



A CASE STUDY ON DEEP VEIN THROMBOSIS

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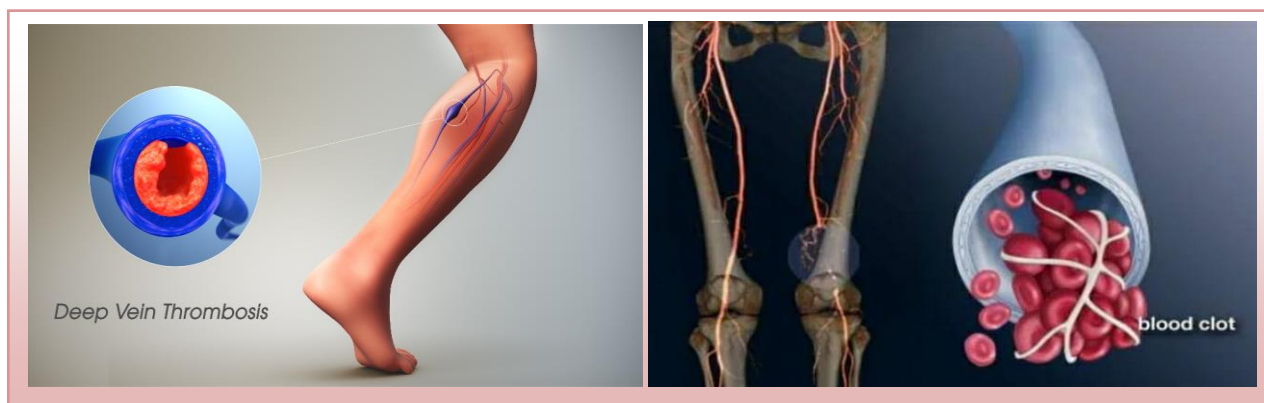
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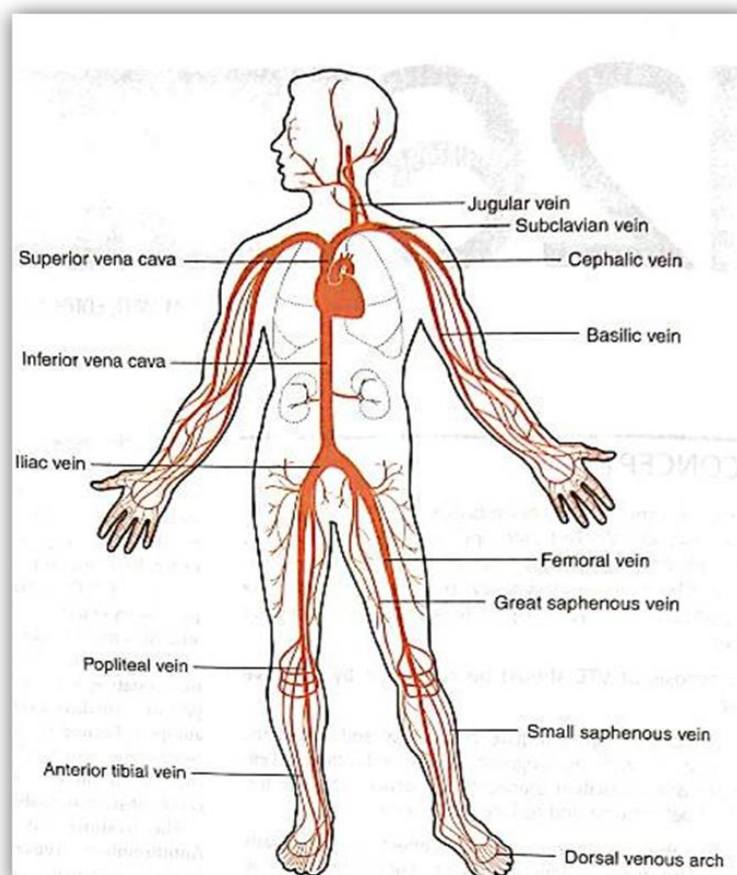
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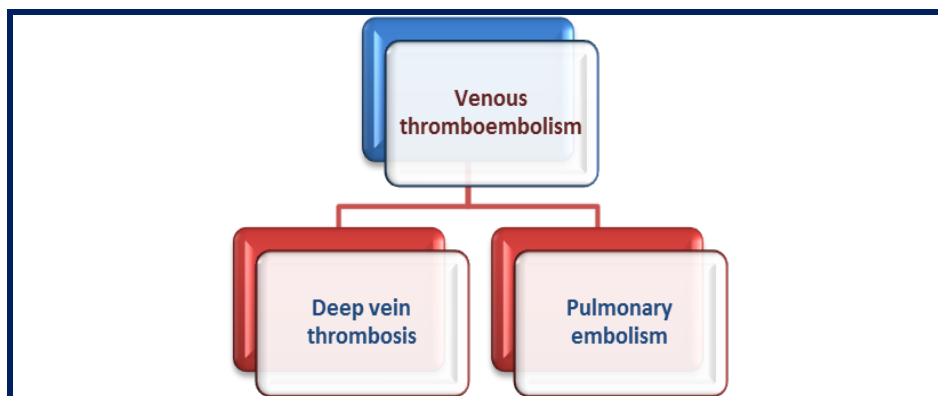


VENOUS CIRCULATION



DEFINITION

Deep vein thrombosis is the formation of blood clot in one of the deep veins of the body, usually veins.

