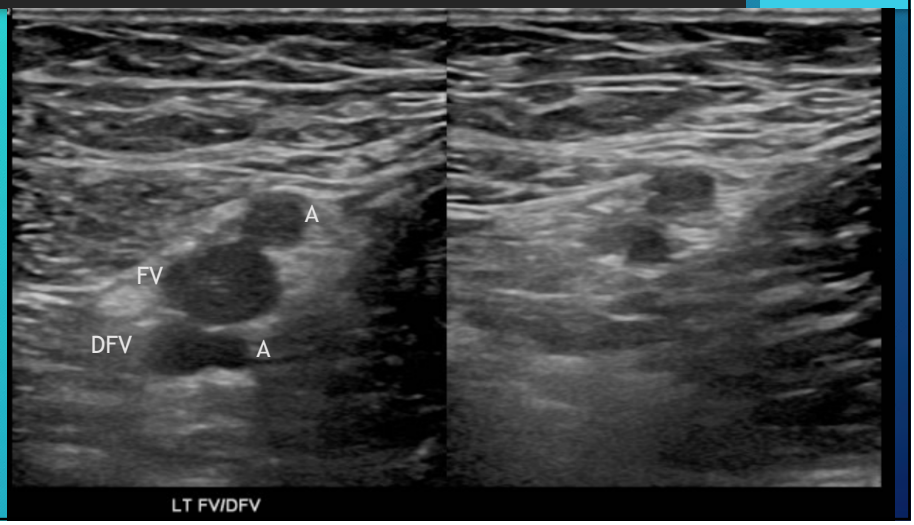
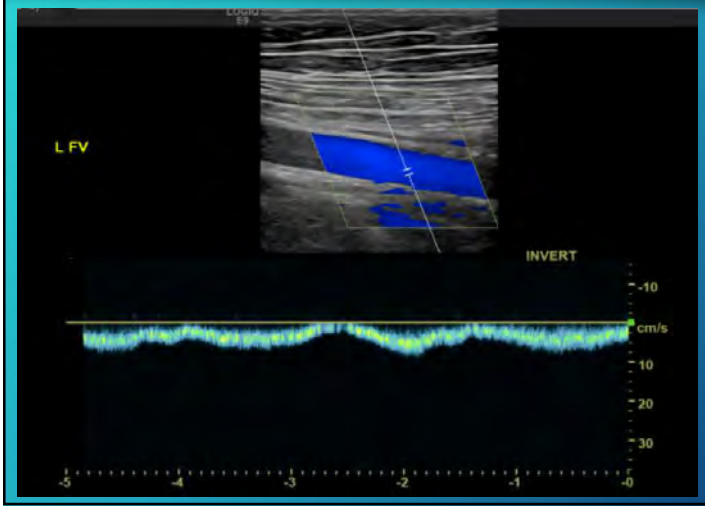
Femoral & Deep Femoral Vein Bifurcation



Femoral Vein - Spontaneous & Phasic



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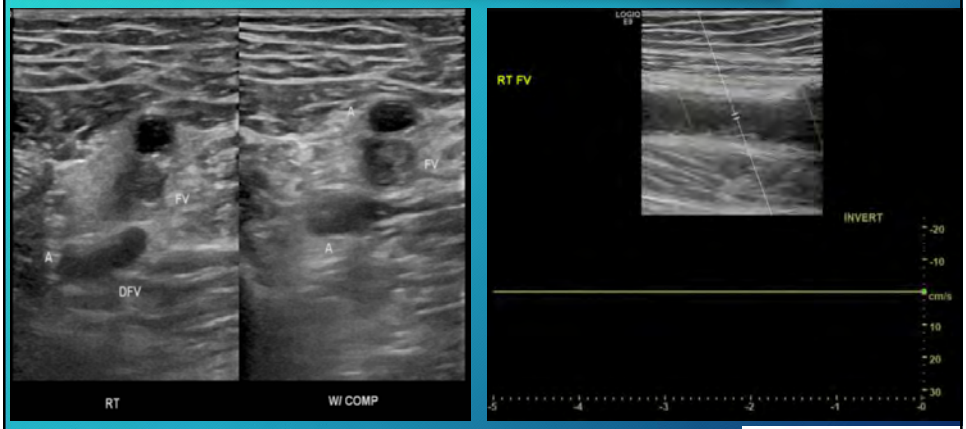
Femoral Vein – Acute DVT



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Femoral Vein – Acute DVT

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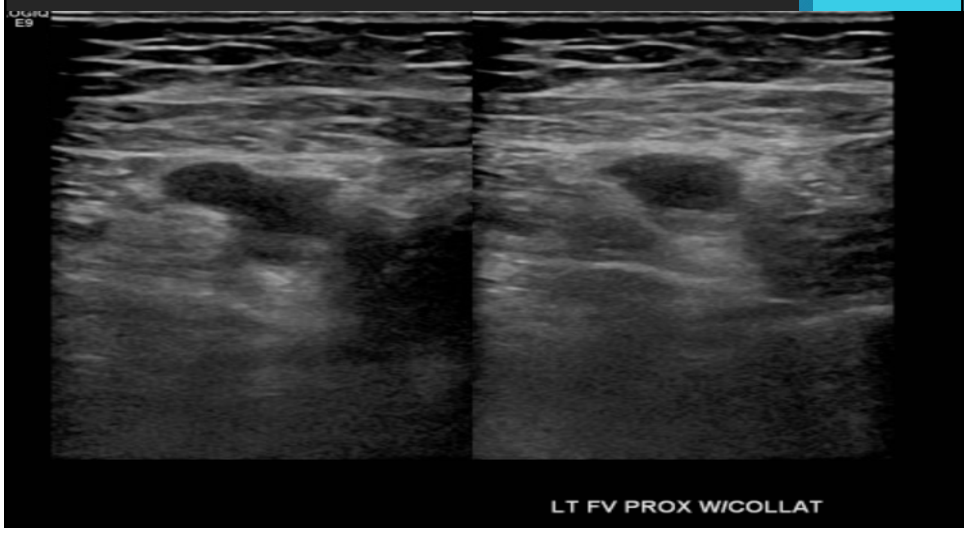
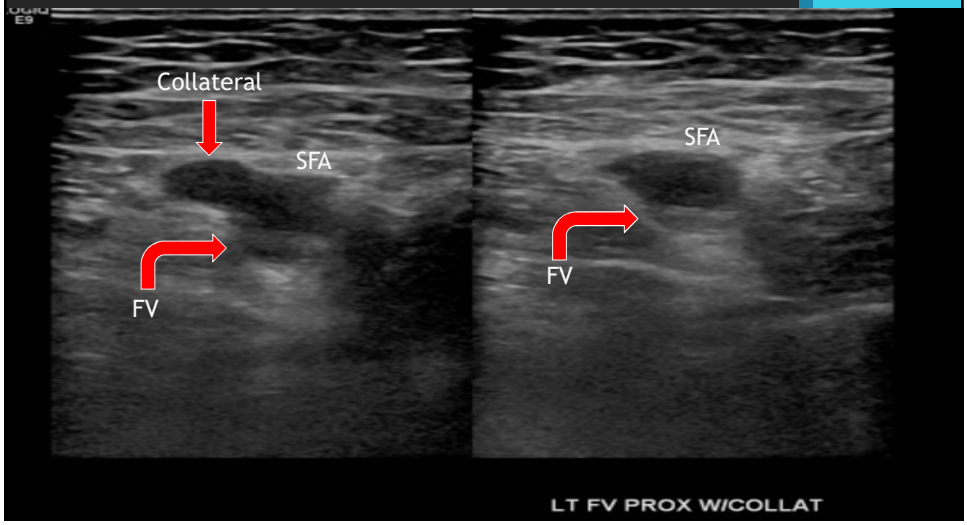
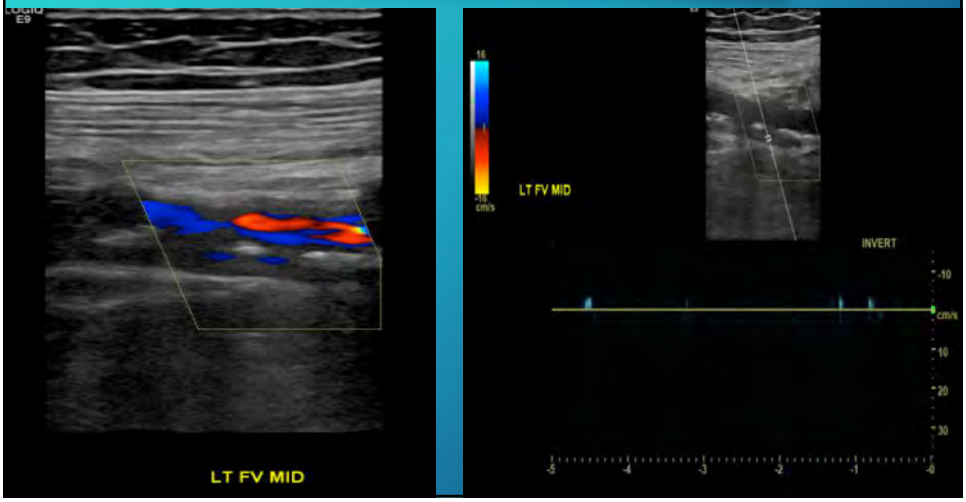
Femoral Vein – Chronic DVT



