MARY WASHING HEALTHCARE IMAGING SERVICES

Lower Extremity Venous Insufficiency/ Varicose Vein Protocol

I. **Patient Preparation:** There is no preparation for this exam.

II. **Patient Positioning:** The patient should lie supine (on a bed or a stretcher) with their head elevated 30-45 degrees. The patient will be slightly rotated (to the side of the leg being evaluated) with the lower extremity externally rotated and knee slightly bent. The patient remains in the supine position for the examination, however should stand for the evaluation of reflux in the superficial veins. If the patient is unable to stand, then adjust the bed to a reverse Trendelenberg as much as possible.

If the patient is unable to stand, or the reverse Trendelenberg bed is not available, then the exam will be performed with the patient sitting with their legs off the bed closest to the sonographer. For patient safety, if the patient comes in with a walker or in a wheelchair, they will likely not be able to stand for the reflux testing. The patient may sit with their legs hanging off the side of the bed. If the patient is unable to sit up without assistance, the exam should be performed with the head of the bed tilted up about 30 degrees and it should be documented in the final report that the modifications were made for the reflux testing.

III. **Equipment:** Imaging and flow analysis performed with Duplex sonography using a linear transducer with a frequency of 5 MHz or higher. A Doppler angle of 60 degrees or less is used when quantitative measurements of venous flow are performed. Occasionally, a lower frequency may be used.

IV. **Primary Purpose of the Venous Examination**—to determine if the valves are functioning properly in the superficial and deep system. Venous insufficiency and valve function are assessed using accepted criteria. Vein size, patency, and course are determined and documented, as appropriate.

V. **Lower Extremity Venous Insufficiency Procedure:** The study documents the venous anatomy, any venous thrombosis and the competency of the valves.

A.Image Protocol:

1. Obtain images following the lower extremity venous DVT protocol. Spontaneous flow should be documented as well as the response to the distal augment. If acute or unknown thrombus is seen, note the location of the thrombus and notify the reading physician. Do not continue with the venous insufficiency protocol without consulting the ordering physician.
2. When evaluating the posterior tibial veins look for any perforating veins that could contribute to venous insufficiency. Look for the enlarged Cockett and Boyd perforators. Look for two echogenic,

nearly horizontal lines above and below the greater saphenous vein. Identify the deep fascia at a depth of 1.0-2.5 cm.

3. In a longitudinal approach, use color Doppler to assess for reflux as the vein passes through the deep fascia.
4. Pay particular attention to the medial lower half of the calf since this is where the majority of the important perforators will be located. Almost always, there will be an incompetent perforating vein towards the periphery of the ulcer which is usually painful. Sterile gel as well as an acoustic gel pad with standard ultrasound gel on top should be used.
5. Image and measure the diameter of the greater saphenous vein in the proximal, mid and distal thigh.
6. Image and measure the diameter of the first lateral branch of the saphenous vein, or accessory saphenous vein. This vein usually courses laterally away from the GSV but occasionally runs parallel to the GSV.
7. Image and measure the diameter of the small saphenous vein in the proximal, mid and distal thigh.
8. Assess the GSV, first lateral branch of the GSV and the small saphenous veins for reflux using distal augmentation. Have the patient stand on a step stool with the weight on the contralateral leg and image the superficial veins as well as the popliteal, mid femoral and common femoral veins. The sapheno-femoral and sapheno-popliteal junctions must be imaged.

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Assess venous Doppler signals for the following qualities:

Augmentation- Does the venous signal augment with distal compression? What happens after augmentation – does the flow stop, or become retrograde?

Competence - does the venous signal stop with valsalva and/or proximal compression?

Phasic- Does the flow in the vein change normally with breathing maneuvers?

Spontaneous- Is there flow in the vein without physiological maneuvers?

B. **Annotation Criteria:** The side-right or left and the name of vein should be noted on the image. For reflux testing, the anatomic position of sitting, standing or reverse Trendelenberg should be noted in the report.

C. **Examination Completion**

1. Upon completion of the exam, **an interventional radiologist** should be consulted **before** the patient leaves the vascular lab.
2. A preliminary reading is sent only if thrombus is seen or the referring physician requests it.