**EPIDEMIOLOGY**

- Venous thromboembolism related death 3,00,000/annum
- 7% are diagnosed and treated
- 34% sudden pulmonary embolism
- 59% undetected
- An estimated 350,00 to 600,000 people in the United States develop VTE each year and more than 100,000 die.
- Patients who sustained multiple traumas or undergo an orthopedic procedure involving a lower extremities are at particularly high risk, with the incidence of VTE often exceeding 50% in the absence of effective prophylaxis.

INCIDENCE

- An annual incidence of symptomatic venous thromboembolism as 117 per 100,000 persons.
- Venous thromboembolism is hospitalized patients has increased from 0.8% to 1.3% over a period of 20 years (reported in 2005).
- Without prophylaxis the incidence of deep vein thrombosis is about
 - ✚ 14% in gynaecological surgery
 - ✚ 22% in neurosurgery
 - ✚ 26% in abdominal surgery
 - ✚ 45%-60% in patients undergoing hip and knee surgery
 - ✚ 15% - 40% in urologic surgery

ETIOLOGY

Virchow's triad describes three factors that are thought to contribute to thrombosis.

**Venous stasis**

- ✓ Prolonged bed rest (4 days or more)
- ✓ A cast on the leg
- ✓ Limb paralysis from the stroke
- ✓ Spinal cord injury
- ✓ Extended travel in a vehicle
- ✓ Age(greater than 65 years)

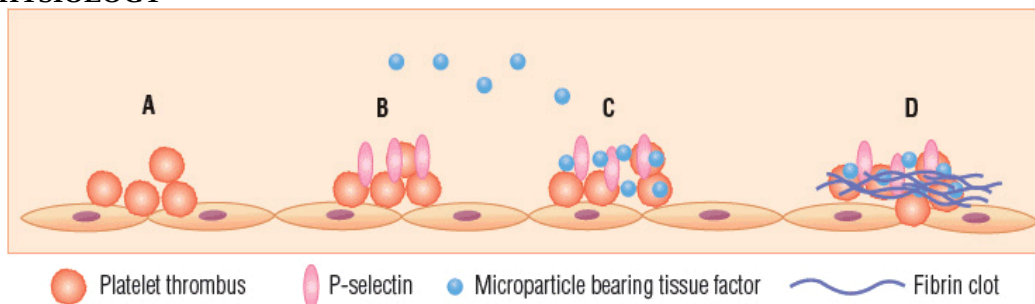
Endothelial damage

- ✓ Trauma
 - ✓ Surgery
 - ✓ Pacing wires
 - ✓ Dialysis access catheters
 - ✓ Repetitive motion injury
 - ✓ Central venous catheters
 - Sub clavian
 - Internal jugular lines
- These lines are cause of upper extremities DVT

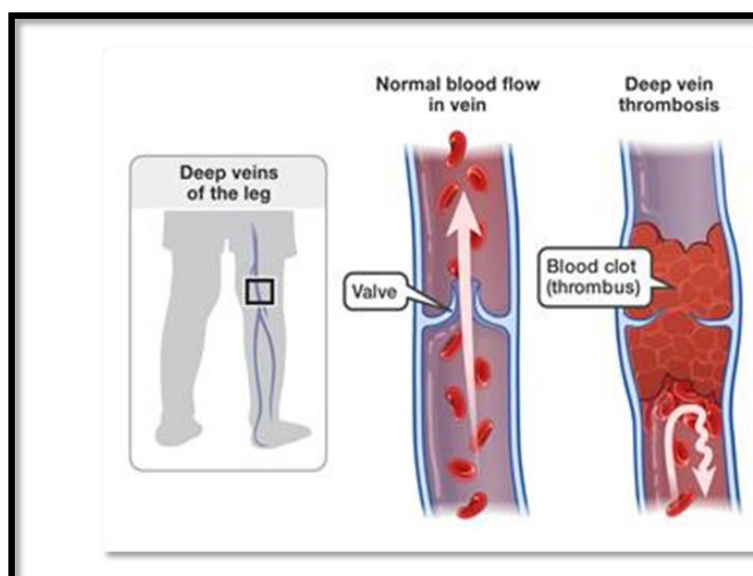
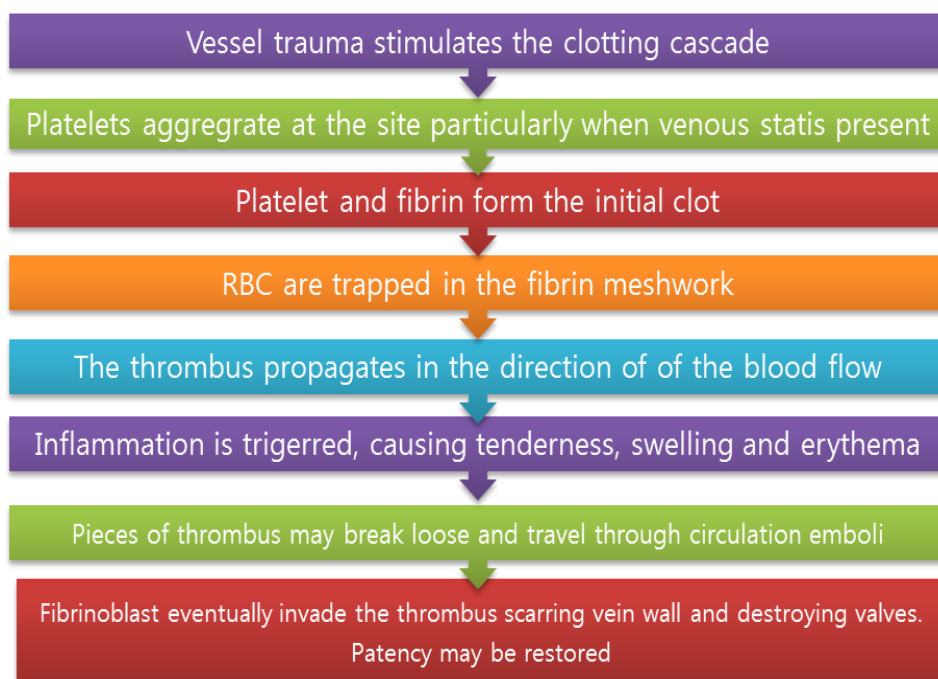
Hypercoagulable state