Femoral Vein – Chronic DVT



Femoral Vein – Chronic DVT



The Popliteal Fossa

What to look for…

- Orientation of the Popliteal Vein "Pop's on Top"
- Gastrocnemius and Small Saphenous Veins
- Acute vs. Chronic DVT
- Popliteal (Baker's) Cysts
- Venous Aneurysm
- Don't be fooled – Arterial aneurysm vs. DVT
- Don't be fooled – Slow flow vs. DVT

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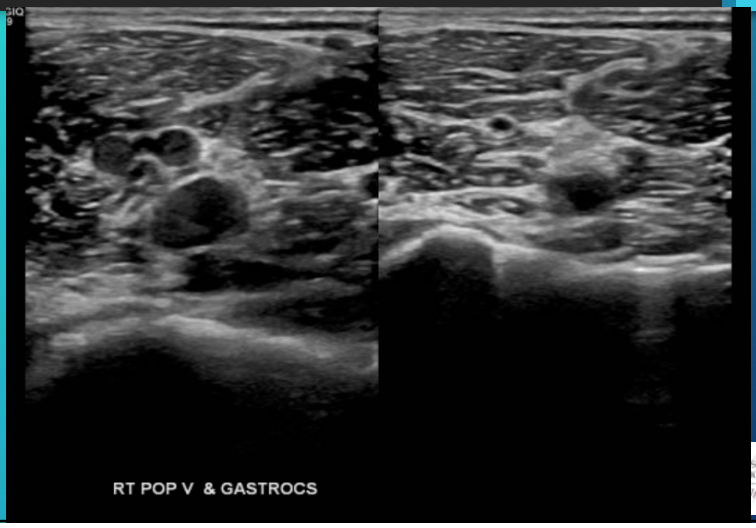
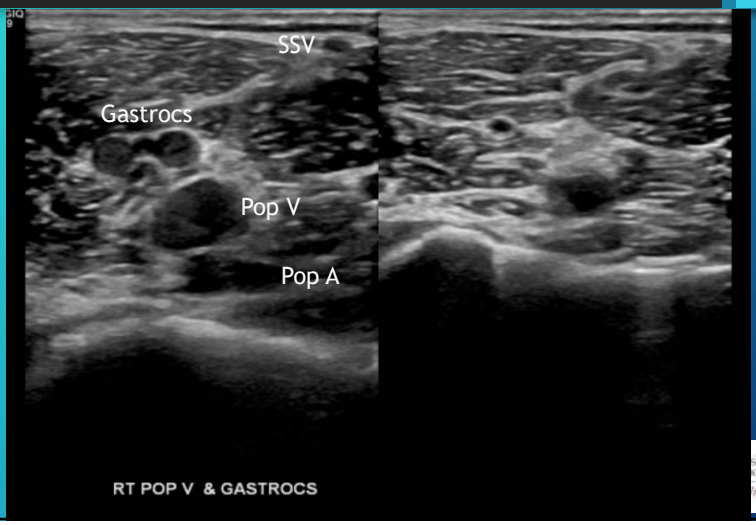
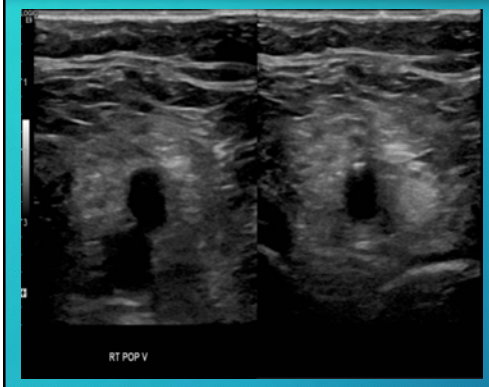
Popliteal, Gastrocnemius & Small Saphenous

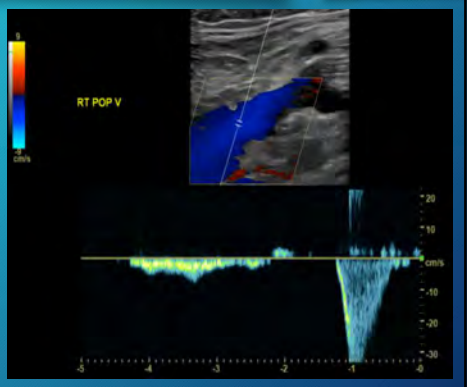


Popliteal, Gastrocnemius & Small Saphenous



Popliteal Vein – Normal "Pop on Top"





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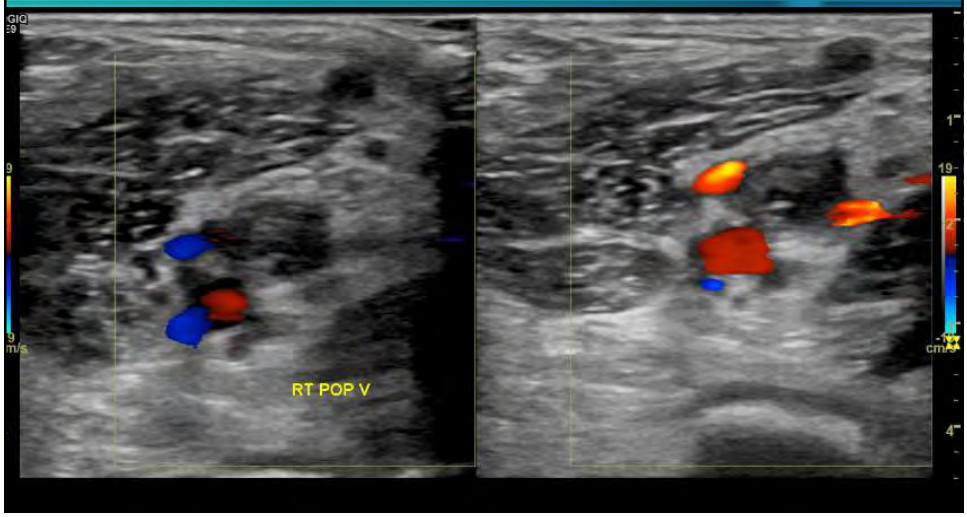
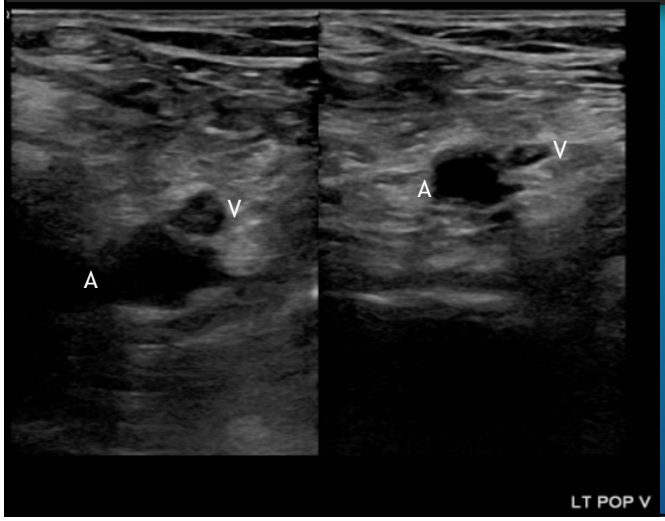
Popliteal Vein – Acute DVT