Varicose Vein / Venous Insufficiency

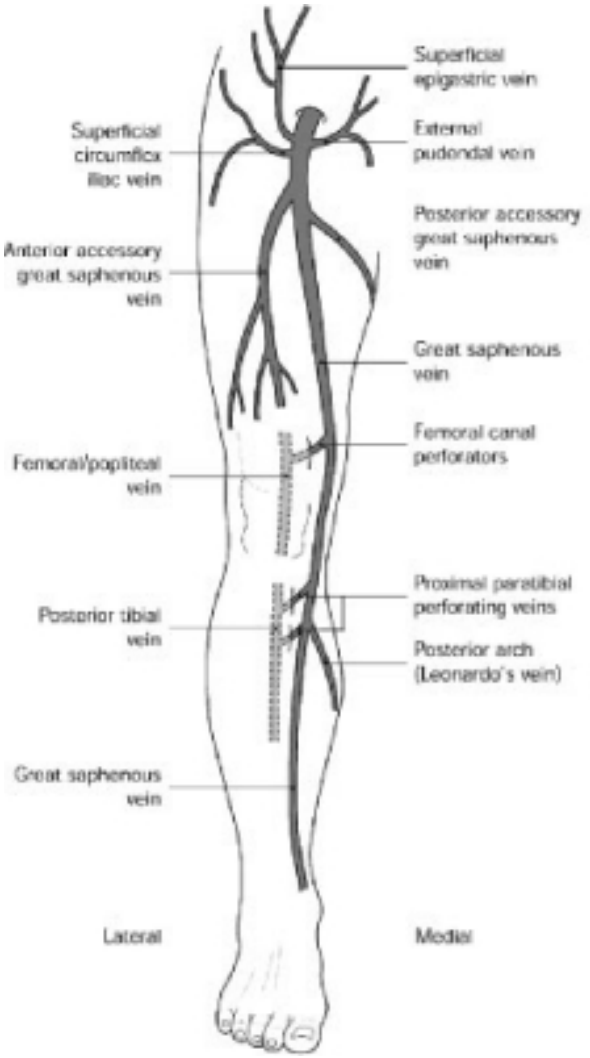
Image Summary

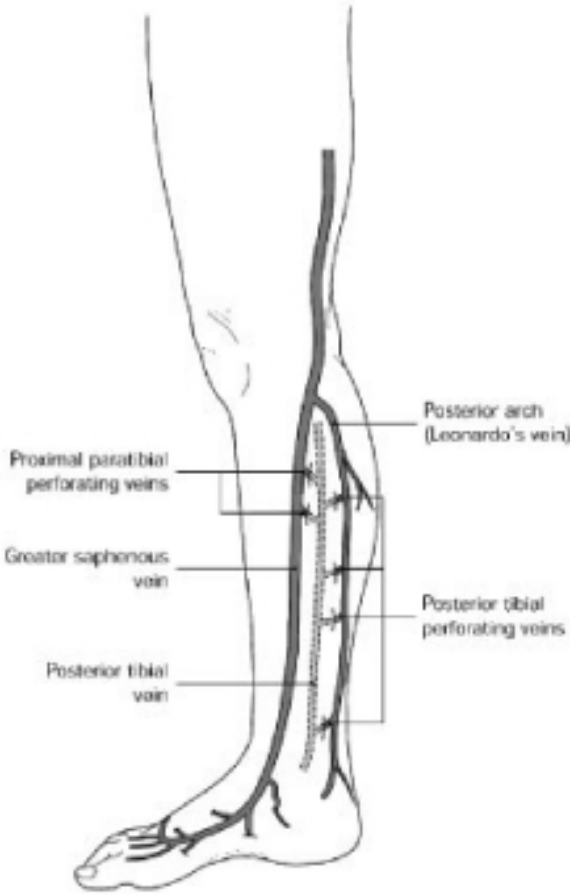
1. Patient information screen with tech initials and patient history
2. Trans dual screen CFV with compression
3. Long CFV valsalva / proximal compression with color/spectral Doppler
4. Long CFV distal augmentation with color/spectral Doppler
5. Long proximal GSV proximal compression with color/spectral Doppler
6. Long proximal Femoral vein proximal compression with color/spectral Doppler
7. Long proximal Femoral vein distal augment with color/spectral Doppler
8. Long mid Femoral vein proximal compression with color/spectral Doppler
9. Long mid Femoral vein distal augment with color/spectral Doppler
10. Trans dual screen distal Femoral vein with compression
11. Trans dual screen POP with compression
12. Long POP valsalva / proximal compression with color/spectral Doppler
13. Long POP distal augmentation with color/spectral Doppler
14. Trans dual screen Posterior Tibial veins with compression
15. Long Posterior Tibial with color
16. Trans dual screen Peroneal veins with compression
17. Long Peroneal veins with color
18. Trans dual screen GSV proximal thigh with compression and measure AP diameter
19. Trans dual screen GSV mid thigh with compression and measure AP diameter
20. Trans dual screen GSV distal thigh with compression and measure AP diameter
21. Trans dual screen proximal Accessory Lateral GSV (First Lateral branch of GSV) with compression and measure AP diameter
22. Long proximal Accessory Lateral GSV distal augment with color/spectral Doppler
23. Trans dual screen mid Accessory Lateral GSV with compression and measure AP diameter
24. Long mid Accessory Lateral GSV with spectral Doppler and Distal augment
25. Trans dual screen small saphenous proximal calf with compression and measure AP diameter
26. Trans dual screen small saphenous mid calf with compression and measure AP diameter
27. Trans dual screen small saphenous distal calf with compression and measure AP diameter
28. Standing, sitting or reverse trendelberg (RT) popliteal vein with Spectral Doppler and distal augment
29. Standing, sitting, or RT mid femoral vein with Spectral Doppler and distal augment
30. Standing, sitting, or RT common femoral vein with Spectral Doppler and Distal augment

