

Medical Engineering & Physics
Quality Manual Volume 3, PMS
ULTRASOUND SCAN FOR LOWER LIMB DVT

Introduction and scope

Ultrasound is established in the investigation of deep venous thrombosis (DVT) and of superficial vein thrombus in the lower limb. Compression ultrasound (CUS) is part of the NICE guidelines pathway for the investigation of patients with suspected DVT and is also used for some patients with suspected pulmonary embolus (PE). Ultrasound is used to ascertain the presence, location and extent of thrombus in the leg veins.

Indications and referral details

Examinations are undertaken for symptomatic patients (swollen leg or legs, painful leg, tenderness) and for high-risk asymptomatic individuals. Follow-up examinations are also conducted to assess progression or regression of thrombus.

The referral should state the reason for the scan including the level of symptoms (whole leg, calf), relevant medical history and which or both legs to be scanned. Contact details of the referring clinician are required.

Equipment

Colour duplex scanner with lower frequency (approx. 3-9MHz) linear array and low frequency (approx. 1-5 MHz) curvilinear array. In very young children and neonates, a high frequency linear array may be used.

Method

Compression ultrasound:

The major veins of the leg are compressed in transverse to confirm the absence of thrombus. Full compression requires complete closure of the visible lumen with the vein walls touching, (see appendix for sample image).

Where possible, the patient should be supine to examine the proximal veins. To rule out proximal DVT, full compression of the common femoral vein (CFV), femoral vein (FV), proximal profunda femoral vein (PFV) and popliteal vein (popV) must be made. Compression should be undertaken at 2-3cm intervals along the femoral vein. Note that it is common for the femoral vein to have a bifid section. In these cases, compression of both lumens must be confirmed. The test is usually done with the linear array but in cases of large thighs, a curvilinear array may provide better clarity.

Compression of the long saphenous (greater saphenous) vein is undertaken.

The calf veins are examined with the patient seated with their leg dependent over the side of the couch. Compression is undertaken of the tibioperoneal trunk, posterior tibial

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veins, peroneal veins, gastrocnemius veins and soleal veins. Calf veins are compressed at intervals of 2-3cm. Compression of the short saphenous vein (lesser saphenous vein) is undertaken.

Doppler examination:

Doppler spectral tracings of flow in the common femoral or distal external iliac vein are made. This may be obtained in either transverse or long section. The spectral flow trace normally shows fluctuation in response to breathing or R heart pressure changes (see appendix). Where respiratory changes are unclear, a Valsalva or cough response can be used. Absence of fluctuation in flow is suggestive of proximal obstruction. In this case, it is useful to compare the trace with that from the contralateral side. Leg swelling can be caused by compression of the iliac veins. In this case, the Doppler sonogram will show constant or near-constant velocity or very low velocities. Direct imaging of the iliac veins can be helpful in determining whether this is due to compression or DVT.

Colour flow imaging (CFI) can also be useful in helping to identify the location of calf veins and their corresponding artery. They can also identify flow channels around thrombus as a result of recanalization of thrombus.

Other findings:

Alternative causes of leg swelling include cellulitis, lymphoedema and haematoma. Swelling behind the knee can result from a Baker's cyst or popliteal artery aneurysm. The concluding report should include comments on the ultrasound appearance of any abnormal features. In the case of previously unknown arterial aneurysm, the referring clinician should be notified and the vascular surgery team informed.

Reporting

The report should identify all veins examined and whether there is no thrombus, thrombus or whether images were inadequate for a conclusive assessment at that level. Thrombus is reported as occlusive or partial. The location and extent of thrombus is reported. In the case of external iliac vein thrombus (EIV), if the proximal extent cannot be visualised, the contralateral EIV is examined. Bilateral occlusion may indicate occlusion of the IVC which may be confirmed by direct imaging. In cases of superficial vein thrombus, the distance from the proximal extent to superficial/deep vein confluence (for example saphenofemoral junction) should be recorded.

Where it is possible, a description of the thrombus appearance should be made. Any other relevant observations and findings are reported (see above).

Limitations of the examination including segments of vein not imaged should be

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reported.

Images stored:

For each leg the following images should be stored and annotated:

- Common femoral/distal external iliac vein Doppler spectral trace
- Dual screen or video of successful compression of common femoral vein, femoral vein at mid thigh and popliteal vein.
- Transverse or longitudinal image of thrombus.

Inspection criteria:

Complete CRIS system patient tested / DNA / rebooked

References:

Nice Guideline cg144: Venous thromboembolic diseases: the management of venous thromboembolic diseases and the role of thrombophilia testing
<http://www.nice.org.uk/guidance/cg144>

Thrush A, Hartshorne T: Vascular Ultrasound, How, why and when. Ch 14 Duplex assessment of deep venous thrombosis and upper-limb disorders.