Popliteal Vein – Chronic DVT



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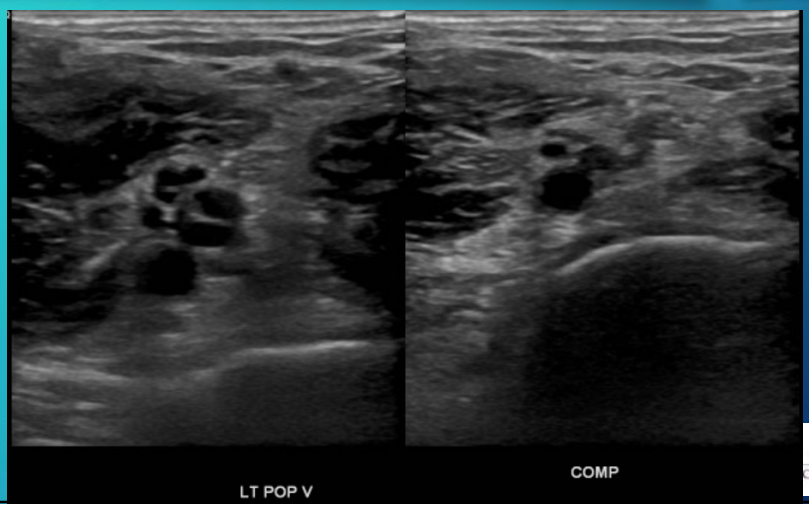
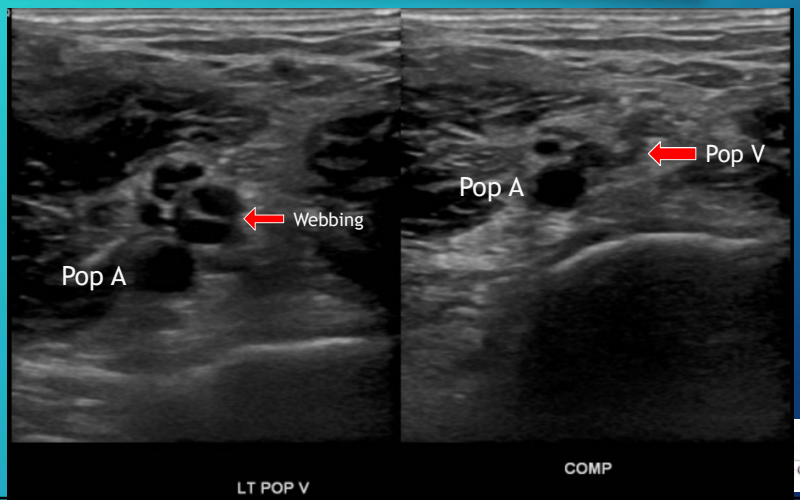
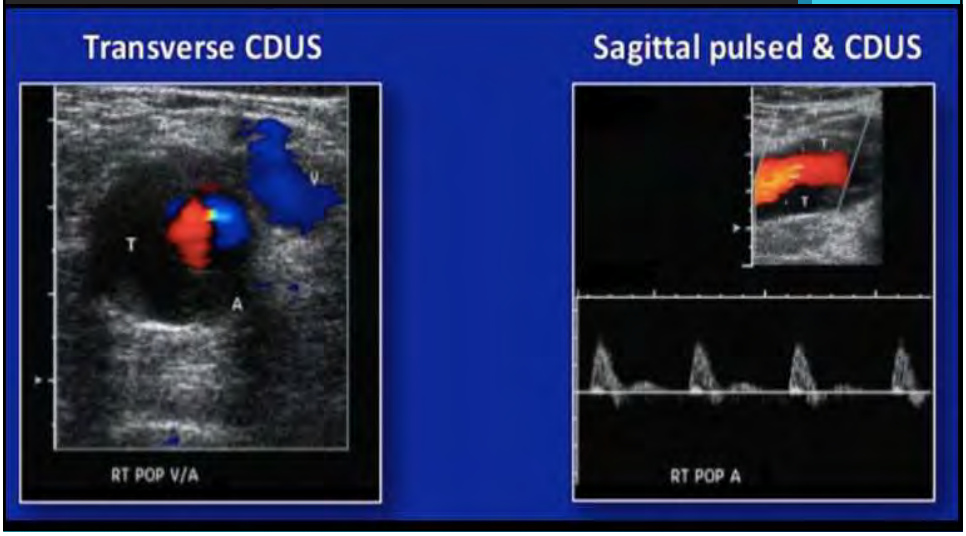
Popliteal Vein – Chronic "Webbing"



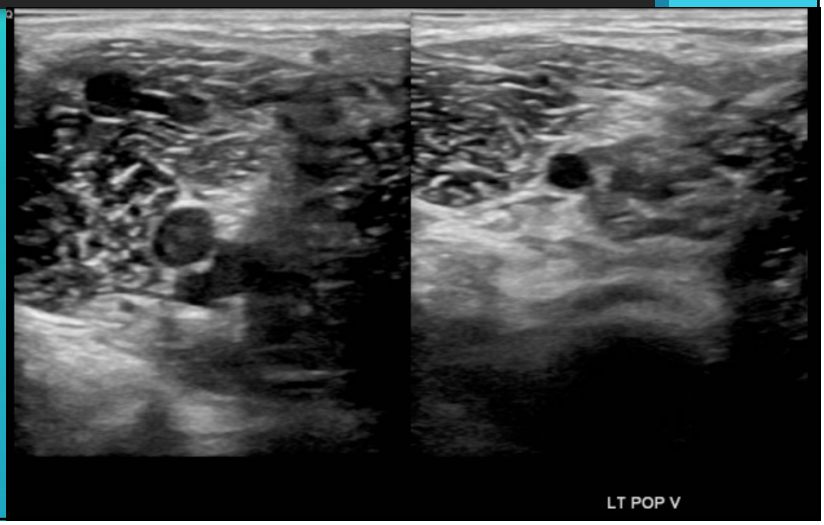
Popliteal Vein – Chronic "Webbing"



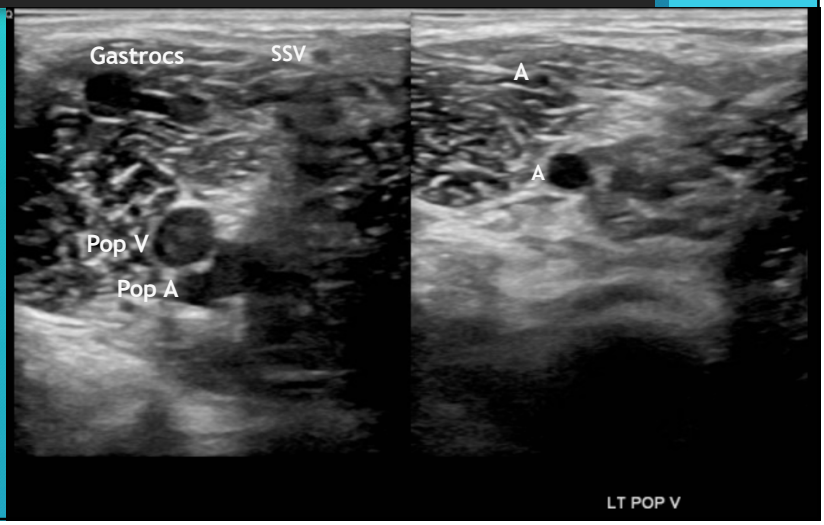
Popliteal Vein – Don't be fooled! Arterial Aneurysm



