**POINT OF CARE ULTRASOUND - Venous US for DVT**

The diagnosis of deep venous thrombosis (DVT) using ultrasound in the emergency department.

DVT US is easy to perform and can be usually be completed in less than 4 minutes\(^1\). 2 point compression US of the thigh veins (at the common femoral vein and popliteal vein) has been shown to have a moderate-high level of sensitivity and specificity even with heterogenous US skills\(^2,3\).

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**Table 1.** Sensitivity and specificity of ED two-point compression ultrasonography, using Department of Radiology ultrasonography as the gold standard.

<table>
<thead>
<tr>
<th>ED Ultrasonography Category</th>
<th>Positive DOR Ultrasonographic Results</th>
<th>Negative DOR Ultrasonographic Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive ED compression ultrasonography</td>
<td>45</td>
<td>1</td>
</tr>
<tr>
<td>Negative ED compression ultrasonography</td>
<td>0</td>
<td>153</td>
</tr>
</tbody>
</table>

Sensitivity, % 100 (95% CI 92–100)

Specificity, % 99.4 (95% CI 96–100)

**DOR,** Department of Radiology.

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**Table 2.** Diagnostic Accuracy of Emergency Physician-Performed Limited Compression Ultrasound for the Detection of Deep Vein Thrombosis

<table>
<thead>
<tr>
<th>LCUS</th>
<th>DVT Positive</th>
<th>DVT Negative</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>47</td>
<td>17</td>
<td>64</td>
</tr>
<tr>
<td>Negative</td>
<td>8</td>
<td>224</td>
<td>232</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>241</td>
<td>296</td>
</tr>
</tbody>
</table>

CI = confidence interval; DVT = deep vein thrombosis; LCUS = limited compression ultrasound. Sensitivity 86% (95% CI 73–94%), specificity 93% (95% CI 89–96%), positive likelihood ratio 12.11 (95% CI 7.56–19.40), and negative likelihood ratio 0.16 (95% CI 0.08–0.30).


ED DVT US is used to determine the presence of an above knee DVT. It does not assess for below knee DVT. In the past, a negative ED DVT US meant the patient could be discharged without anticoagulation for a formal US within 5 days with the GP. However, the treatment lines between above and below knee US are being blurred and full anticoagulation is now recommended for high risk and symptomatic DVT unless contra-indicated\(^4,5,6\). Thus, even if the ED DVT US is negative, the patient may require clexane and a formal US within 12-24 hours.
Currently, ED DVT US is most helpful in determining patient disposition and the extent of the DVT. A negative ED DVT US means the patient can be discharged with outpatient follow-up. An extensive, proximal DVT, which may be treated with mechanical thrombectomy or intravascular thrombolysis, indicates the need for admission and involvement of haematology and radiology.

**Probes used**

*Curvilinear Probe (abdominal probe)*
- Low frequency therefore high penetration (especially useful in larger patients)
- Wide field of view

*Linear Probe (vascular probe)*
- Great in a thin person
- Usually not enough penetration in the thigh

**Technique**

*Patient position*

Reverse trendelenberg (ie legs dependent).
Leg externally rotated.
Flex knee to 90 degrees for popliteal vein.

*Probe*

Held in transverse with the probe marker to the patient’s right.

*Imaging*

Use split screen if possible.

Freeze a transverse image of the CFV at the saphenofemoral junction without compression. Label the image as “right or left CFV”.
Now freeze an image of the CFV with compression. Label the image as “comp”.
Do the same for the proximal femoral and popliteal veins.

*What to look for*

The vein should compress completely. That is the anterior and posterior walls appose. The artery should remain round. If the vein doesn’t compress completely without so much pressure that the artery is also compressed: positive test.

If there is an acute clot, the clot will appear hyperechoic (grey-white lumen rather than the usual black lumen). A chronic clot may become hypoechoic (black) and difficult to visualize. Thus, a vein may fail to compress due to DVT, but still have a hypoechoic lumen.
Longitudinal view of the femoral vein

Common femoral and femoral veins

**DEEP VEINS OF THE LEG**

- **Proximal**
  - Common iliac vein
  - External iliac vein
  - Deep femoral vein
  - Common femoral vein
  - Femoral vein
    (Sometimes called "Superficial femoral vein"

- **Distal (Calf)**
  - Popliteal vein
  - Anterior tibial vein
  - Posterior tibial vein
  - Peroneal vein

**The femoral vein is sometimes referred to as the "Superficial femoral vein." This can be confusing since the femoral vein is a deep vein and should be treated as such.**
Veins of the leg
From http://www.straighthealthcare.com/deep-veins-illustration.html

Start at the groin.
Probe held in transverse with the probe marker to the patient’s right.
Locate the common femoral vein at its junction with the saphenous vein.
Apply vertical downward pressure on the vein.
The anterior and posterior walls of the vein should meet, completely obliterating the lumen of the vein.
*Note* the pressure should not be so great that the artery also compressed. le artery should remain round.

*OPTIONAL:* Follow the vein inferiorly (in transverse) in the thigh to the bifurcation of the CFV into the femoral vein (previously superficial femoral vein)
and the profunda femoris vein (deep femoral vein).
Apply vertical downward pressure and look for compression of the femoral vein.

*Popliteal vein*

![Popliteal vein and artery at the knee](http://images.3d4medical.com/The-blood-vessels-of-the-knee-26-image_RM5558.html)

At the knee, locate the popliteal vein in transverse (superficial to the artery).
Compress against the tibia and look for obliteration of the popliteal vein.
Images: Normal

Rt SFJ
long saphenous

FA: femoral artery; CFV: common femoral vein

R groin.
Note FA still round
FA: femoral artery; CFV: common femoral vein

R upper thigh FA: femoral artery; FV: femoral vein
Popliteal fossa
PA: popliteal artery; PV: popliteal vein

Images: DVT

DVT noted in FV. FV does not compress.