DEEP VEIN THROMBOSIS

Abstract
Deep vein thrombosis is the thrombus or clot formation in the deep veins of the calf leading to interruption of flow of blood through deep veins. The formation, propagation and dissolution of venous thrombus represent a balance between thrombus formation and body's protective mechanisms such as circulating inhibitory of coagulation and fibrinolytic systems. Diagnosis of deep vein thrombosis at the earlier stage is very important if this dreadful complication (pulmonary embolism) is to be prevented. Venous injury should be avoided by avoiding pressure on the calf veins and by avoiding infusing irritant substances through leg veins.

Key words: Deep vein thrombosis, Virchow’s triad, Doppler flowmeter, Low molecular weight heparin.

Deep vein thrombosis is the thrombus or clot formation in the deep veins of the calf leading to interruption of flow of blood through deep veins. It is a common cause of increased morbidity and mortality in surgical patients.

The risk of embolization to pulmonary artery and almost fatal consequences are very high. Fortunately it is less common in this part of the world (Indo-Pakistan).

INCIDENCE
The incidence of DVT is increasing. 140,000 - 250,000 new cases are seen every year in USA.

It leads to 50,000-200,000 deaths every year.
It causes 15% in hospital deaths every year.

**PATHOLOGY & PATHOGENESIS**

Stasis of blood, injury to the vessel wall and increased coagulability are the common factors leading to thrombus formation in the calf veins.

Virchow’s triad for thrombo embolism formation is primary mechanism for development of venous thrombosis; (Venous stasis)
- Reduced blood flow.
- Injury to veins.
- State of hypercoagulability.

The vascular injury leads to promotion of adherence of platelets to the endothelium. Platelets also release mediators after activation which allow fibrinogen to stick to adjacent platelets.

Hemostatic plug is formed and strengthened. Thrombolysis also begins after plug formation.

The formation, propagation and dissolution of venous thrombus represent a balance between thrombus formation and body’s protective mechanisms such as circulating inhibitory of coagulation and fibrinolytic systems.

Age is important in thrombus formation and pulmonary embolism is more common in middle aged and elderly. Thrombosis more common with disorders such as;
- Congestive cardiac failure.
- Acute myocardial infarction.
- Atrial fibrillation.
- Metastatic malignancy.
- Carcinoma of pancreas.
- Carcinoma of prostate.
- Major surgery.
- Major trauma.

- Burns.
- Pregnancy.
- Post partum infection.
- Oral contraceptives
- Severe trauma
- prolonged immobilization
- Long air travel
- Hip replacement surgery
- Polycythemia
- Smoking
- Obesity
- Diabetes mellitus
- Varicose veins
- Previous H/O DVT

The incidence of deep vein thrombosis is high following above diseases, during prolonged immobilization, in the ladies, after previous thrombosis and with varicose veins.

The thrombus is usually formed in the deep veins of the calf and obstruction to venous flow occurs. The thrombus may be blocking many vessels leading to raised venous pressure and edema formation.

If the venous pressure raises above local arterial pressure, venous gangrene occurs due to lack of blood flow.
Following thrombosis, most of the veins remain obstructed. Recanalization of veins also occurs but the venous valves are destroyed and become incompetent.

Loose thrombi are taken away by the blood as emboli to the right heart and pulmonary artery, leading to pulmonary embolism.

Small emboli do not cause serious effects immediately but larger emboli are usually fatal.

80% of the pulmonary emboli arise from thrombi of deep veins of the calf. Only 55% are diagnosed before the death of the patient.

**TROUSSEAU’S SYNDROME**

It is a condition which presents with spontaneous recurrent migratory venous thrombosis. Arterial embolization is caused by non-bacterial thrombotic endocarditis or both.

It is seen in patients with known malignancy or occult malignancy.

These patients have persistent low grade intravascular coagulation and anticoagulant therapy with heparin should be continued for ever otherwise new thrombus formation will occur:

- Two properties of the malignant lesions are required to develop Trousseau’s syndrome;
- The malignant cells express surface membrane tissue factor.
- Structural features of the tumor permit the malignant cells or vesicles it sheds to be exposed to circulating blood².

**PARADOXICAL EMBOLISM**

It is the embolism which passes through an intra-cardiac defect such as patent foramen ovale. It is associated with deep vein thrombosis and pulmonary embolization³.

**DIAGNOSIS**

Diagnosis of deep vein thrombosis at the earlier stage is very important if this dreadful complication (pulmonary embolism) is to be
DEEP VEIN THROMBOSIS

Proper history and clinical examination are most important in diagnosing this condition. The most prominent signs of deep vein thrombosis in pregnant women are swelling and tenderness of the affected leg, sometimes accompanied with fever and leucocytosis. The leg swelling may be absent in pelvic thrombosis.

Swelling of calf, local tenderness and positive Homan’s sign are common clinical features. Absence of these features does not exclude deep vein thrombosis. Edema of limb and even venous gangrene may be present if the venous pressure is raised.

DOPPLER FLOWMETER
Ultrasound waves are used to measure the flow of venous blood in leg veins with the doppler probe.

It gives correct results in 80% cases but fails to detect venous obstruction if the obstruction is partial or larger collateral are present leading to reasonable venous flow.

Screening doppler sonography should be performed in all patients of hip fracture surgery to identify deep vein thrombosis (DVT) as patients are at higher risk of developing proximal DVT.

RADIOACTIVE FIBRINOGEN UPTAKE TEST
Radioactive fibrinogen (labeled I 125) is injected intravenously and radio-activity is checked up with receiving counter probe.

Thyroid uptake of iodine is blocked with potassium iodide before isotope is given. This test can diagnose deep vein thrombosis with 70-98% accuracy. False positive results are seen in the presence of haematoma, bruising, previous operations, edema and inflammation.