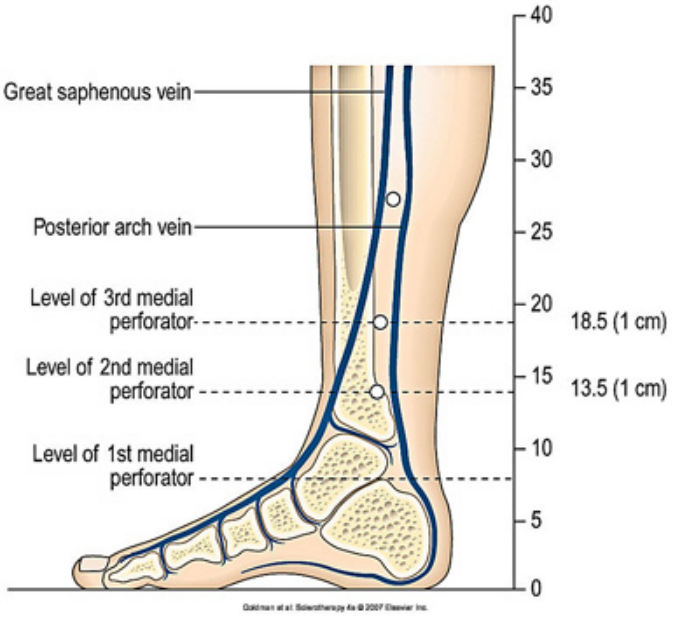
31. Standing, sitting or RT GSV in thigh with spectral Doppler and distal augment
32. Standing, sitting or RT GSV in calf with spectral Doppler and distal augment
33. Standing, sitting or RT sapheno-femoral junction with spectral Doppler and distal augment
34. Standing, sitting or RT small saphenous vein in thigh and calf with spectral Doppler and distal augment
35. Standing, sitting, or RT sapheno-popliteal junction with spectral Doppler and distal augment
36. Standing, sitting, or RT suspected areas of reflux or perforators.

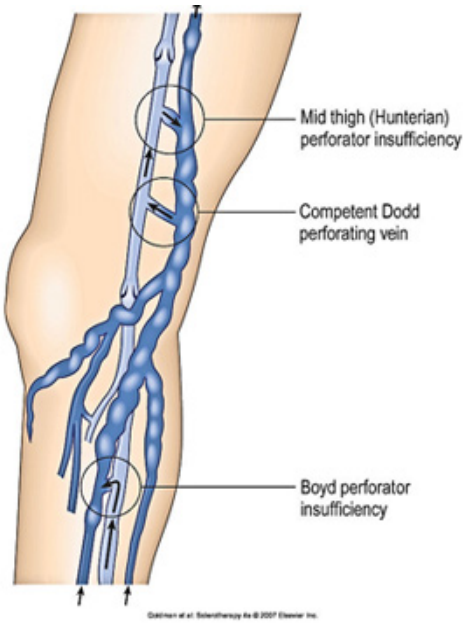
***The transverse dual screen images should be taken with the AP diameter on the left and compression image on the right. <u>For a Unilateral venous you must get a waveform with contralateral CFV</u>**

THE PATIENT SHOULD STAND TO ASSESS FOR REFLUX IN THE SUPERFICIAL VEINS. IF THAT IS NOT POSSIBLE, ADJUST THE BED TO A REVERSE TRENDELENBERG AS MUCH AS POSSIBLE.









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2) Practical noninvasive Vascular Diagnosis, Kempczinski, Yearbook Publishers, Chicago, IL.
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4) Ultrasound Atlas of Vascular Diseases; Krebs, Giyanani, Eisenberg, Appleton and Lange, Stamord, CT
5) Vascular Diagnosis, Mansour, M. Ashraf and Nicos Labropoulos
6) Guidelines for Treatment of Lower Extremity Deep vein Thrombosis Journal of Interventional Radiology 2006; 17:435-448
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