Popliteal Vein – Don't be fooled!
Normal

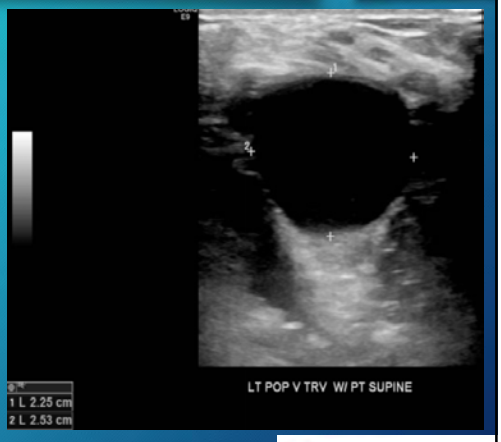


Popliteal Vein – Don't be fooled!
Normal



Popliteal Fossa – Popliteal (Baker's) Cyst

Popliteal Vein – Vein Aneurysm



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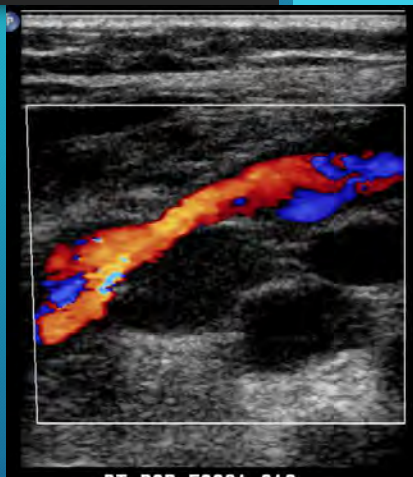
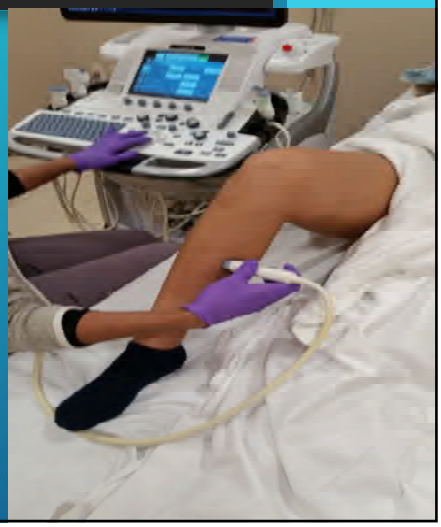
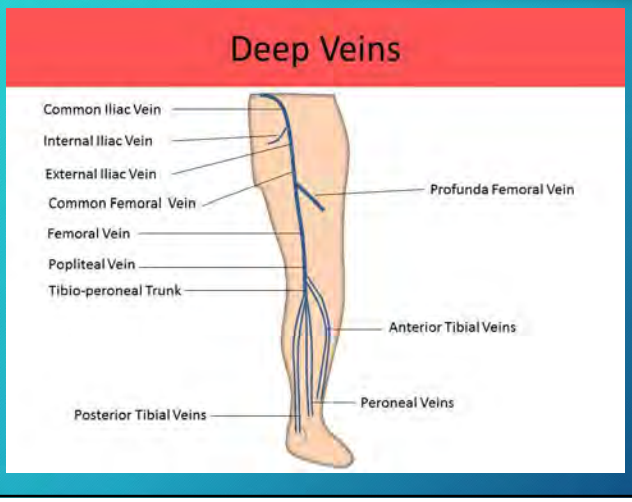
Popliteal Fossa – Adventitial Cystic Disease



Calf Veins – Patient Positioning



Calf Veins – Pairs



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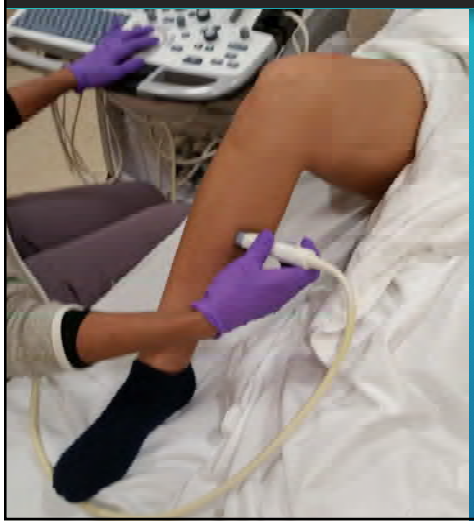
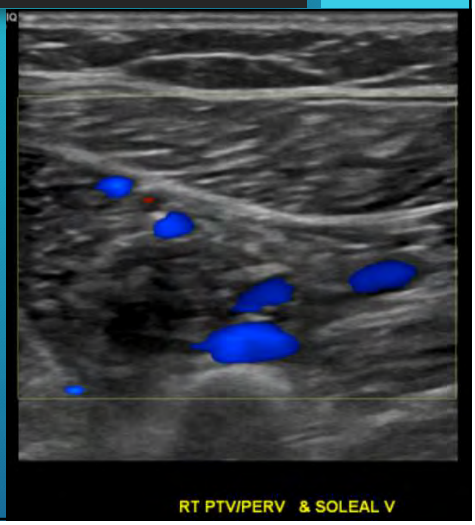
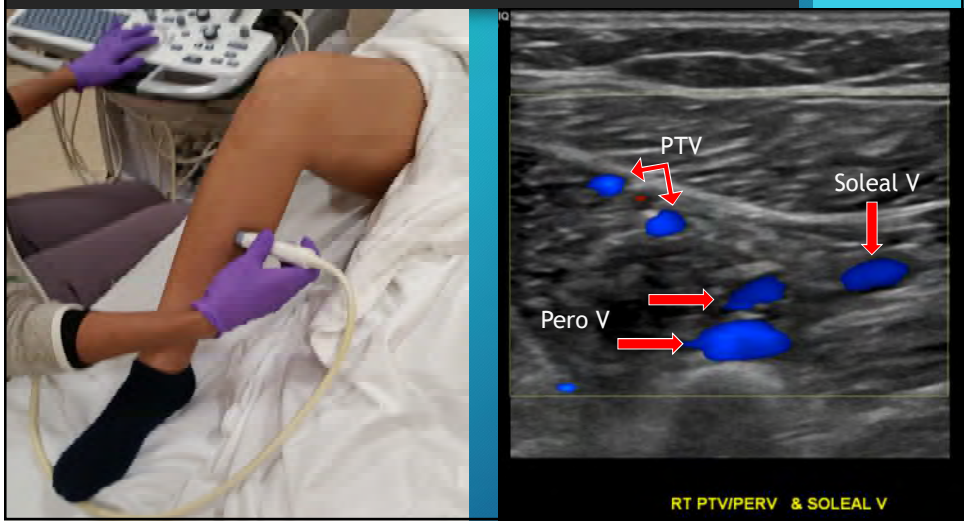
Calf Vein Imaging

