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Update: Significant Event Analysis of Deep Vein Thrombosis

What happened?
A 52 year old woman presented at an evening surgery with a painful leg and gave a history of having run a marathon 10 days earlier. She developed L. sided knee pain after the race, prior to flying home from abroad. Swelling behind the knee was discrete and well circumscribed and the problem was compatible with a Bakers cyst. Advice to re-attend if the situation failed to resolve, the patient had attended the local A&E unit a week later and diagnosed as having a sports injury. The following day she developed chest pain, was admitted to hospital with a diagnosis of DVT and PTE. D dimer test was strongly positive.

Why did it happen?
Failure to diagnose a serious medical problem. When seen by another GP after discharge, he volunteered that she had had a thorough all the patient problems to DVT only. She certainly could have sustained an injury related to running the marathon but it is possible her DVT could have occurred on the outbound or homeward flight. Clinical diagnostic accuracy of DVT is only approximately 50%. I would have been better to refer her, given her history of long haul flights. WHO states there is one case of DVT in every 600 journeys over 4 hours.

What has been learned?
Reviewed information including the SIGN guideline 62; DOH guidance on travel related DVT; BMJ clinical evidence.

What have you changed?
Have now a higher index of suspicion for DVT. It may not present with classical signs. Propose to carry out a “probability assessment”. Greater knowledge of D dimer test and compression ultrasonography. Suggested that the probability assessment should be adopted as part of the assessment of patients with a possible DVT.

How common is DVT?
Incidence is 1:100 patients per year. Untreated DVT has a 1:20 risk of death from PTE. Untreated DVT 50% go on to have PTE and 30% of these potentially fatal. DVT above knee and popliteal are strongly associated with PE.

What are diagnostic signs?
Common physical signs are local pain and tenderness of calf or along path of deep veins and or oedema with swelling of whole limb. Some are asymptomatic. Clinical diagnostic accuracy is no better than 50% therefore investigate if any suspicion. D dimer has high sensitivity 95% but low specificity 50% often used as a preliminary screening test as the negative predictive value is high. Contrast venography is the gold standard but compression ultrasound is non invasive so is often used.

Can the risk be quantified?
A validation model classifies patients before investigation as having a high, intermediate or low probability of deep vein thrombosis. It can be used to reduce the need for diagnostic tests in patients with suspected deep vein thrombosis.

Clinical feature Score

Active cancer (treatment ongoing or within the previous six months or palliative)	1
Paralysis, paresis, or recent plaster immobilization of the legs	1
Recently bedridden for more than three days, or major surgery within four weeks	1

Localised tenderness along the distribution of the deep system	1
Entire leg swollen	1
Calf swelling by more than 3cm compared withthe asymptomatic leg (measured 10cm below the tibial tuberosity)	1
Pitting oedema (greater in the symptomatic leg)	1
Collateral superficial veins (non-varicose)	1
Alternative diagnoses are as likely or wider than that of deep vein thrombosis (for example, ruptured Baker's cyst Superficial thrombophlebitis or infective cellulitis)	2

0 or less = low probability; 1-2 = moderate probability; 3 or more = high probability.

What are the risk factors

Hormone replacement therapy doubles the risk of venous thromboembolism in current users, resulting in 16 to 23 excess cases per 100 000 users per year. The risk is greater in the first year of use. The risk in people taking low dose oral contraceptives is also increased by up to six times that of non-users, depending on the preparation used. The absolute risk is low, however, at 3 to 4 per cent per 10 000 person years.

Other risk factors and conditions predisposing to venous thromboembolism are related to abnormalities in blood flow, blood clotting components, or vessel walls (Virchow's triad), singly or in combination.

They include:

- Previous venous thromboembolism
- Prolonged immobility or bed rest
- Paraplegia
- Surgery – major pelvic or abdominal operations or lower limb orthopaedic operations such as joint replacement within last 3 months
- Trauma – lower limb fractures, spinal injury
- Severe obesity
- Myocardial infarction, ischaemic stroke, congestive cardiac failure, acute respiratory failure
- Cancer, especially adenocarcinomas, which may not yet be clinically apparent
- Age (40 years or older)
- Genetic coagulopathies – factor V Lieden mutation (activated protein C resistance), protein C deficiency, protein S deficiency, antithrombin deficiency prothrombin gene mutation
- Acquired coagulopathies – lupus anticoagulant and antiphospholipid antibodies, hyperhomocysteinaemia, dysfibrinogenaemia, myeloproliferative disorders such as polycythaemia rubra vera
- Very tall
- Pregnant or recently delivered
- Venous obstruction due to external compression from pelvic masses or lymph nodes

What investigative tests are there?

Plasma D dimers are specific fibrin degradation products. Their concentrations are raised in patients with venous thromboembolism. They have a high negative predictive value, low concentrations – used with clinical probability, plethysmography, or ultrasonography – can therefore help to rule out the need for imaging. D dimers are sensitive but not specific, and high concentrations may occur post operatively, in the elderly, in malignancy or pregnancy, and in other conditions.

Enzyme linked immunosorbent assay and latex agglutination are laboratory based tests (enzyme linked immunosorbent assay is the more sensitive).

Rapid near patient tests include SimpliRed, a whole blood agglutination test that produces a result in 10 minutes, and Simplify, an immunochromatography test that has not yet been fully evaluated.

Ultrasonography is the best non-invasive test, with a sensitivity and specificity of 97% for proximal deep vein thrombosis (75% sensitivity for symptomatic calf deep vein thrombosis). Compression ultrasound is the simplest and most commonly used method. Thrombosis is unlikely if the vein is compressible with no residual lumen. In patients with suspected calf vein thrombosis where compression ultrasound is less sensitive, it may be combined with a pre-test clinical model or repeated after five to seven days. Serial ultrasonography is inconvenient and more expensive, but untreated patients with two negative tests over a week have less than a 2% chance of proximal extension or subsequent deep vein thrombosis. It has been suggested that serial scans may not be needed if compression ultrasonography of the proximal leg veins is combined with a pre-test probability model. Duplex ultrasonography has an additional pulsed Doppler signal that detects phasic blood flow fluctuations during respiration. Absence of a phasic pattern implies venous thrombosis. Colour flow duplex imaging is duplex ultrasonography in which false colour is used to indicate the direction of blood flow.