- ✓ Surgery and trauma- 40% of all thromboembolic disease
- ✓ Malignancy
- ✓ Increased estrogen
- ✓ Inherited disorders of coagulation- deficiencies
 - *Proteins-S*
 - *Protein-C*
 - *Anti-Thrombin-III*
- ✓ Acquired disorders of coagulation
 - *Nephrotic syndrome*
 - *Anti-phospholipid antibodies*

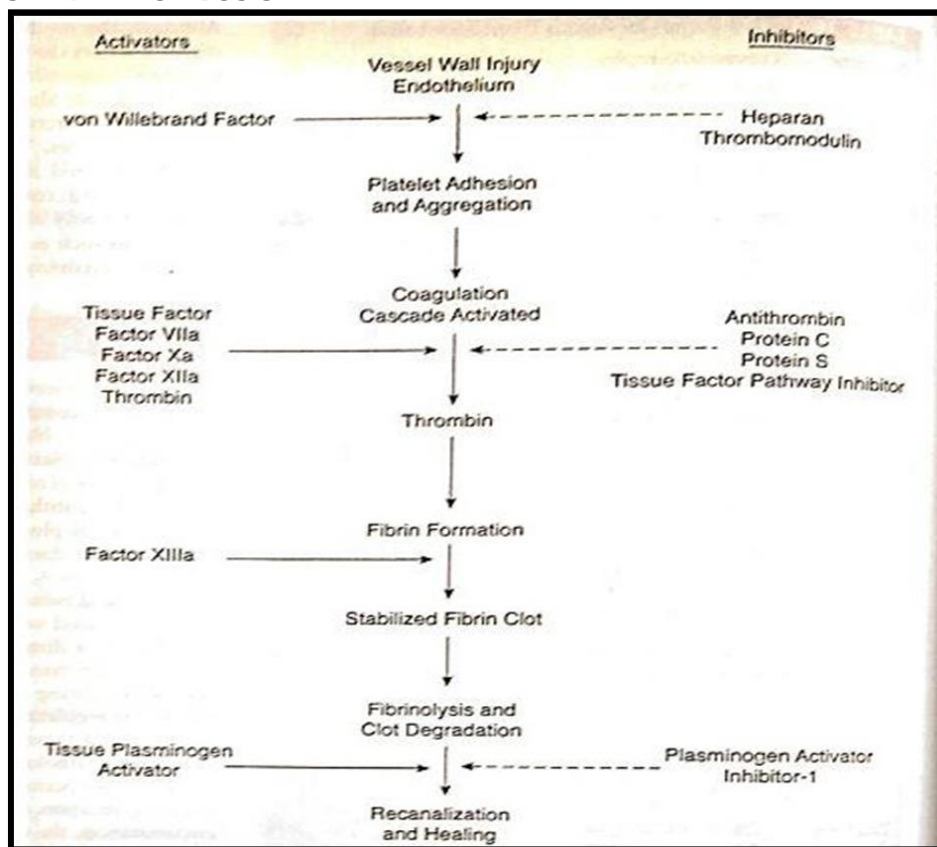
PATHOPHYSIOLOGY



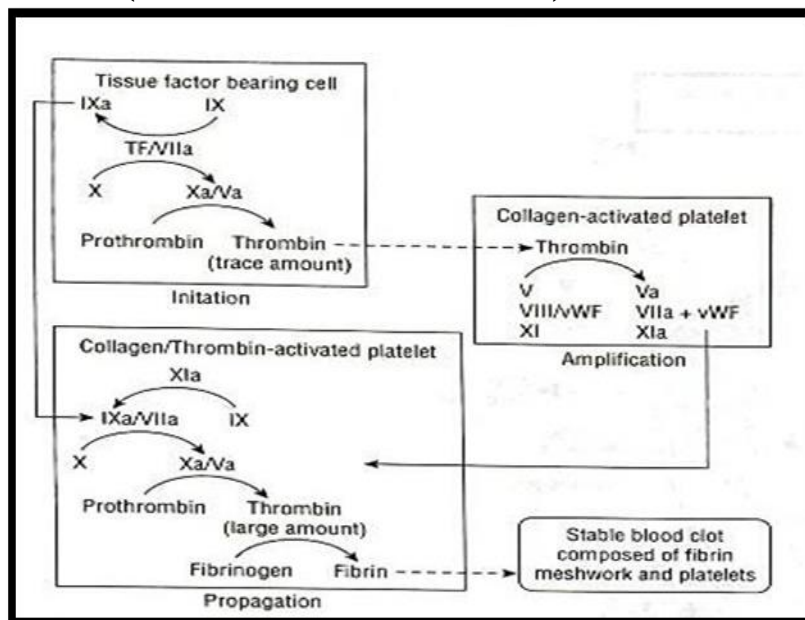
- A. Activated platelets adhere to vascular endothelium
 B. Activated platelets express P- selectin
 C. Pathologic microparticles express active tissue factor and are present in a high concentration in the circulation--- these micrpaticles accumulate perhaps by binding to activated platelet expressing P-selectin.
 D. Tissue factor can lead to thrombin generation and thrombin generation leads to platelet thrombus formation and fibrin generation.



