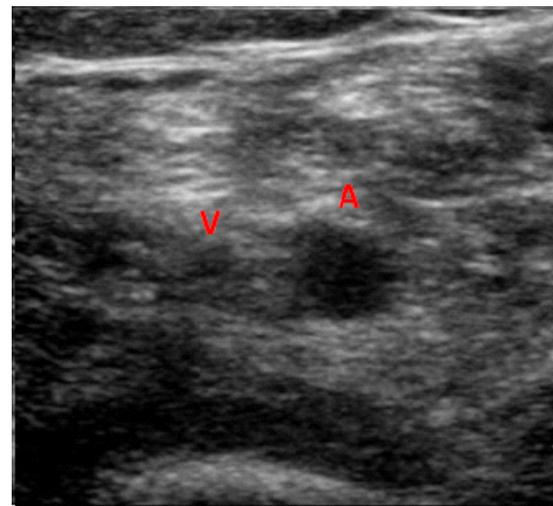
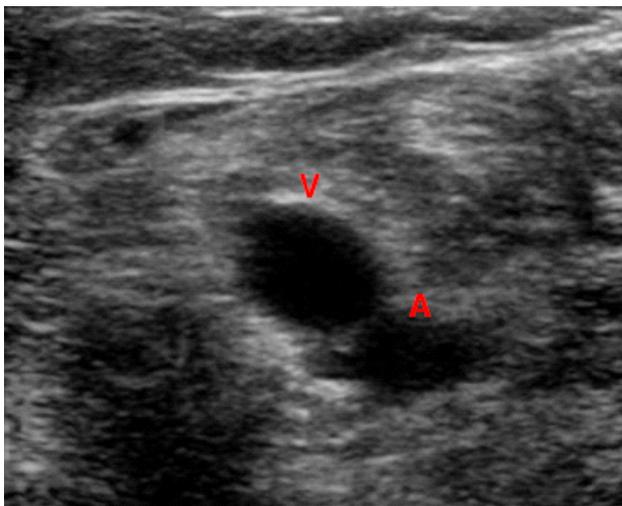


DVT ULTRASOUND REVISITED

DVT ultrasound has increased in sophistication, along with the rest of vascular ultrasound, as the technology and skill levels have increased. We find ourselves identifying increasingly small and distal thrombi, which then creates a treatment dilemma for the referrer.

The cornerstone of thrombus detection is **venous compression**. Unfortunately, venous thrombus is as sonolucent as flowing blood and cannot be visualised directly as a filling defect in a vein. On the other hand, a vein with flowing blood will be compressible, whereas one containing thrombus will not.

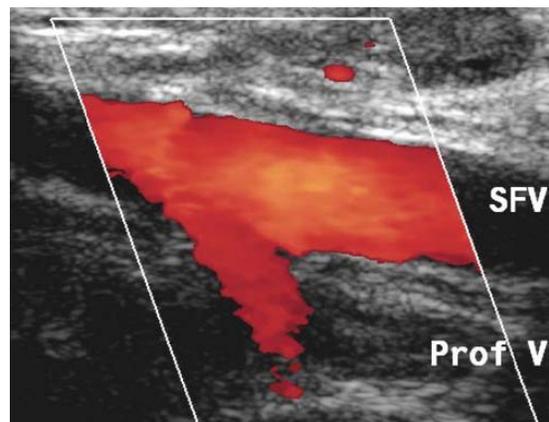
The study begins as proximal as possible in the groin and extends distally as far as the lower calf. The technique is simple, with the probe transverse to produce a cross-sectional image. The vein is seen as an oval hypoechoic structure. We then apply direct probe pressure to compress the vessel. A normal vein lumen will be obliterated with relatively light pressure, while a lumen filled with thrombus is noncompressible.



Popliteal vein and artery before and after compression. The vein compresses normally.

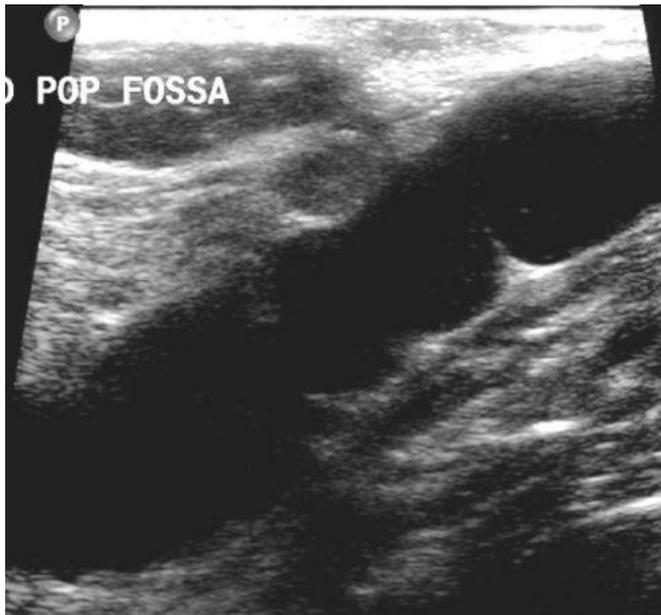
Colour Doppler interrogation is less accurate than compression in the major veins of the lower limb. It is useful in the calf, however, where the small veins can be difficult to localise. Colour Doppler assists this by detecting the arteries adjacent to the calf veins. Flow in the iliac veins and the IVC can also be assessed with colour Doppler.

Originally, DVT ultrasound reliably visualised as far as the popliteal vein, but we didn't venture below this as we assumed thrombus confined to the calf didn't need treating! Now a skilled operator expects to visualise paired veins to the ankle, muscular veins and the long and short saphenous veins. The problem for the referrer then becomes what to do with thrombus in a single deep calf vein, a muscular vein thrombus or a superficial thrombophlebitis, which in many



Colour Doppler showing a normal superficial femoral vein.

cases may be incidental to the presenting complaint. It is also quite common for us to find **unrelated but potentially relevant pathology**, such as a Bakers cyst or gastrocnemius tear, and a thorough operator always addresses the symptomatic area after the venous study.



An incidental finding of a large popliteal cyst on a DVT study.



A small tear in the medial head of gastrocnemius.

Treatment is typically via the thrombosis service, with subcutaneous low molecular weight heparin followed by warfarin for all thrombus in common femoral, superficial femoral, popliteal and paired calf veins. Short segments of thrombus in a single calf vein or confined to a muscular vein may or may not be treated, depending on other factors such as symptoms, co-morbidities and whether or not it is provoked or spontaneous.

Pitfalls: Just as we see elsewhere with ultrasound, visualisation can be limited by body habitus. As well as obesity, lymphoedema and ulceration may hinder visualisation in the lower limb and sometimes we have to report nonvisualisation of particular vessels. In this situation, a single nonvisualised calf vein is unlikely to be responsible for symptoms or need anticoagulation. In the rare event that there is continuing clinical concern a follow-up study at 48-72 hours can be done, looking for any thrombus that has propagated proximally.

Old thrombus can produce a real imaging dilemma, as frequently the vessels never recanalise and remain noncompressible. They have some morphological features which may be useful, as they are often small and echogenic, as opposed to fresh thrombus where the veins are distended and hypoechoic. Distinction between old and new thrombus remains difficult.

Vicki Morganti