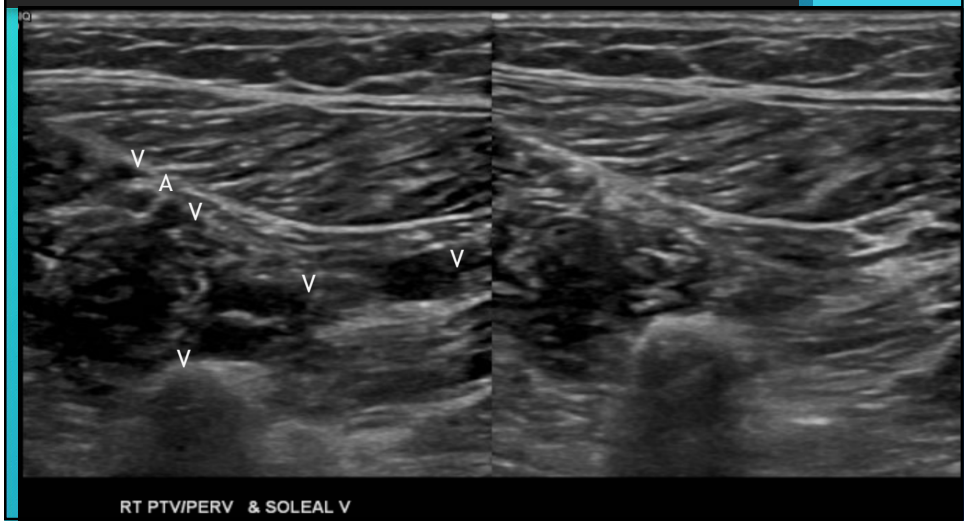




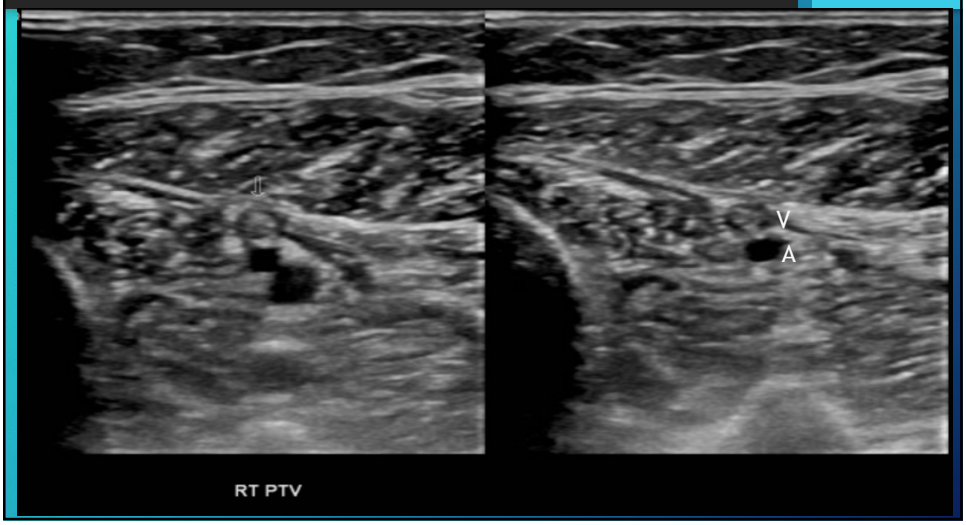
Calf Vein Imaging



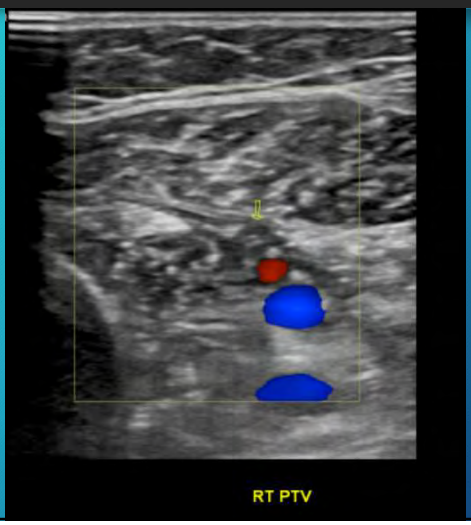
Calf Veins



Calf Veins – Posterior Tibial Veins with DVT

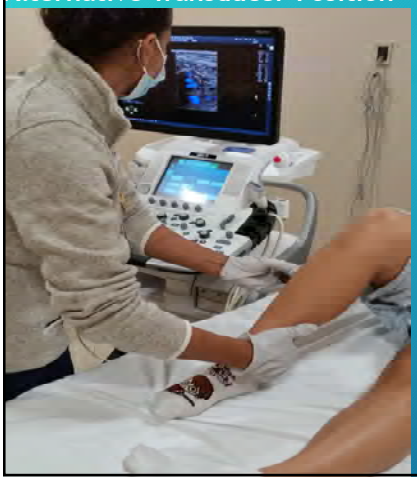


Calf Veins – Posterior Tibial Vein with DVT

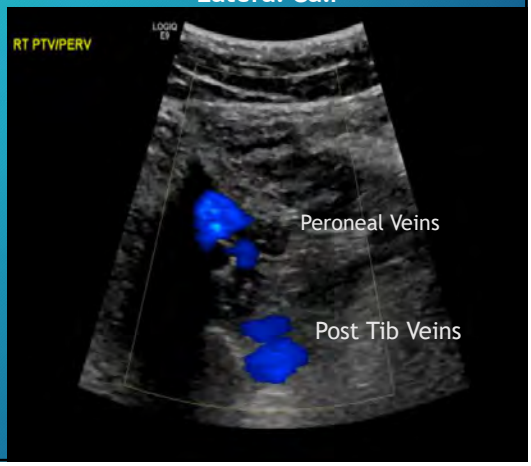


Calf Veins – From a lateral approach

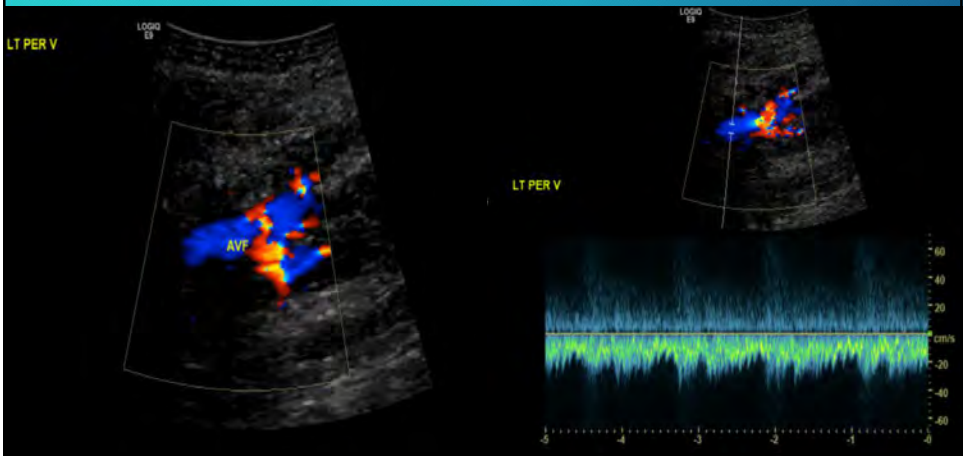
Alternative Transducer Position



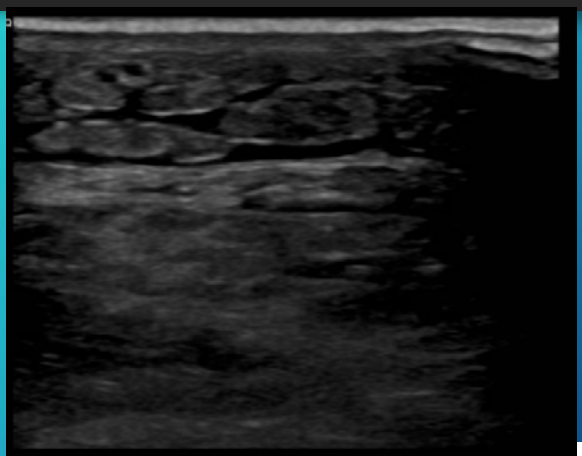
Lateral Calf



Calf Veins – Arteriovenous Fistula



Calf Edema



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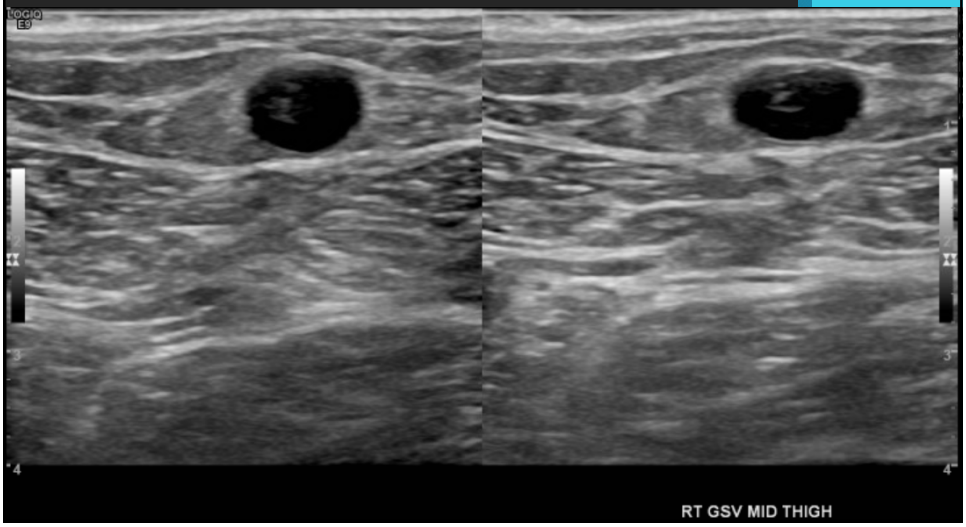
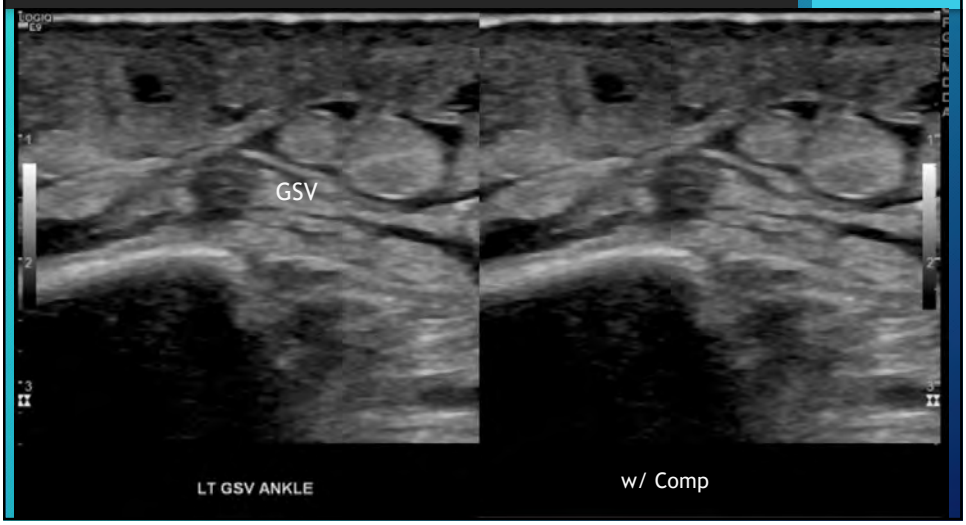
Superficial Phlebitis - GSV



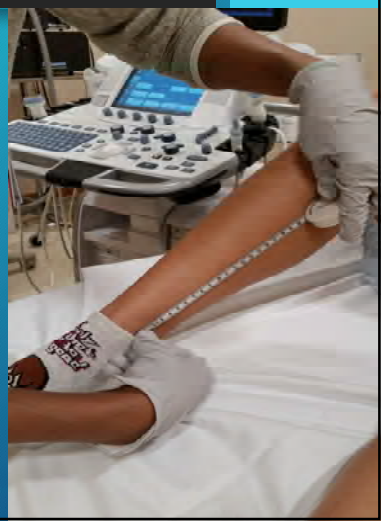
Superficial Phlebitis & Calf Edema



Helpful Hints…

Measure for progression - proximal extent of thrombus

- Use a landmark…any landmark (SFJ, groin crease, knee joint, popliteal vein, SPJ, medial malleolus, lateral malleolus)
- Use calipers on the imaging machine
- Use a pocket measuring tape
- Use the head of the transducer (usually about 4cm)



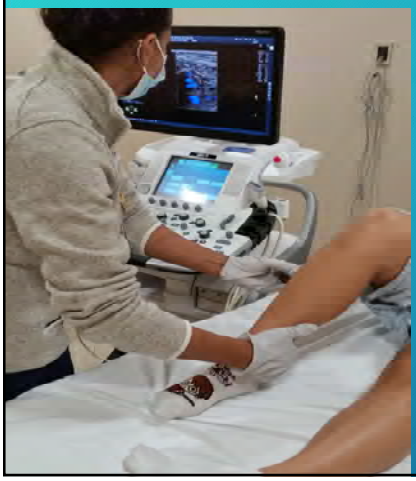
Helpful Hints…

Alternative transducer

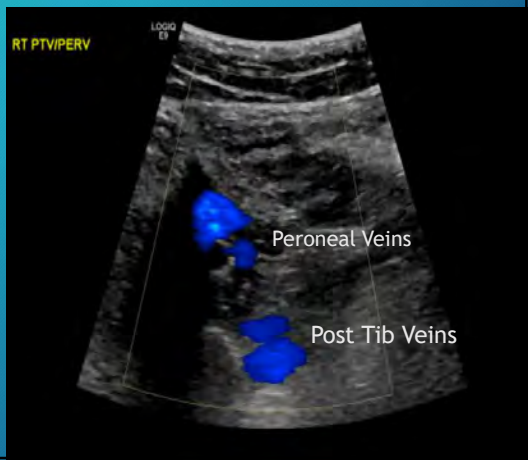
Curved linear transducer for large legs or edematous leg

Helpful Hints…

Alternative Transducer Position



