

MARY WASHINGTON HEALTHCARE IMAGING SERVICES

**Attachments/Charts**

A. Criteria for Normal Venous Doppler Signals

1. Spontaneity

- Venous signals can be heard at all levels of the limb without manipulation (such as augmentation). Vasoconstriction can interfere with normal spontaneity

2. Phasicity

- Venous signals fluctuate in response to respiratory efforts with considerable flow is seen with inspiration, whereas there is decrease in flow during expiration.

3. Augmentation

- Venous flow should show a marked increase in response to compression distal to area being examined and after the release of compression proximal to the area being examined.
- Sniff test or rapid inspiration may demonstrate augmentation of the jugular and subclavian veins.
- Abnormality exists when normally expected augmentation is not present.

4. Nonpulsatility

- Veins in close proximity to the heart may exhibit pulsatile waveforms as a result of the transmitted pulsations from the right atrium, especially the jugular & subclavian veins. However, the flow should change with respiration. The velocity should go up then almost bottom out, or return to baseline with respiration.

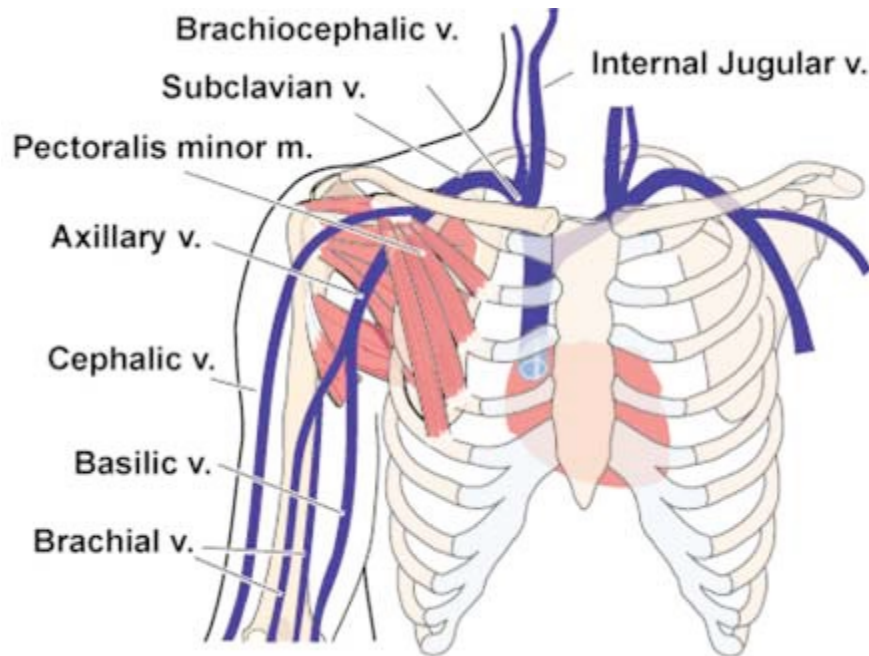
## B. Criteria for Determining Presence and Age of Venous Clot

Normal vein	Acute Clot	Subacute Clot	Chronic Clot
Easily visualized; complete filling of the venous lumen with color	Symptomatic for less than 14 days, visualization of actual clot may be difficult, absence or decreased color flow	Symptomatic for 15-28 days or imaging indicates that thrombosis occurred within this time interval. May have some color flow.	Symptomatic for more than 28 days, lumen may be reduced and color flow may have a filling defect
Echo-free lumen (except for valves)	Soft, homogenous echoes to nearly anechoic, with the brightness less than the surrounding tissue Composed of red blood cells & fibrin	Becoming more echogenic-somewhat homogenous. As thrombus ages, the red cells break down and are replaced with fibrin mesh.	Bright, heterogeneous echoes. Chronic thrombus is covered with endothelium.
Absence of clot	Echolucent clot with smooth surface. May appear to "float" within the vessel or be loosely adhered to the vein walls.	Thrombus becomes attached to vein wall typically by two weeks, although often can be very difficult to determine if it is attached	Rigid, echogenic clot with irregular surface; firmly attached to vessel walls; focal or circumferential wall thickening; linear intravenous webs easily visualized
Vein size is larger than corresponding artery (if deep vein)	Distended vein but vein wall is thin and smooth	Less distended	Vein and artery are same size (if deep vein)
Complete compression of the near and far vein walls without space other than the walls. Rapid inspiration or sniff test should cause the subclavian vein to collapse at least 60%; however caution should be used when diagnosing DVT based on these criteria alone.	Spongy or non-compressible. Possible minimal collateral circulation seen as tubular structures in close proximity to vessel	Partially compressible or noncompressible vein. Collaterals continue to enlarge.	Partially compressible or noncompressible vein. Increasing collateral circulation, collaterals may be larger and easily visualized
Veins in close proximity to the heart may exhibit pulsatile waveforms, especially the jugular & subclavian veins. However flow should vary with respiration.	Continuous, diminished or absent Doppler flow	May have some color flow and thickened walls	Recanalization with flow in residual lumen
Spontaneous and augmented flow is normal.	Not usually assessed as there is no flow.	Not usually assess as there is little flow	Partial spontaneous and augmented flow may be noted.

**Note: Acute on Chronic DVT refers to venous thrombosis that has both chronic and acute components. This can be correlated with the patient's symptoms as well as previous imaging.**

**Differentiating acute from subacute clot may be very difficult without a prior duplex study, especially if the patient is not on anticoagulation therapy. If the patient has not had imaging and is not being treated, the clot should be considered acute. Visualization of collaterals suggests chronicity, but does not exclude concomitant acute thrombus.**

## C. Map of the upper extremity veins

References:

- Introduction to Vascular Ultrasonography, 5<sup>th</sup> Edition, Zwiebel, Pellerito, Philadelphia  
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Ultrasound Atlas of Vascular Diseases; Krebs, Giyanani, Eisenberg, Appleton and Lange, Stamford, CT  
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 Vascular Diagnosis, Mansour, M. Ashraf and Nicos Labropoulos  
Guidelines for Treatment of Lower Extremity Deep Vein Thrombosis, Journal of Interventional Radiology 2006, 17:435-448.  
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