HEMOSTASIS AND THROMBOSIS



COAGULATION CASCADE (TF, VON WILLEBRAND FACTOR)



CLINICAL MANIFESTATIONS

- Calf pain or tenderness or both
- Swelling with pitting edema
- Increased skin temperature
- Superficial venous dilation
- Cyanosis can occur with severe obstruction

Less frequent manifestations of venous thrombosis include

- Phlegmasia alba dolens
- Phlegmasia caerulea dolens
- Venous gangrene

Phelgmasia alba dolens

Thrombosis is only major deep venous channels sparing collateral veins



Causing painful congestion and odema of leg, with lymphangitis

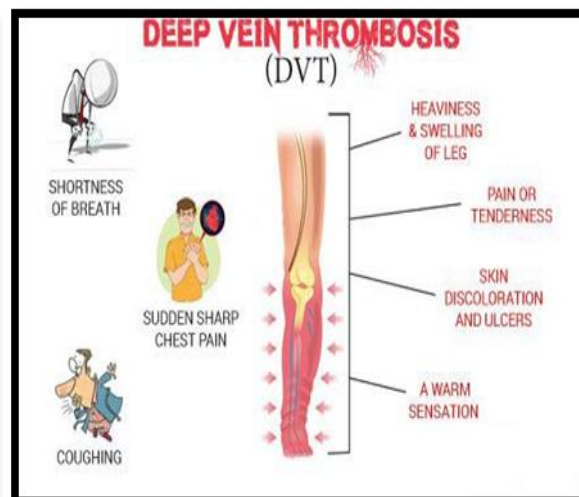
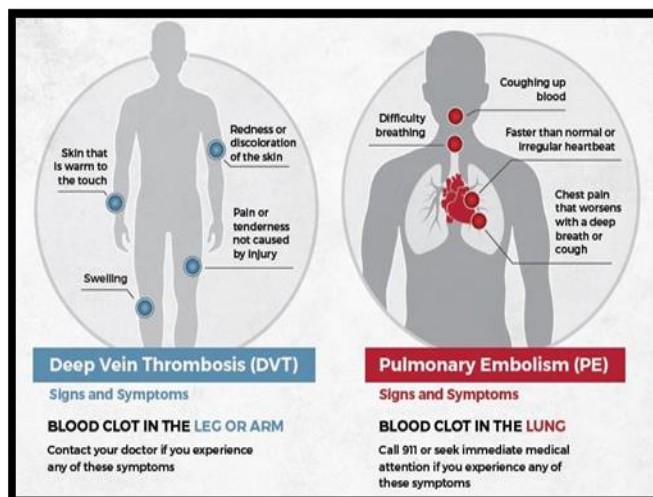


with further increases Odema

**Phelgmasia caerulea dolens**

thrombosis extend to collateral veins

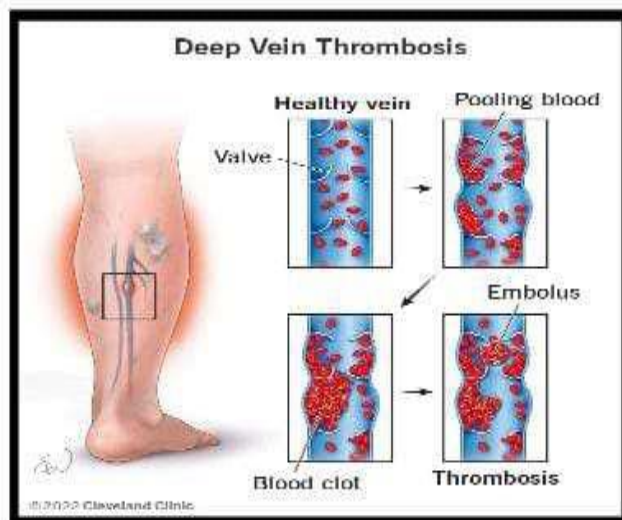
congestions, massive fluid sequestration, edema

**SIGN AND SYMPTOMS**

RISK FACTORS

- ✚ Age: Being older then 60 increases the risk
- ✚ Injury or surgery
- ✚ Pregnancy
- ✚ Birth control pills (oral contraceptives) or hormone replacement therapy

