MANAGEMENT OF DEEP VEIN THROMBOSIS AND PULMONARY EMBOLISM

***Dr. S. Fayyaz Hussain FRCP (Edin)**

Deep vein thrombosis (DVT) usually originates in the deep-veins of the leg. Risk of developing pulmonary embolism (PE) is high if the thrombus extends above the knee. There is controversy whether DVT below the knee requires treatment. If the decision is made not to treat below knee DVT then the patient should be followed for signs of progression of the thrombus above the knee.

Risk Factors:
Major Trauma and Surgery (especially orthopedic surgery),
Hyper-coagulation states including Cancer,
Congestive Heart Failure (with or without myocardial infarction)
Bed Rest
Pregnancy and post-partum period
Contraceptive pills especially above the age of 35 and in smokers.
Obesity

Diagnosis: For the diagnosis of DVT the initial investigation of choice is color flow Doppler ultrasound. It is a highly sensitive and specific test. It combines the ability to detect changes in venous flow and venous collapse under the ultrasound probe pressure using color Doppler visual display. Absence of detectable clot is correlated with a low frequency of pulmonary embolism. Contrast venography has been used for years for the diagnosis of DVT. Results of venography are at times difficult to interpret and Doppler ultrasound is now more commonly used.

Ventilation Perfusion (V/Q) scan looks for areas of the lung that are ventilated but are not perfused. It visualizes the gas exchange in the lungs using Xenon-133 and the perfusion of the lung using technetium 99m-labeled albumin aggregates. The test is reported as high probability, intermediate probability or normal. High probability scans are defined as at least one lobar or two or more segmental mismatches (that is ventilated but not perfused). High probability scans are associated with pulmonary embolism approximately 90% of the time. Normal V/Q scans are defined as showing both normal ventilation and normal perfusion. Normal scans virtually exclude the diagnosis of PE. The V/Q scan is a diagnostic end point only if it is normal or high probability. False high probability scans occur most often in patients with a previous pulmonary embolism. Therefore, the V/Q scan is less useful in patients with previous pulmonary embolism unless a new baseline scan was obtained after completion of treatment. Scans read as intermediate, indeterminate or low probability required additional studies to exclude or confirm a diagnosis of pulmonary embolism with adequate certainty. The usual strategy is to follow an indeterminate, intermediate or low probability V/Q scan with a noninvasive study to assess the lower extremity for DVT.

Pulmonary Angiography is the "gold standard" test for diagnosing pulmonary embolism. An angiogram positive for P.E. shows cut-offs in the vascular tree or intraluminal filling defects. Using the perfusion scan as a guide, selective injection of the lungs can decrease the amount of contrast necessary for a diagnosis.

**Head of Pulmonary Section and Associate Professor*
The Aga Khan University Hospital, Karachi.

Prophylaxis: Heparin is the agent of choice for prophylaxis of DVT and PE. For most medical patients heparin 5,000 units bid, given subcutaneous, is adequate. For some patients intermittent pneumatic compression of legs is an alternative. Prolonged prophylaxis with heparin carries some risk because long-term heparin use is associated with osteoporosis.

Treatment: Treatment is generally targeted at preventing further clot formation and allowing the normal fibrinolytic process to dissolve the clot. Fibrinolytic agents like streptokinase can be used to lyse the clot in emergency clinical situations e.g. patient with PE and shock.

Heparin is the primary anticoagulant used to acutely treat DVT and PE. Heparin is a mixture of glycosaminoglycans that bind to and activate antithrombin III to inhibit further clot formation. The usual dose for Heparin is a loading dose of 5,000 units followed by approximately 1,000 units per hour to keep the APTT at 1.5 to 2 times control.

Warfarin (coumadin) is used to maintain anti-coagulation over a long period of time. It is a compound that competes with vitamin K and depletes vitamin K dependent clotting factors (II, VII, IX and X). Its action is similar to heparin in that it inhibits further clot formation, however, its advantage over heparin is that it can be taken orally. Warfarin therapy can begin on day one of heparin therapy and is monitored using the PT (Prothrombin Time), and a ratio of treated to control PT (INR) of 2.0 to 3.0 is considered therapeutic. Several days of overlap of heparin and warfarin are usually required. Warfarin inhibits clotting factor production and treatment the PT does not elevate until the preexisting clotting factors are consumed or degraded.

Caval Interruption: Because most clots (95%) form in the deep veins of the pelvis and lower extremity, they must travel through the inferior vena cava to reach the lungs. Caval interruption, usually meaning placement of a Greenfield Filter, is reserved for patients who bleed on heparin or are not candidates for anticoagulation. These latter patients include patients with recent surgery or bleeding. In addition, it can be used for patients who experience recurrent pulmonary embolism despite adequate anticoagulation. Overall, caval disruption is an inferior therapy compared to heparin or warfarin because it does not treat the hypercoagulable state. If the filter becomes obstructed with clot, the body develops collaterals around the caval obstruction. This may lead to recurrent pulmonary embolism.

Low Molecular Weight Heparins: Recent studies show that low molecular weight heparin is slightly superior for both treatment and prophylaxis of deep-vein thrombosis. There is a lower incidence of heparin associated thrombo-cytopenia with the low molecular weight heparins. However, low molecular heparins are quite expensive. For most medical patients the increased cost probably exceeds the increased benefits.