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The Medical Professionals' Network

M E D I C A L I M A G I N G

Deep Venous Thrombosis of the Lower Limbs

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Lower limb deep venous thrombosis (DVT) is a condition in which fresh thrombus (blood clot) forms in the deep veins of the legs and pelvis. Besides causing local symptoms including calf pain, swelling and oedema, thrombus in the lower limb veins is also a source of emboli that may lead to life-threatening pulmonary embolism (PE).



Figure 1: Transverse scan through a normal right common femoral vein (CFV): (a) without compression the lumen of the CFV (v) is visible, while (b) with compression the lumen disappears (arrow).

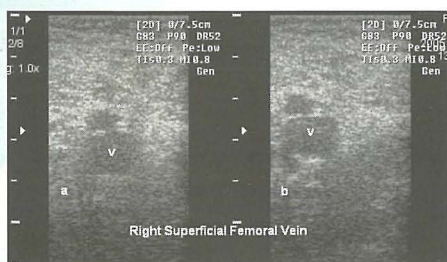


Figure 2: Transverse scan through a thrombosed left CFV: (a) without compression the lumen of the CFV is visible, and remains visible with compression (b).

DVT and consequently PE are most commonly seen in patients with reduced mobility and underlying medical illness. Immobilisation, surgery in the past 3 months, stroke, previous history of venous thromboembolism and malignancy are the most important risk factors. The incidence of DVT also increases exponentially with age. In patients with extensive or recurrent DVT/PE (especially under 50 years of age), genetic

prothrombotic disorders such as factor V Leiden mutation, excess factor VIII, antithrombin 3 deficiency and protein C and S deficiencies are often present. Other important risk factors include the oral contraceptive pill, smoking, obesity and hypertension. 'Economy class syndrome' (or traveller's thrombosis) is rare, occurring in one in 400 000 passengers in flights longer than 8 hours. An increased risk of thrombosis has not yet been confirmed in flights of less than 4 hours.

The likelihood that a patient with a history of DVT will present with repeat symptoms within 1 year is reported to be as high as 20%. Repeat symptoms are largely determined by the extent of venous reflux, the presence of persistent popliteal obstruction and the rate of recanalization, all of which may determine the presence of postphlebotic syndrome. Postphlebotic syndrome is caused by impaired venous valve function from prior thrombosis. Particularly in the erect position, the retrograde venous flow leads to chronic venous hypertension, which induces superficial varicosities, chronic swelling, hyperpigmentation from stagnant red blood cell breakdown and in severe cases ulceration.

In patients with symptoms of lower limb DVT or PE, the diagnosis of DVT is routinely established with venous ultrasound (US). Compression venous US is the venous procedure of choice in patients with suspected DVT as it is non-invasive and has a high sensitivity (95%) and specificity (98%).

The principle of compression venous US is simple; normal veins compress fully so that the anterior and posterior walls touch under pressure of the examining probe (Figure 1), while those containing thrombus do not (Figure 2).

Editor's Word

'An issue to be remembered ...' – these were the concluding remarks of our Scientific Editor when we finalised the compilation of this issue. Indeed this is a special issue because it coincides with the fifth anniversary of this magazine. These five years has seen a progressive metamorphosis in quality to the standards achieved to date. Not only is this issue full of articles of interest to all members of the medical professions but this issue coincides with the launch of the Association of Surgeons of Malta's **on-line Continuing Medical Education Service** which is being delivered through TheSYNAPSE Portal. This innovative project leads the way to new and more convenient modalities of CME that compliment existing methods. TheSYNAPSE Portfolio has now expanded to include TheSYNAPSE Portal, TheSYNAPSE Direct, TheSYNAPSE eCME and TheSYNAPSE Magazine. More vehicles are planned to be added to this portfolio in the coming months.

This is our contribution to you as Maltese Health Care Professionals and our Healthcare system.

Wilfred Galea

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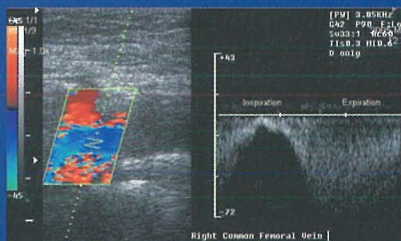


Figure 3: Normal phasic flow in the right CFV during respiration.