- ✚ Obesity
- ✚ Smoking
- ✚ Cancer
- ✚ Medical co-comorbidities

**COMPLICATIONS**

1. The most serious complication of a DVT is that the clot could dislodge and travel to the lungs, which is called.

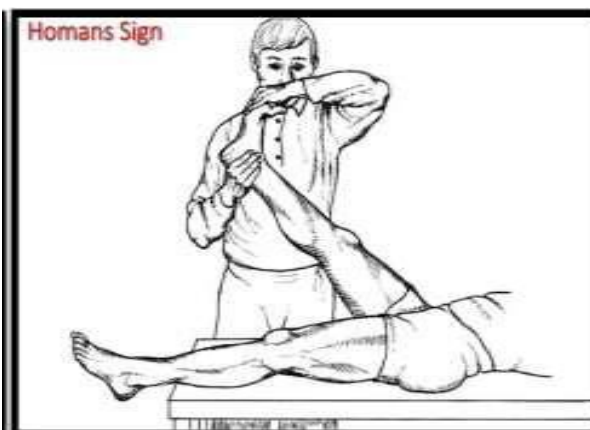
Pulmonary embolism

DVT is a medical emergency present in the lower extremity there is 3% chance of PE killing the patient.

2. A late complication of DVT is the **Post-phlebotic syndrome**, which can manifest itself as edema, pain or discomfort and skin problems.

CLINICAL EXAMINATION

- ❖ Palpate distal pulses and evaluate capillary refill to assess limb perfusion
- ❖ Move and palpate at joints to detect acute arthritis or joint pathology
- ❖ Neurologic evaluation may detect nerve root irritation, sensory, motor and reflex deficits should be noted

HOMAN'S SIGN

Homan's sign or test is a screening test used to check for DVT of the calf.

It's sometimes called "Dorsiflexion sign"

Procedure

The patient is supine.

The examiner lifts the affected leg and rapidly dorsiflexes the patient's foot with the knee extended.

This maneuver is repeated with the patient's knee flexed while the examiner simultaneously palpates the calf.

RESULT

Sign is positive if pain is occurring upon dorsiflexion of the foot with knee extended and flexed indicating DVT.

MOSES SIGN

Gentle squeezing of the lower part of the calf from side to side.

Moses sign also known as “**Bancroft’s sign**”.

Procedure

- Patient should be awake and cooperative during moses’s test.
- Patient should be prone during this examination.
- The patient should have her knee flexed 90 degrees.
- The examiner squeezes the patient calf and observes patient for sign of discomfort and pain.

Interpretation

Positive Moses’s test

There is a positive moses’s test when there is...

- Short duration “deep” calf pain — this could indicate lower extremity vascular insufficiency, thrombophlebitis, arteriosclerosis obliterans.
- Persistent “achy” calf pain — gastrosoleus strain or MFTP.

LINTONS SIGN/TRENDLENBERG TEST

This test is used to identify weakness of the hip abductors.

It also can be used to assess other mechanical, neurological or spinal disorders such as Congenital dislocation of the hip.

Procedure

The patient is asked to stand on one leg for 30 secs without leaning to one side, the patient can hold onto something if balance is an issue.

The examiner observes the patient to see if the patient pelvis stays level during single-leg resistance.

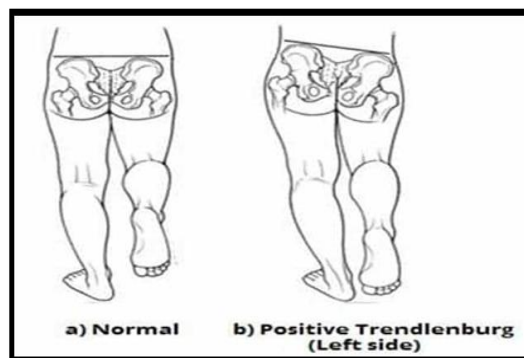
After applying tourniquet at saphenofemoral junction patient made to work, then limb is elevated in supine position prominent superficial veins will be observed.

Interpretation

The trendelenberg test is positive...

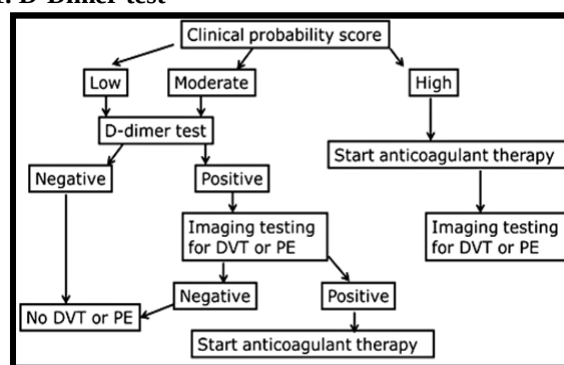
During unilateral weight bearing the pelvis drops towards the unsupported side.

If the hip remains levels the test is considered as negative.



DIAGNOSIS

1. D-Dimer test



2. Compression ultra sound (CUS) and computed tomography pulmonary angiography (CTPA) are used most often for initial evaluation of suspected VTE.

3. Radiographic contrast studies (Venography, pulmonary angiography) are the most accurate and reliable diagnostic methods but are also expensive, invasive and difficult to perform.

4. Clinical assessment checklists (eg. Wells score) can be used to determine whether a patient is likely or unlikely to have DVT or PE.