Lateral Calf



Helpful Hints

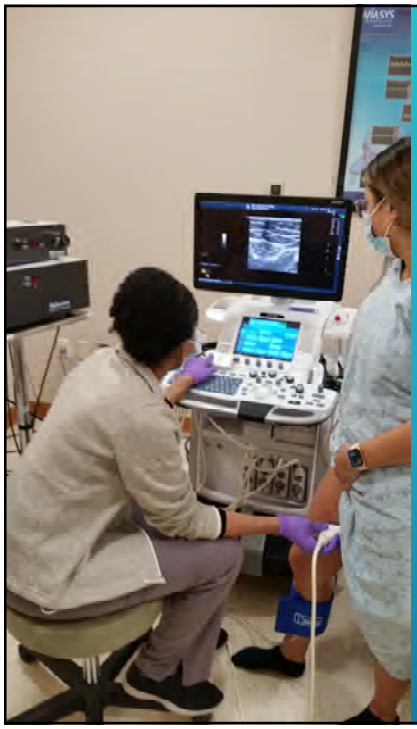
Scanning calf veins is difficult!

Ask for help when needed

You can't call what you can't see

Venous Insufficiency (Reflux) Testing

- Complete assessment for DVT prior to reflux testing
- Patient positioning
- Technologist positioning
- Additional equipment (compression/release device or second technologist with hand-held inflator & cuff)



Venous Reflux Testing Patient & Technologist Positioning

Massachusetts General Hospital
Fireman Vascular Center

Venous Reflux Exam Anatomy Proximal to Distal

- Common Femoral Vein
- Saphenofemoral Junction
- Great Saphenous Vein (GSV) proximal thigh
- Anterior Accessory Saphenous Vein (AASV) if seen
- Femoral Vein
- GSV mid thigh
- GSV distal thigh
- GSV knee level
- Popliteal Vein
- Small Saphenous Vein (SSV) at SPJ

Massachusetts General Hospital
Fireman Vascular Center

Venous Reflux Exam – What to look for...

- Reflux Duration Times (Valve Closure Times)
- Diameter and Depth of the GSV, AASV and SSV
- Branch Tributaries (including reflux times, diameter, depth)
- Superficial Phlebitis
- Incompetent Perforators
- Tortuosity of the vessels
- Duplicated or “bifid” superficial systems

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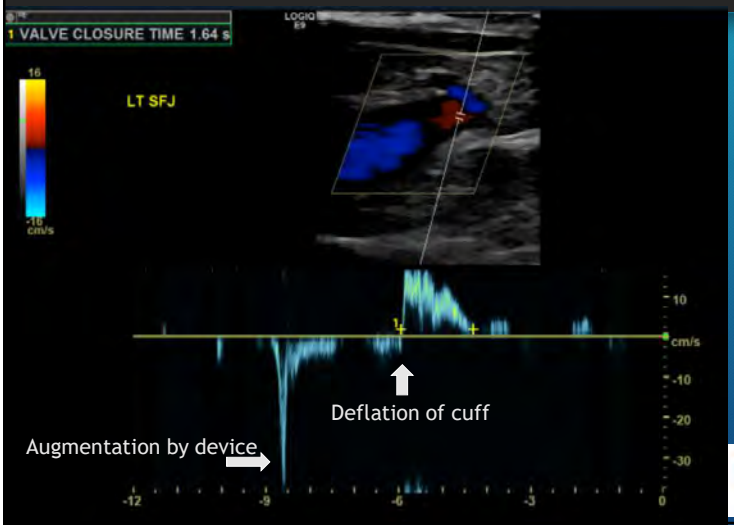
Venous Reflux Exam – Reflux Duration Times