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Appendix

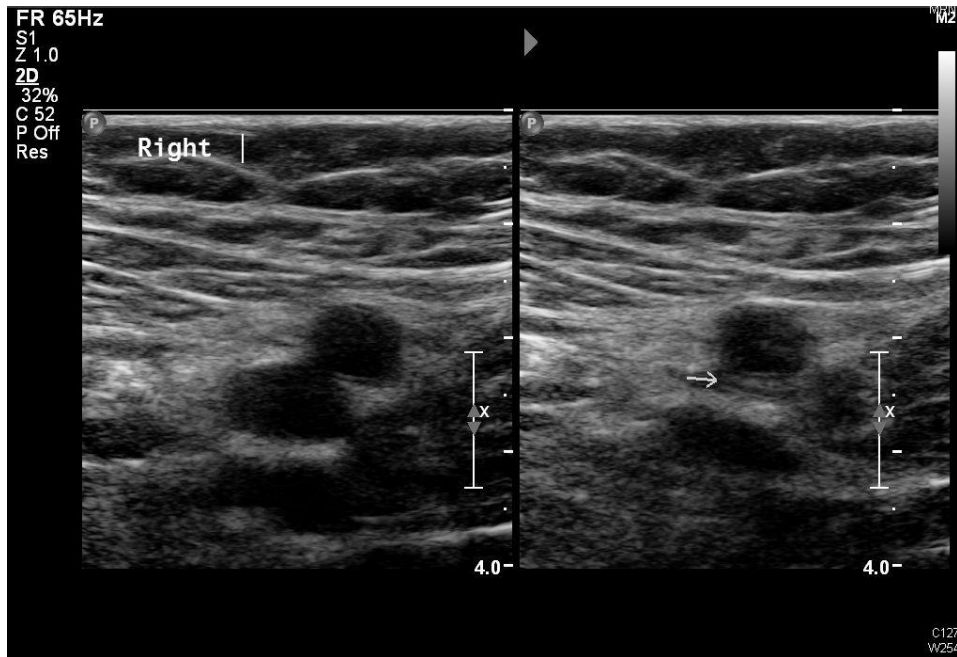


Image 1 Compression of femoral vein. In the R image, the femoral vein walls touch (arrow) indicating no thrombus.

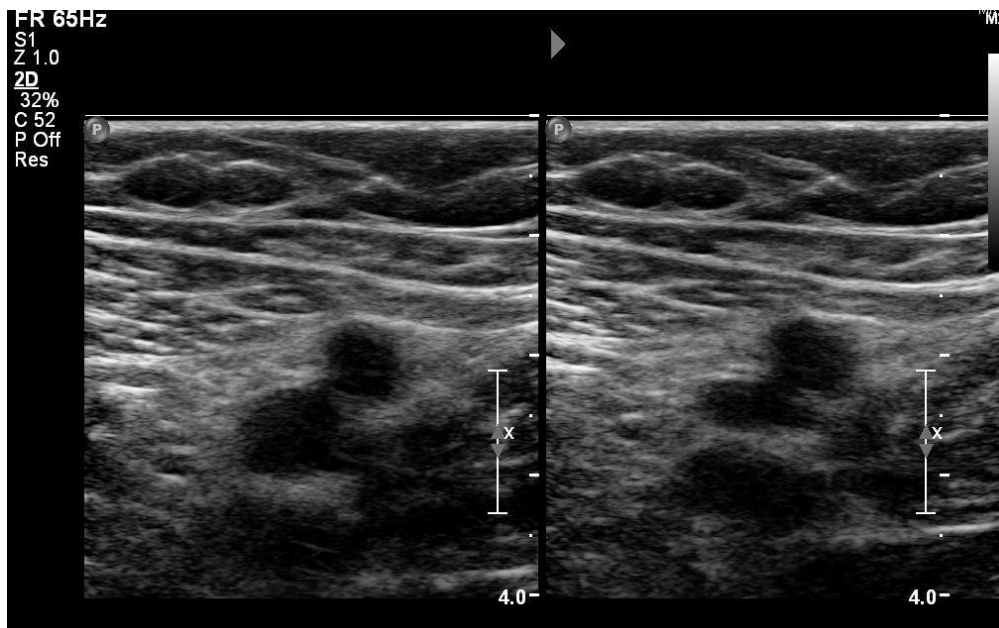


Image 2 inadequate compression of femoral vein (R) which does not confirm the absence of thrombus.

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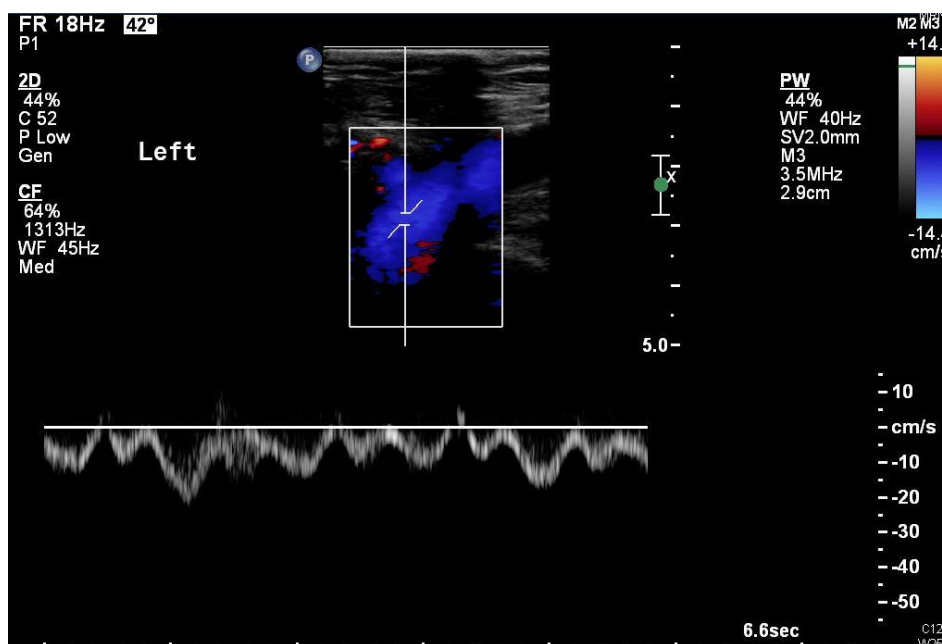


Image 3 Normal Doppler spectral trace of the distal external iliac vein showing flow changes due to proximal respiration and R heart changes pressure changes.