5. International normalised ratio (INR) and Activated partial thromboplastin time (APTT).

DVT SCORE

Calculation of clinical pretest probability (Wells DVT Score)	
Active cancer (on treatment for last 6 months or palliative)	1
Paralysis, paresis or plaster immobilization of lower limb	1
Immobilization previous 4 days	1
Entire leg swollen	1
Calf Swollen by more than 3 cm	1
Pitting edema	1
Collateral superficial veins (non-varicose)	1
Probable alternative diagnosis	-2
(If both legs are symptomatic, score the more severe leg)	

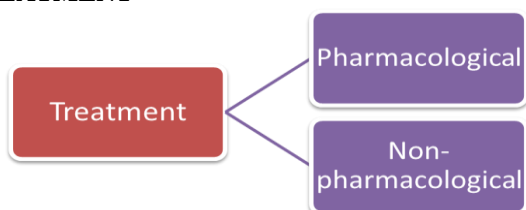
Interpretation of the score

- ≥ 3 High DVT Risk
- 1-2 Moderate DVT Risk
- <1 Low DVT Risk

VENOUS DUPLEX ULTRASONOGRAPHY

It is due to high sensitivity, specificity and reproducibility has replaced venography as the most widely used test in the evaluation of the disease. This involves both B mode image and Doppler flow analysis.

TREATMENT



Treatment

Goals of treatment

- The initial goal is to prevent VTE in at-risk populations.
- Treatment of VTE is aimed at preventing thrombus extension and embolization, reducing recurrence risk, and preventing long-term complications.

Pharmacological treatment

- Oral anticoagulants (Direct Thrombin Inhibitors)
- Thrombolytic agents
- Embolectomy therapy
- Low molecular wt heparin
- Ultra fractionated Heparin

1. Oral anticoagulants

(Direct Thrombin Inhibitors)

- Rivaroxapam** ⇒ 15mg twice daily for 3 weeks followed by 20mg once daily with dinner meal.
- Apixaban** ⇒ 10 mg daily for 1 weeks followed 5mg twice daily.
- Dabigatran** ⇒ 220mg used after 5 days of unfractionated heparin/low molecular wt. heparin/ Fondaparinux twice daily

2. Thrombolytic agents

These agents are proteolytic enzymes that enhance conversion of plasminogen to plasmin, which subsequently decreases fibrin matrix

- Streptokinase ⇒ 2 lakh 59 units as loading dose over 30 min followed by 1 lakh IU/hr

- Urokinase ⇒ 4,400 IU/kg as loading dose over 10 min
- Alteplase ⇒ 0.9mg/kg over 30 mins, {max. dose is 100 mg}
- Reteplase ⇒ 0.6 mg/kg over 15 min {max. dose is 50 mg}

3. Embolectic therapy

Surgical removal of embolus or catheter based surgical procedure

4. Low molecular wt. heparin

- Enoxaparin ⇒ (1mg/kg) SC every 12 hrs or 1.5 mg/kg every 24 hrs.
- Tinzaparin – 175U/kg once daily with normal kidney function
- Enoxaparin/ Tinzaparin/ Dalteparin – 200U/kg SC once daily (or) 100U/kg twice daily with normal renal function{max. total daily dose is 18,000 units}

5. Ultra fractionated Heparin

It binds to anti thrombin,provoking a configurational change that makes it much more potent in inhibiting the activity of IXa, Xa, XIIa and IIa

R.O.A: Bolus, 5000U

IV followed by continous IV infusion at a rate of 1000 U/hr

The dose is adjusted for unfractionated heparin to maintain APTT

(1.5-2.5 times) normal which should be evaluated every 6hrs

Fondaparinux Na

The dose is adjusted to body wt. which is given S.C every 24 hrs.

Non-pharmacologic therapy

- Encourage patients to ambulate as much as symptoms permit.
- Ambulation in conjunction with graduated compression stockings results in faster reduction in pain and swelling then strict bed rest with no increase embolization rate.
- Inferior vena cava filters should be only used when anticoagulants are contraindicated due to active bleeding.
- Elimination of the obstructing thrombus via thrombolysis or thrombectomy may be warranted in life-or limb-threatening DVT.

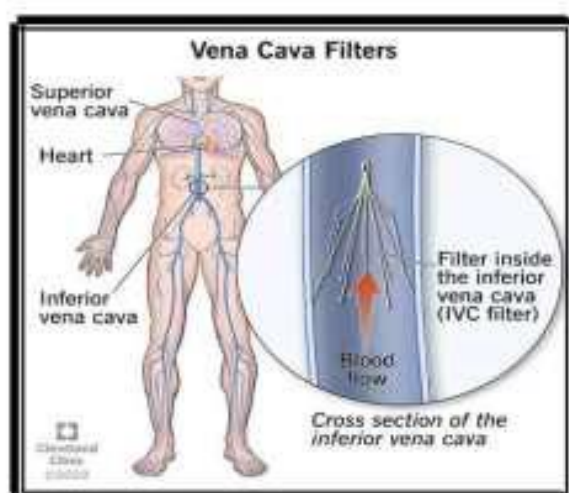
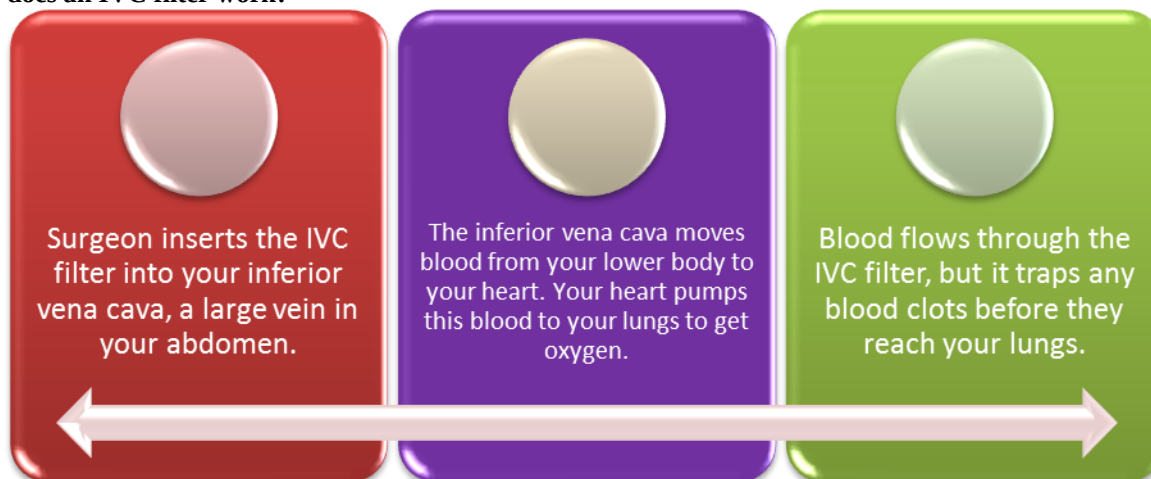
1. Inferior venacava → IVC filter