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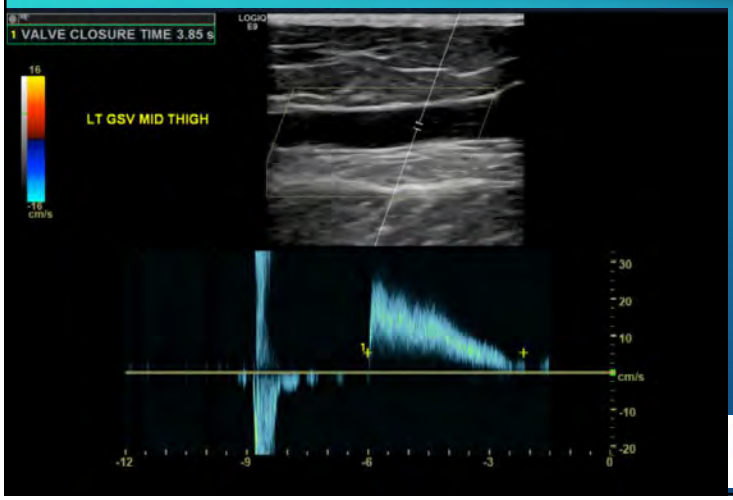
Venous Reflux Exam – Reflux Duration Times



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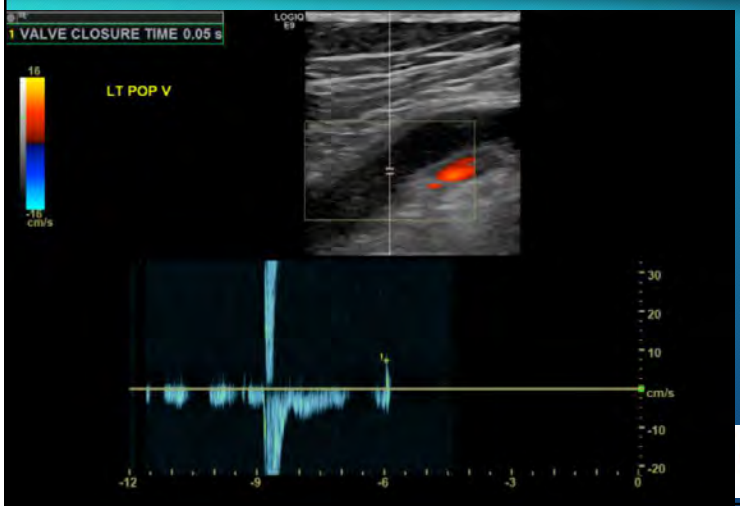
Venous Reflux Exam – Reflux Duration Times



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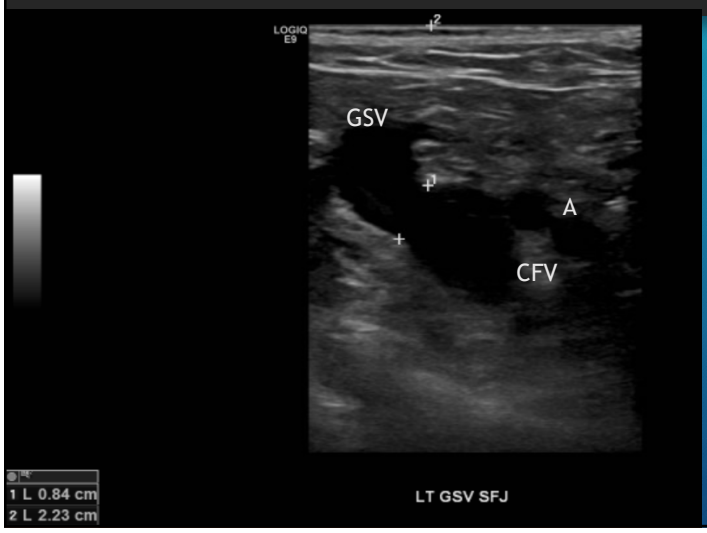
Venous Reflux Exam – Diameter & Depth



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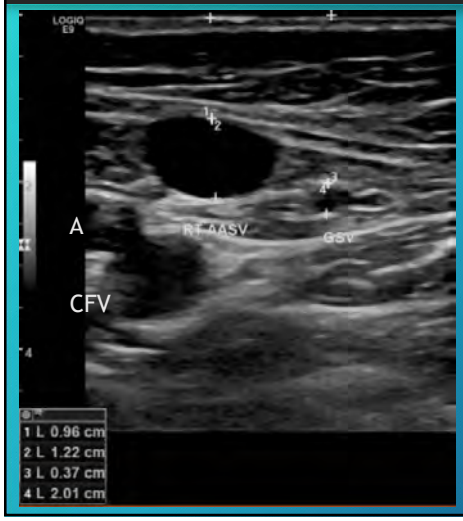
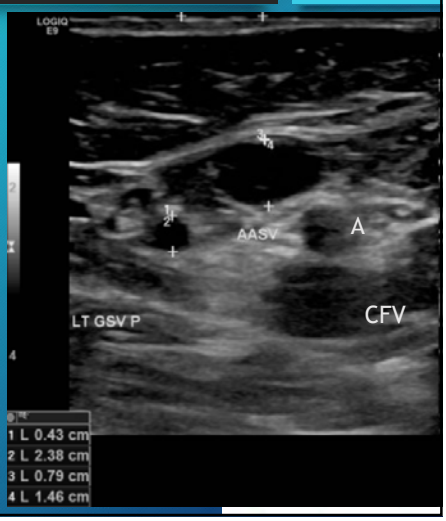
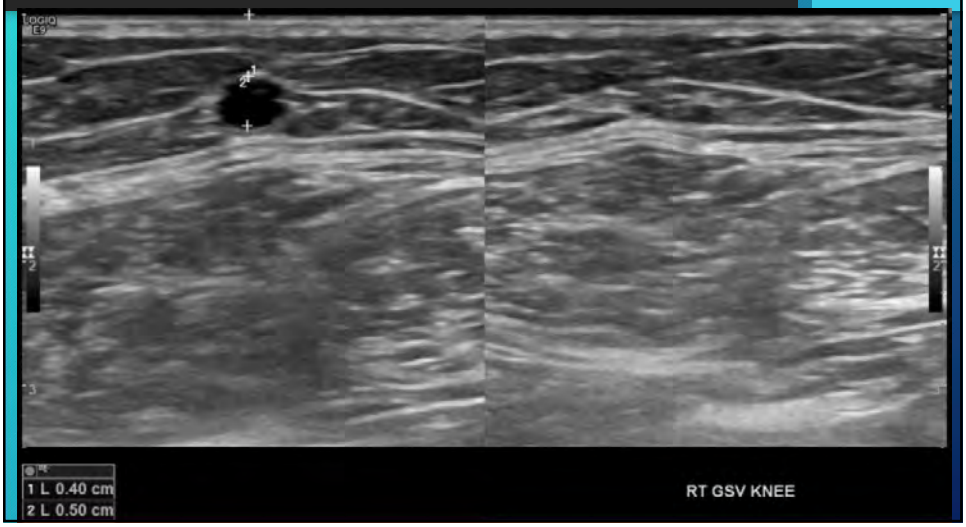
Venous Reflux Exam – Diameter & Depth