Colour and Spectral Doppler ultrasound are also used to detect flow patterns in the common femoral (Figure 3) and popliteal veins; abnormal flow patterns in these veins indicate pelvic and more distal calf vein thrombosis respectively. Abnormal flow patterns on Doppler ultrasound include lack of flow, lack of phasic variation with respiration and lack of flow during calf compression; all are indirect signs of more proximal or distal venous occlusion.

In patients with a history of DVT who present with recurrent symptoms due to postphlebotic syndrome or recurrent DVT, US may in some cases not distinguish acute thrombus from prior or chronic thrombus. In addition, a non-occlusive clot may go undetected because of its location, small size and non-occlusive nature. X-ray venography is invasive and technically very difficult, while having limited accuracy due to incomplete venous filling with contrast particularly in the calf. X-ray venography has been largely replaced by US.

New scintigraphic techniques may assist in distinguishing post-thrombotic change from fresh thrombosis. The radiopharmaceutical Technetium-99m apcitide is a complex of the radionuclide Tc-99m and the small synthetic peptide apcitide. Apcitide binds to glycoprotein IIb/IIIa receptors, which are expressed on the surface of activated platelets, making the radiopharmaceutical specific for acute thrombi but not chronic thrombi. These attributes may make Tc-99m apcitide

imaging a potential complementary test for differentiation of acute from chronic DVT and detection of segmental DVT which does not show up with US in selected patient populations (Figure 4).

The prevalence of postoperative DVT has been reported to be as high as 60% in patients who have undergone arthroplasty. This high prevalence has led to prophylaxis with postoperative anticoagulation therapy, pneumatic leg compression and early physiotherapy, and in some institutions routine ultrasound is used to detect subclinical DVT. Administration of heparin, warfarin or low-molecular-weight heparin may make US visualization of a thrombus more difficult because the thrombus may be segmental, hypo-echoic and less likely to occlude the lumen. Tc-99m apcitide scanning may be helpful in these patients if they have a positive ventilation/perfusion scan. A more efficient way to evaluate PE and DVT simultaneously is with spiral CT. Rapid consecutive post-intravenous contrast spiral CT scanning of the pulmonary arteries followed by the lower limb veins has been shown to confirm the presence of both PE and DVT in a single examination (Figure 5).

Another situation in which diagnosis of acute DVT is problematic is isolated calf vein thrombus. 88% of calf thrombi occur in the asymptomatic population. Isolated calf vein thrombus is rarely a cause of PE. US can be used for direct detection of calf thrombi or for assessment of propagation into the femoral-popliteal system, which occurs in approximately 20% of patients.

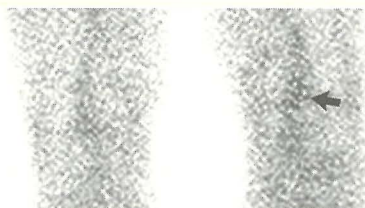


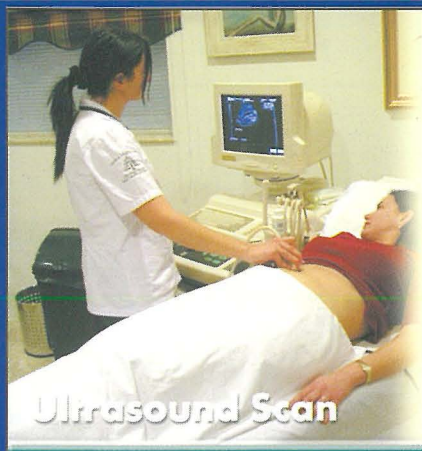
Figure 4: Tc-99m apcitide showing tracer accumulation (arrow) consistent with acute thrombus in the right popliteal vein .



Figure 5: Spiral CT scans following a single injection of IV contrast material showing (a) PE (arrow) and (b) left popliteal vein DVT (arrow).

In summary, there are a number of imaging techniques available to help us detect DVT in patients at risk and in those with evidence of PE. Venous US has been used clinically for over 2 decades with hundreds of published studies confirming its validity. Despite the shortcomings of venous US in some cases of chronic DVT and following arthroplasty, no body of knowledge exists that unequivocally points to replacing venous US in day-to-day clinical practice. Tc-99m apcitide imaging may have a role in cases with equivocal US findings. Spiral CT is useful in patients with clinically suspected PE, as it will confirm PE and identify the source of emboli (DVT) in one sitting; however, larger studies will be required to statistically confirm the efficiency of this technique. ☐

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