A vena cava filter is a small metal device that stops blood clots from traveling to your lungs (pulmonary embolism).

Healthcare providers use two types of vena cava filter:

Inferior vena cava (IVC) filter: An IVC filter stops blood clots from your lower body.

Superior vena cava (SVC) filter: An SVC filter stops blood clots from your upper body.

How does an IVC filter work?

2. Surgical procedures

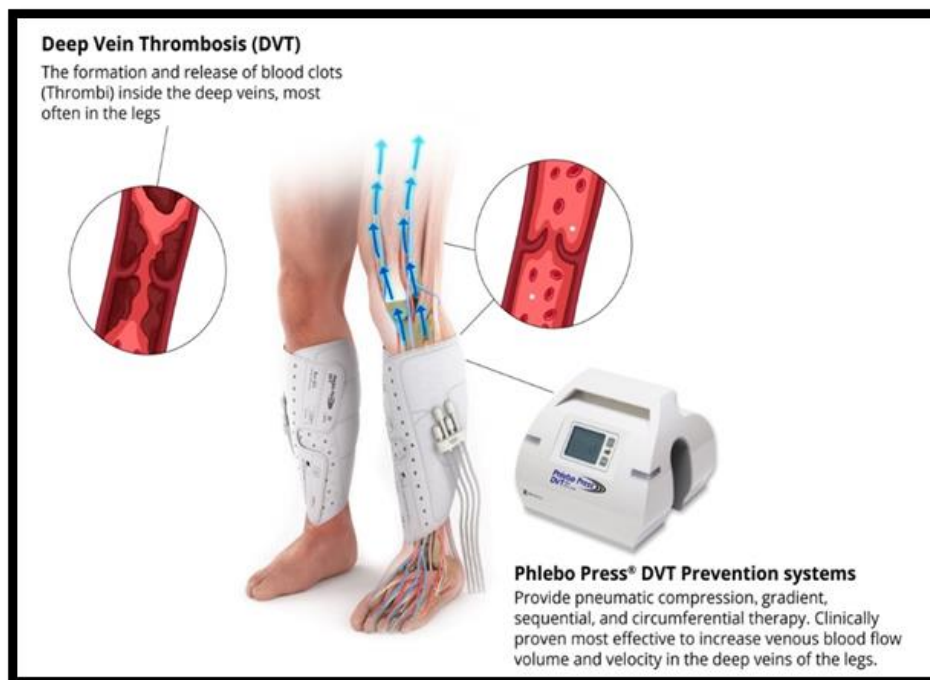
3. Mechanical:

❖ Graded compression stocking

❖ Pneumatic compression boots

GRADED COMPRESSION STOCKING

PNEUMATIC COMPRESSION BOOTS



MANAGEMENT

Prophylactic treatment includes:

- ➔ Unfractionated heparin
- ➔ Low molecular wt. heparin
- ➔ Vit K analogus
- ➔ Tissue plasminogen activator (0.9 mg/ml)

EVALUATION OF THERAPEUTIC OUTCOMES

- ❖ Monitor patient's resolution of symptoms, development of recurrent thrombosis, symptoms of post thrombotic syndrome and adverse anticoagulant effects.
- ❖ Monitor haemoglobin, haematocrit and blood pressure carefully to detect bleeding and anticoagulant therapy.
- ❖ Perform coagulation tests (APTT, PT, INR) prior to initiating therapy to establish the patient's.

LIFESTYLE AND HOME REMEDIES

Once you receive treatment for deep vein thrombosis you need to watch your diet and look for signs of excessive bleeding, as well as take steps to help prevent another DVT. Some things you can do include:

Check in with your doctor regularly: To see if your medication or treatments need to be modified. If you're taking warfarin (Coumadin, Jantoven), you'll need a blood test to see how well your blood is clotting.



Take your blood thinners as directed: If you've had DVT, you'll be on blood thinners for at least three to six months.

Watch how much vitamin K you're eating: If you are taking warfarin. Vitamin K can affect how warfarin works. Green leafy vegetables are high in vitamin K. Check with your doctor or a dietician about your diet if you're taking warfarin.