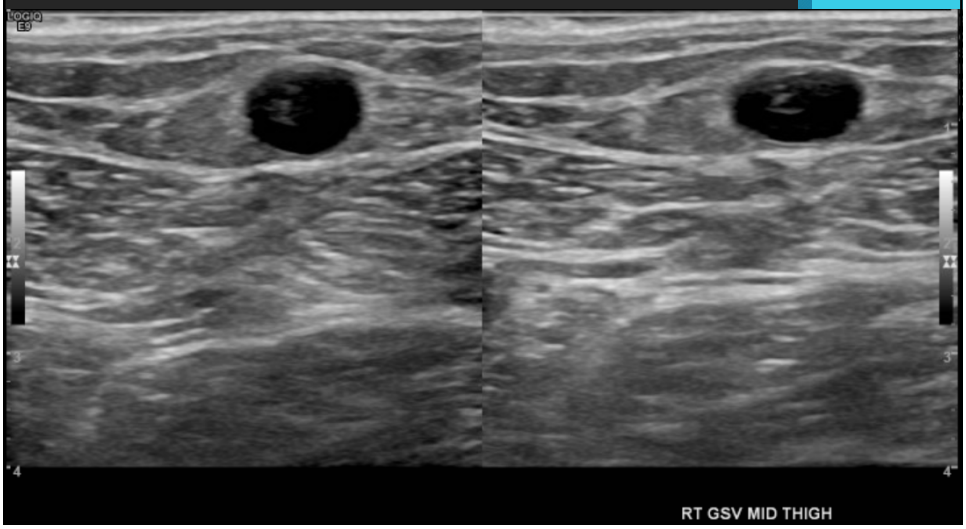




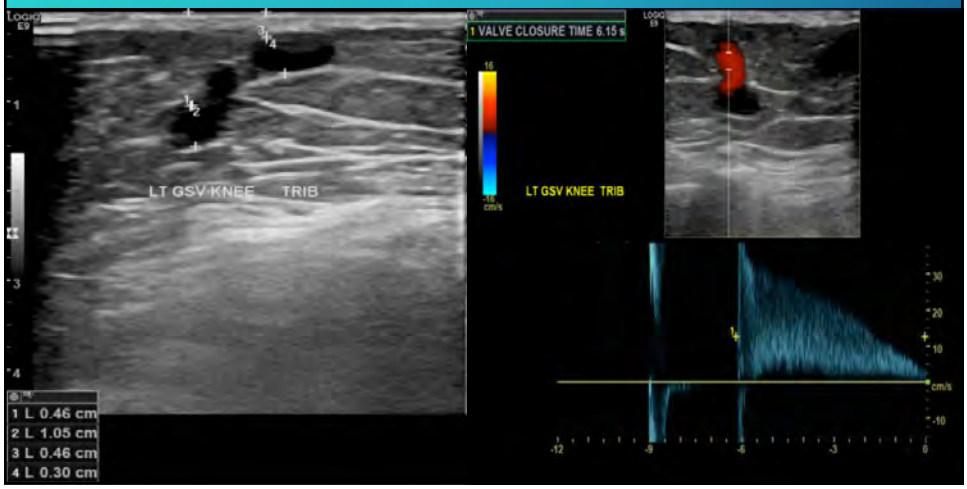
Venous Reflux Exam
Diameter Depth Phlebitis



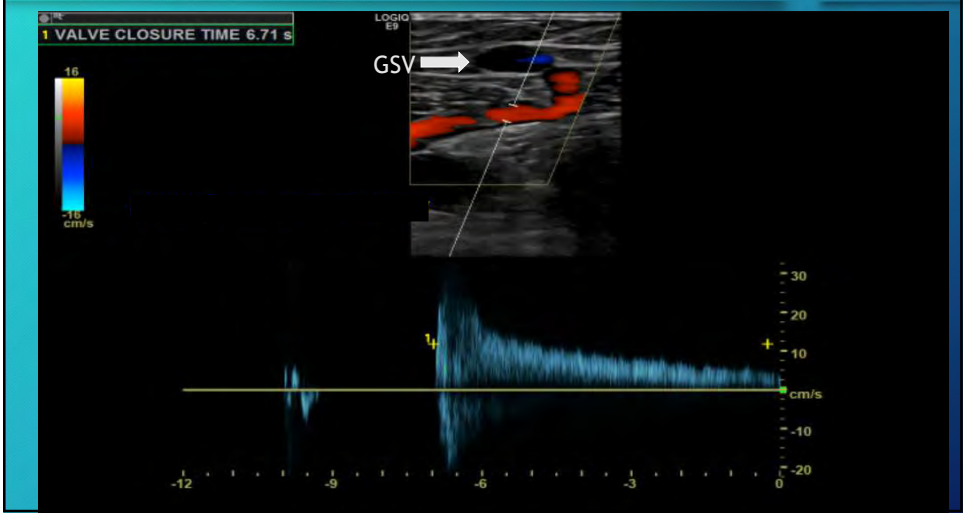
Superficial Phlebitis - GSV



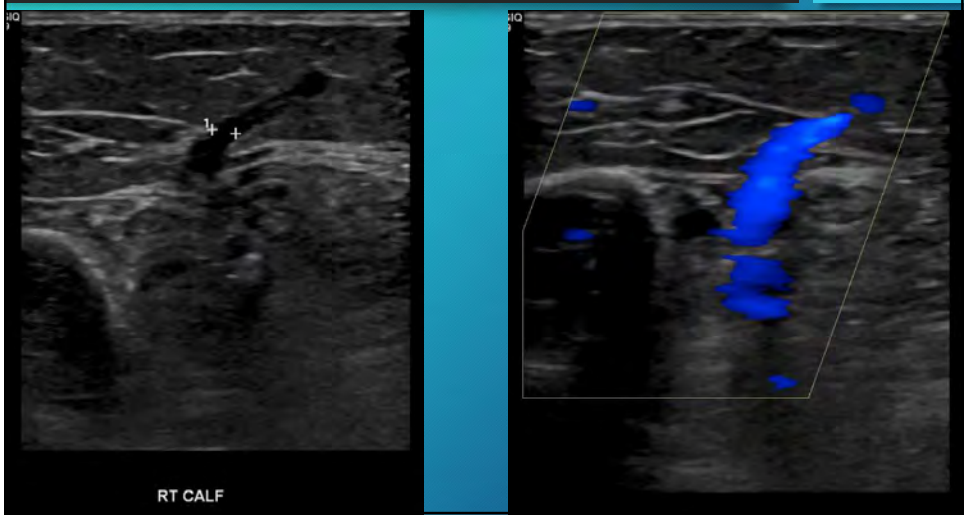
Venous Reflux Exam – Branch Tributary



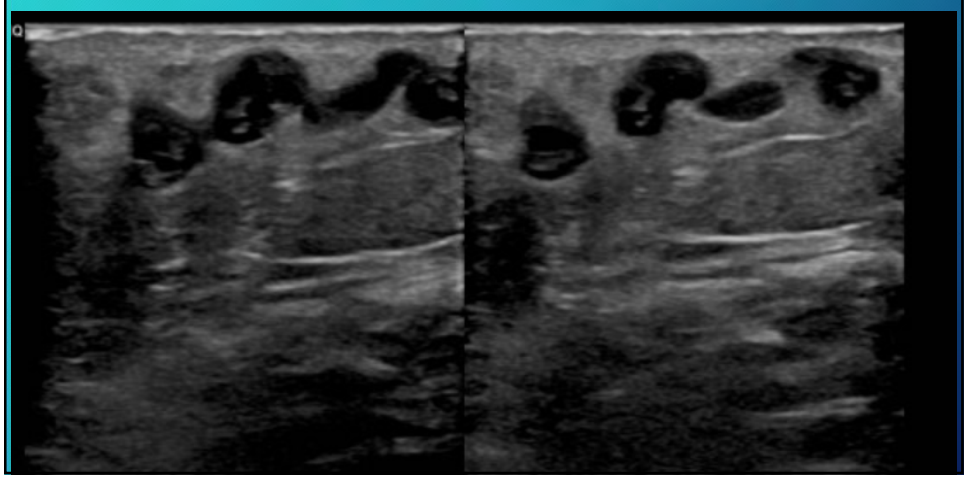
Venous Reflux Exam Perforator to femoral vein



Venous Reflux Exam
Perforator crossing facial border



Venous Reflux Exam – Tortuosity of veins



The Venous Ultrasound Exam

Key Elements-

- Positioning (patient, technologist, transducer)
- Vessel Orientation (Mickey Mouse, Pop's on Top)
- Vessel Compressibility (Acute DVT vs. Chronic DVT)
- Doppler Waveform Characteristics
- Superficial Phlebitis
- Other Pathologies
- Valve Closure (Reflux) Duration Times

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The Lower Extremity Venous Ultrasound Exam

Thank you!

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