Terminology and Diagnostic Criteria Committee, Japan Society of Ultrasonics in Medicine

Criteria for ultrasound diagnosis of deep venous thrombosis of lower extremities

Objectives

The criteria for ultrasound diagnosis of deep venous thrombosis of the lower extremities are defined.

Target

The area to be tested comprises the veins of the lower extremities, including the inferior vena cava (Fig. 1).

Ultrasound devices and testing conditions

When testing the pelvic region, a 3.5-MHz convex probe or sector probe is primarily used. For testing the femoral, popliteal, and crural areas, a 7- to 10-MHz linear probe or a 3.5- to 5.0-MHz convex probe is primarily used. B-mode ultrasonography is adopted for morphological diagnosis. Color Doppler or pulse Doppler methods are employed for evaluation of blood flow. With the color Doppler method, the velocity scale is set low to 10–20 cm/s.

Fig. 1. Anatomy and physiology of deep veins of the pelvis and lower extremities. Veins of the pelvis and lower extremities can be divided into three groups: iliac veins serving as conduits, femoral veins that prevent regurgitation, and crural veins serving as pumps. In the crural veins, the pump function of venous muscle is primarily seen in the soleus vein within the soleus muscle. Three branches (medial, middle, and lateral) of this vein are usually visible. 1, inferior vena cava; 2, common iliac vein; 3, external iliac vein; 4, internal iliac vein; 5, common femoral artery; 6, deep femoral artery; 7, superficial femoral artery; 8, great saphenous vein; 9, popliteal vein; 10, small saphenous vein; 11, calf vein; 12, anterior tibial vein; 13, posterior tibial vein; 14, fibular vein; 15, soleus vein (15-1, medial branch; 15-2, middle branch; 15-3, lateral branch)
Fig. 2. A B-mode short-axis view of the left superficial femoral vein (L-SVF): thrombus is visible (arrow). B B-mode long-axis view of the left superficial femoral vein: thrombus is visible (arrow). C Color Doppler long-axis view of the left superficial femoral vein: thrombus is visible (arrow).

Fig. 3. A Cross-sectional view of the right inguinal area in a healthy volunteer. Evaluation of compression-caused deformation. Left, without compression, the femoral vein (V), located medial to the femoral artery (A), is visible. Right, with compression: under pressure by the probe, the femoral vein appears compressed (arrow). B Cross-sectional view of the right inguinal area in a patient with deep venous thrombosis (affecting the right common femoral vein). Evaluation of compression-caused deformation. Left, without compression, the femoral vein (V) is thicker than the femoral artery (A). Right, with compression: the femoral vein (V) is deformed but does not show complete compression. C Evaluation of soleus vein thrombosis by the compression method (cross-sectional view of right crus using a dorsal approach). There is a lesion in the medial branch of the right soleus vein. Left, without compression, two soleus veins (blue and red arrows) are visible, with a thickness of about 1 cm. Both veins are almost free of internal echo. Right, when pressure is applied, one of the two veins is compressed (red arrow). This vein is rated as free of thrombus. The other vein is not compressed (blue arrow) and is rated as having thrombus.