PHLEBOGRAPHY
It is the most accurate and specific method of diagnosing deep vein thrombosis. Negative shadow or lack of venous filling with the radio-opaque dye indicates venous thrombosis.

PLETHYSMOGRAPHY
The change in the venous volume of the limb is measured with this method and deep venous thrombosis can be diagnosed. It is rarely used.

CONTRAST MEDIUM VENOGRAPHY
Although it is confirmatory test for deep venous thrombosis, it is invasive and has its own hazards. Allergic and anaphylactic reaction contrast induced DVT, technical difficulties, Inadequate studies, intra observer variability and lack of availability. This investigation is non diagnostic or contraindicated in 20-25% of patients.

RADIOISOTOPE VENOGRAPHY
It is associated with relatively less number of complications. It is rarely used these days.

DUPLEX SCANNING
Real time B mode ultrasound with Doppler wave mapping is used for duplex scanning in deep vein thrombosis.

It is combination of real time ultrasonography with doppler flow studies.

Scan detects thrombus by failure to compress the vascular lumen.

Color doppler shows absence of color filling.
and flow in the deep veins.

The sensitivity of duplex scan for proximal vein DVT is 97% but 73% for calf vein DVT. Its over all specificity is 95%.

It helps to differentiate DVT from haematoma, baker’s cyst, abscess and other causes of leg pain and edema.

It is unable to differentiate between old and new thrombus. Color doppler is unable to diagnose perforating vessels.

**CT/M.R.I**

Perforation can be visualized by CT scan with 3D reconstruction.

It is expensive but an excellent method of investigations. It has no complications and is a non invasive investigation.

It is used more after now a days in suspected cases of DVT. Its accuracy is similar to contrast venography. It is most sensitive and useful in pregnant ladies during 2nd and 3rd trimester.

**PREVENTION**

Factors predisposing to deep vein thrombosis should be avoided.

**PRE-OPERATIVE MEASURES**

Weight should be reduced as the incidence of deep vein thrombosis is more in obese patients.

Oral contraceptives should be discontinued in patients who are at risk to develop deep vein thrombosis.

It is known that prolonged immobilization definitely increases the chances of deep vein thrombosis. The patients who are admitted to the hospital for investigations prior to major surgery are at a greater risk as they keep lying in the bed are likely to develop deep vein thrombosis.

If possible, patients should be investigated as outpatients and they should be advised limb exercises if not contra indicated by their disease.

**PRE-OPERATIVE MEASURES**

Venous injury should be avoided by avoiding pressure on the calf veins and by avoiding infusing irritant substances through leg veins.

Elevation of limbs by putting a pillow under the heals in operating theater is a very effective and simple method for avoiding the injury to deep calf veins. It has brought down the incidence of deep veins thrombosis post operatively.

The flow of blood in the limb vessels also improved due to effects of gravity in the elevated limbs.

Stasis of blood can be minimized by elevation of limbs, exercises, compression bandages and using pneumatic pumps during prolonged surgery and immobilization.

**PHARMACOLOGICAL MEASURES**

Hypercoagulability states can be prevented by using anticoagulants and antiplatelet stickiness drugs.

Heparin 5000 iu subcutaneously eight hour-ly for five days starting from the day of operation decreases the incidence of deep vein thrombosis.

Intravenous use of dextran during operation
also decreases the deep vein thrombosis inci-
dence.

Use of aspirin, persantin and antiprostaglan-
dins also decreases the deep vein thrombus formation.

TREATMENT
CONSERVATIVE
Bed rest and elevation of the limb should be
done when the thrombus has formed. This
minimizes the separation of clot and the risk
of pulmonary embolus formation.

Cessation of smoking is recommended in
pregnant or post-partum women.

Elastic stocking or compression bandages
are used to improve venous return and de-
crease venous pressure. Later on leg exercises are encouraged to improve the venous
return.

Anticoagulants like heparin are given in con-
tinuous intravenous injections.

Low molecular weight heparin have almost
replaced standard heparin in the treatment
d of DVT in pregnant women. It has less num-
ber of side effects, easy subcutaneous applic-
ation, no need for laboratory control, lower
risk of bleeding and lower risk of osteoporosis
and thrombocytopenia post treatment⁵.

Later on oral anticoagulants are started and compression bandages are given.

THROMBOLYTIC THERAPY
Streptokinase and urokinase are used in estab-
lished cases of deep vein thrombosis, dose
is 600000 iu in first half hour and 1000000
iu every hour according to the prothrombin
time.

Infusion of tissue-type plasminogen activator (tPA) has very promising outcome in lysing
the clot in peripheral deep veins. It minimizes the tendency toward post phlebitic syn-
drome

It also helps to lyse the pulmonary embolus. Intravenous infusion is as effective as in-
trapulmonary infusion¹.

SURGICAL TREATMENT
LIGATION OF VEINS
Ligation of the veins proximal to the throm-
bus eliminates the risk of pulmonary embo-
lism but has its own disadvantages which
make this operation less popular.

PLICATION OF VENA CAVA
This is also an alternative to ligation of veins
to avoid pulmonary embolism but has its own ill effects making it unsatisfactory as well.

THROMBECTOMY AND LIGATION
It is surgical removal of the thrombus. This
method is used if the deep vein thrombus has
already occurred. Re thrombus formation is
very common after this method.

MOBIN UD DIN UMBRELLA OR GREEN-
FIELD STEEL WIRE FILTER
These prosthesis and cannulas are helpful in
avoiding pulmonary embolism.

Once deep vein thrombus has occurred, the
treatment is not satisfactory.
REFERENCES