Be on the lookout for excessive bleeding: Which can be a side effect of taking medications such as blood thinners. Talk to your doctor about activities that could cause you to bruise or get cut, as even a minor injury could become serious if you're taking blood thinners.

Move: If you've been on bed rest, because of surgery or other factors, the sooner you get moving, the less likely blood clots will develop.

Wear compression stockings: to help prevent blood clots in the legs if your doctor recommends them.



- Pharmacotherapy hand book by terry l.schwinghammer, joseph t. dipiro, vicki l. eilingrod, ceccily v. dipiro 11th edition.

A CASE STUDY ON DEEP VEIN THROMBOSIS IN SOAP FORMAT

SUBJECTIVE EVIDENCE

A 54 year old male patient was admitted to the hospital for the following complaints
c/o: Right lower limb swelling and pain since 14 days. With fever on and off, vomiting (3 episodes), headache.

Medical history: Hypertension, since 10 yrs

Surgeries: Right leg implant removal done in 2018

Medication History: Tab.Telma 40 mg

OBJECTIVE EVIDENCE

Odema: Yes, right leg

Vitals

PARAMETER	VALUE
Temperature	99°F
Blood pressure	130/90 mm of Hg
Pulse rate	102 bpm
Respiratory rate	20cpm

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- Clinical pharmacy and therapeutics by rofer walker and cate whittle sea 3rd edition
- Pharmacotherapy- a pathophysiological approach by joseph. T. dipiro, robert l. Talbert, gary c.yee, gary g. Watze, barbara g. Wells, l. Michael posey 8th edition.

LAB INVESTIGATIONS

CBP

Parameter	Recorded Values	Normal values
Hb	9.4g/dl	13-17g/dl
RBC	3.57mill/cumm	4.5-5.5mill/cumm
WBC	8,300 cells/cumm	4000-10,000 cells/cumm
PCV	30.1 vol	40-50%
MHC	26.4pg	28-32 pg
Platelet count	4.5 lakhs/cumm	1.5-4.0 lakhs/cumm

RBC:- Mild microcytic, hypochromic form

RFT :- Serum cr.- 1.2mg/dl (0.7-1.2mg/dl)

PROVISIONAL DIAGNOSIS

Pain and swelling in leg along with tenderness

RADIOLOGICAL TESTS

US of right lower limb:

- Complete thrombosis of right common femoral and superficial
- Femoral vein extending into GSV till below knee level.
- Partial thrombosis of right popliteal vein.
- Near total thrombosis of right external Iliac vein.
- Diffuse extensive odema of right thigh and leg noted.

CLINICAL ASSESSMENT FOR DVT

Yes, moderate

FINAL DIAGNOSIS

DVT of Right Leg

ABOUT THE DISEASE

- Deep vein thrombosis (DVT) occurs when a blood clot (thrombus) forms in one or more of the deep veins in the body, usually in legs.
- Deep vein thrombosis can cause leg pain or swelling but also can occur with no symptoms.
- This condition is serious because blood clots can loosen and lodge in the lungs.

ASSESSMENT

- Problem 1- DVT
- Problem 2- Hypertension
- Problem 3- Anaemia

MEDICATIONS

Generic name	Brand name	Therapeutic use	Dose	Route	Frequency
ENOXAPARIN	Inj. Enoxaparin	Anticoagulant	60mg	SC	BID
ACETAMINOPHEN + TRAMADOL	T.Ultracet	Analgesic	300mg	Oral	SOS
TELMISARTAN	T. Telma	Antihypertensive	40mg	Oral	OD
NICOUMALONE	T. Acitrom	VT	2mg	Oral	OD
PANTOPRAZOLE	Inj. Pantop	PPI	40mg	IV	BD
ONDANSETRON	Inj. Zofer	Anti emetic	4mg	IV	OD
FERROUS ASCORBATE	T. Orofer	Iron supplement	100mg	Oral	BD

ABOUT THE DRUGS

- Inj. Enoxaparin :- To dissolve the clots
- T. Acetaminophen + tramadol :- Antipyretic and analgesic
- T. Telma :- Antihypertensive
- T. Nicoumalone :- Anti platelet
- Inj. Pantoprazole :- Proton Pump Inhibitor
- Inj. Ondansetron :- Antiemetic
- T. ferrous ascorbate :- Anemia

**CLINICAL PHARMACIST INTERVENTIONS
INTERACTIONS****Inj. Enoxaparin + T. Telma**

The concomitant use of Heparin and ARB's increase risk of hyperkalemia, serum potassium and renal function tests should be monitored.

Inj. Enoxaparin + Acetaminophen

Acetaminophen increases effects of enoxaparin by unknown mechanism.

T. Pantoprazole + T. Ferrous ascorbate

Pantoprazole will decrease the level or effect of ferrous ascorbate by increasing gastric pH.

NON-PHARMACOLOGICAL PLAN

- ❖ Do Wear stockings
- ❖ Do Not Cross Your Legs
- ❖ Raise Level of Legs While Sleeping.
- ❖ Avoid Vit.K Supplements in the Diet (Green vegetables, Ground nuts)
- ❖ Do Regular Exercise.
- ❖ Take Iron Tablets Along with Vit.C Enriched Foods Like Lemon Juice To Increase Its Absorption.